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Banking in the Age of the Platform Economy –

European Banks' Strategies of Interdependence and a Resource Based View Adapted for Platform-Related Interdependence

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Abstract

Since the 2007-08 Global Financial Crisis, banks have been assailed by numerous forces that have increased interdependence in their industry. Rapid technological advances, the rise of the platform economy, regulatory changes, evolving consumer behaviour, and the emergence of new competitors like fintechs and bigtechs have meant that strategic resources and capabilities increasingly reside outside the ownership and control of banks. These forces have been particularly potent in Europe due to favourable regulatory reforms like the Payment Services Directive 2 (PSD2) and the Open Banking Standard. Thus, banking leaders need to consider these external resources and capabilities and the potential to cocreate value with them, as they devise strategies to navigate the forces of interdependence. Failing to do so risks banks becoming disintermediated from various business functions they have long dominated.

This study describes the strategies that the top 20 banks in Europe adopted in response to these forces between 2008-19 through the lens of the Resource Based View (RBV) of strategy. Several important studies presented reformulations of the RBV to better adapt it to interdependence, however, since these studies preceded the rise of the platform economy, they presented adaptations focused on dyadic and multi-firm interdependence. Building on these existing reformulations, this study proposes a further adaptation to the RBV to better cater for platform-related interdependence. To achieve this, two managerial perspectives on interdependence (ecosystems, platforms), an economic perspective (networks), and the concepts of coopetition and temporary competitive advantage are drawn upon to extract several considerations that are then integrated into the RBV.

Having identified 4 modalities of banks' strategies of interdependence, this study adopts a longitudinal, multiple-case study to put forth a taxonomy of banks' strategies of interdependence and to present a contextual presentation of the 20 banks' institutional context. These findings are abstracted to formulate a meta-taxonomy of strategies of interdependence that is applicable more broadly beyond banking.

The primary theoretical contribution that this study makes is to present an empirically validated reformulation of the RBV that makes it better adapted to platform-related interdependence; consequently, this study helps address several lingering critiques of the RBV. This study makes several important managerial contributions including to banks' top management who need to strategize for the forces of interdependence in their industry, regulators including those in countries that are commencing their open banking journey, and leaders at bigtechs and fintechs who need to continue to evolve their strategies from trying to displace banks towards cocreating value with them. Several recommendations for future research are suggested including the need to tackle the relative advantage of a strategy of interdependence over others under different conditions.

Keywords: banking, fintech, platform economy, multisided platforms, ecosystems, networks, relational rents, network externalities, value cocreation, coopetition, temporary competitive advantage, Resource Based View, external resources and capabilities, multiple-case study, taxonomy

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1 – Introduction

The banking industry has had to contend with numerous disruptive forces since the 2007-08 Global Financial Crisis. Banks' profitability has been negatively impacted by several factors that emerged from the crisis including a low-growth macro-economic environment, new monetary policy measures such as quantitative easing, and sustained low interest rates. Banks have also been confronted with numerous and more stringent regulatory reforms. In this environment, a "digitally native" generation emerged which created a shift in consumer expectations towards digitalization. Rapid advances in emerging technologies such as artificial intelligence, cloud computing, and blockchain facilitated the emergence of new business models; this manifested itself in banking with the emergence of a new type of competitor, financial technology start-ups (or fintechs), which challenged banks. Fintechs were bolstered with the concurrent proliferation of innovation labs, incubators, and accelerators as well as significant venture capital funding, which were critical contributors to their rise. Bigtechs such as Apple and Google also began to venture into banking, applying new technologies to redefine value creation in financial services. In Europe, these forces were catalysed by the passing of new regulations that promote the activities of fintechs and bigtechs, particularly the European Commission's Payment Service Directive 2 (PSD2) and the UK Competition and Market Authority's (CMA) Open Banking Standard, which came into force in January 2018. Section 2 (the "Big Issue") elaborates on these new forces in detail, it also abstracts these forces and characterizes them as the forces of interdependence, noting that while the banking industry has often faced disruption, new technologies, and new regulations, the difference with these forces of interdependence is that value creation in the banking sector is increasingly stemming from strategic resources and capabilities that reside outside the ownership and control of banks, which has traditionally not been the case. Recognizing this, but also acknowledging the significant advantages that banks have, not least the ability to originate new money, Section 2 concludes by posing the managerial question about the strategies that European banks have been taking in response to interdependence.

Section 3 then refines this important managerial question into a research question that can be empirically studied through a theoretical frame. Given this study's internal-realist ontological position, observing the unit of analysis (banks' strategies of interdependence) can be effectively achieved by observing the modalities of banks' strategies of interdependence. Before observing these modalities, it is important to define this study's understanding of strategy, which is best captured by the Resources Based View (RBV).

Section 3 examines the foundations of the RBV, whose roots go back to Penrose (1959) and which underwent significant development in the 1980s (e.g., Wernerfelt, 1984; Barney, 1986; Lippman & Rumelt, 1982; Dierickx & Cool, 1989), and which grew in popularity during the 1990s (e.g., Barney, 1991; Peteraf, 1993; Oliver, 1997; Barney, et al., 2011; Foss, 2011; Sirmon, et al., 2007; Maritan & Peteraf, 2011; Wernerfelt, 2011; Ahuja & Katila, 2004; Le Breton-Miller & Miller, 2015). The RBV suggests that firms can derive Ricardian rents and sustained competitive advantage through the effective management of superior resources and capabilities. As the RBV has grown in popularity it has developed and evolved, often through the incorporation of knowledge from other fields and disciplines such as economics, psychology, and entrepreneurship, and has even generated several spin-offs such as Dynamic Capabilities (Teece, et al., 1997) and the Natural Resource Based View (Hart, 1995).

A number of academics sought to introduce the notion of interdependence into the RBV, with two particularly important contributions, Dyer & Singh's (1998) Relational View, and Lavie (2006) who built on Dyer & Singh (1998) to propose a reformulation of the RBV that took into account external resources. However, these contributions were made at a time when interdependence was mostly characterized by dyadic or multi-partner networks and preceded the technologies and firms that came to define the meteoric rise of the "platform economy". Thus, in Section 3, while building on Lavie (2006) and Dyer & Singh (1998), I propose a further adaptation to the RBV that more completely captures the forces of interdependence. To achieve this, I draw on two managerial perspectives (ecosystems, platforms), an economic perspective (networks) which includes considerations about network externalities and multi-sidedness, and the notions of hypercompetition and coopetition. By drawing on these literatures, I propose two adaptations to the RBV, a) that firms should take into account as strategic resources and capabilities, certain resources and capabilities that are controlled or owned by external parties, and b) that firms should, under conditions of hypercompetition, take into account temporary competitive advantage as a component of an overarching strategy for sustained competitive advantage. By drawing on these literatures, I suggest eight considerations which I integrated into the amended RBV to facilitate the proposed adaptations. It is also important to note, that while the RBV has reached a stage of maturity (Barney, et al., 2011), there are nevertheless a number of critiques of the RBV, such as the seminal work of (Kraaijenbrink, et al., 2010) (elaborated on in Section 3), thus in proposing the adaptation to the RBV, I seek to contribute to addressing these critiques where possible. With this in mind, I conclude Section 3 by demarcating the universe and time boundary, detailing the modalities of banks' strategic response to interdependence, and, posing the

research question that this study will address: “Through the lens of a Resource Based View that has been adapted for platform-related interdependence by accounting for a) external resources and capabilities and b) temporary competitive advantage, what strategies have firms adopted in response to interdependence in the platform economy age?”

Section 4 details the soft-positivist, qualitative research design and methodology that this study adopts to answer the research question. This study is descriptive and seeks to contribute to the development of new knowledge and theory. It adopts a Straussian view of the relationship between theory and data, a circular research process, an abductive conceptual framework, and a longitudinal multiple-case study methodology. The study also enforces a number of safeguards that help in the maximization of the construct validity, generalizability, and reliability of research outcomes. The study triangulates between different types of data (documents, archival databases), methods, and data sources (e.g., press releases, financial databases, annual financial statements). The research design and methodology are crafted in a way that helps answer the research question, provide contextual insights, and ultimately results in a taxonomy of banks’ strategies of interdependence. The contextual insights that provide a deeper understanding of the 20 banks’ institutional milieu – especially in terms of their financial performance over the period considered – are presented in Section 5. Section 6 presents the empirical findings which culminates in the taxonomy of banks’ strategies of interdependence. Section 6 also abstracts these findings into second order findings to generate a meta-taxonomy of strategies of interdependence which is applicable more broadly and is not limited to the European banking sector. Section 7 presents this study’s theoretical contributions, especially how the empirical findings support this study’s reformulation of the RBV. Section 7 also elaborates on this study’s managerial contributions, as well as touching on some of the study’s limitations and avenues for future research. Section 8 concludes.

2 – Big Issue

Banking has been in a state of flux since the shock of the 2007-08 Global Financial Crisis (GFC). The crisis led to a prevailing recessionary, low-growth macro-economic environment globally, the introduction of new monetary policy measures like quantitative easing, and the sustaining of interest rates at close to zero for over a decade which has negatively impacted banks' profitability (Molyneux & Wilson, 2017; Claessens, et al., 2018). Banking regulators have enacted more stringent regulatory reforms, like Basel III which introduced stricter solvency and liquidity requirements, and the Financial Stability Board's more onerous capital adequacy requirements (Claessens, et al., 2018), as well as the European Commission's Payment Service Directive 2 (PSD2) and the UK Competition and Market Authority's (CMA) Open Banking Standard that came into force in January 2018 and which force banks to open-up their customers' data to third-parties (Basso, et al., 2018).

The GFC brought to the forefront the excessive risk-taking and reckless pursuit of short-term profits that was incentivized in banking. This was manifested in the failure of prudential corporate governance (e.g., Lehman Brothers collapse), price fixing (e.g., LIBOR manipulation) and mis-selling (e.g., UK banks mis-selling payment protection insurance) (Nordberg, 2011; Molyneux & Wilson, 2017). Consequently, consumer trust in banking eroded significantly (Shim, et al., 2013). Concurrently, a new digitally native generation emerged that is easily disillusioned, used to instant gratification, and vocal on social media (Twenge, et al., 2010). Meanwhile, the pace of technological change has been formidable with advances in artificial intelligence, blockchain, and cloud computing facilitating new business models across industries.

2.1 – New Challengers to Banks: Fintech and Bigtech

In this changing environment a new breed of competitor emerged to challenge banks (see Appendix 2, which presents the broadening financial services landscape). Benefiting from strong investment, openness to disruptive technologies, and less constrained by regulations, these nimble new-entrants – financial technology companies (fintechs) – began unbundling traditional financial services value chains and contesting increasingly commoditized conventional financial services functions (Gomber, et al., 2018; Gozman, et al., 2018). Venture capital funding has been essential in the growth of fintechs (Hill, 2018) as

have the innovation labs, incubators, and accelerators supported by governmental, supranational, and private organizations. Bigtechs (e.g., Apple, Google, Alibaba, Tencent) are also applying new technologies to challenge conventional banking operations. Drawing on their vast customer data and institutional legitimacy, they are adding financial services to existing offerings (e.g., Apple Pay, Alipay) with potential for deeper incursions into financial services in the future (Hill, 2018). Fintechs and bigtech are redefining value creation in banking, putting at stake banks' business models. Unless banks respond by adapting their strategies, they risk becoming disintermediated (e.g., merely assuring regulatory compliance, executing transactions) from value systems they once dominated.

2.2 – The Rising Forces of Interdependence in the Platform Economy

Banks are no strangers to adapting to changes in technologies and consumer behaviour (e.g., the formation of the Society for Worldwide Interbank Financial Telecommunication (SWIFT), payment cards, internet banking). However, the disruptive forces of fintech and bigtech are more potent challenges to banks as they emanate from outside the banking sector, enabled by regulatory changes, public policy, funding and innovation partners, and capitalizing on innovative technologies to better meet customers' rapidly evolving banking demands, while banks are burdened with the legacy of the GFC, outdated technology, declining profits, more stringent regulations, and disillusioned customers. The disruptive forces of fintech, bigtech, and emerging technologies will be elaborated on in Section 2.4, 2,5, 2,6, and 2,7, regulatory forces and public policy enablers will be discussed in Section 2.8, 2,9, 2.10, and 2.11, and the influence of venture capital, innovation labs, incubators, and accelerators will be covered in Section 2.12. Collectively, these disruptive forces can be abstracted and characterized as the disruptive force of interdependence. This force of interdependence that has greatly grown in the banking sector can potentially have negative ramifications for banks, for example, a study conducted by the management consulting firm McKinsey & Company found that unless they take mitigating actions banks risk losing up to 40% of retail banking revenues by 2025[1]. This disruptive force is more pronounced in Europe where PSD2 and the Open Banking Standard have invigored fintechs. The notion of "open banking" called for by these regulations is expected to lead to the unbundling of banks' products from distribution channels, creating a marketplace model that lowers barriers to entry for fintechs (Zachariadis & Ozcan, 2017). This therefore makes the notion of

[1]https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/cutting%20through%20the%20noise%20around%20financial%20technology/cutting-through-the-fintech-noise-full-report.ashx

interdependence in banking more salient in Europe than elsewhere, which is why European banks constitute the focus of this study. Moreover, the forces of interdependence are likely to be more widely felt by large, international, and diversified banks who will need to contend with these forces across diverse geographic, regulatory, and business segment fronts, compared to small, specialized, local banks whose more restricted activities limit the impact that the forces of interdependence can have on them. Thus, within the European context, this study will focus on the largest 20 banks. The notion of interdependence is related to rapid change. This accelerated pace of change is driven by globalization, the emergence of the platform economy, the "Knowledge Society", rapidly evolving and disruptive technological innovation, and the blurring of industry boundaries (Drucker, 1969; Handy, 1989; Christensen, 1997); this rapid pace of change is described by D'Aveni (1994) as a hypercompetitive business environment. The forces of interdependence in the banking industry have made it a more hypercompetitive one. Bigtech, fintechs, venture capital firms, incubators, accelerators, and innovation labs are likely to benefit from this environment and their activities will further reinforce interdependence and hypercompetition. On the other hand, banks will need to come to terms with hypercompetition and the forces of interdependence in their industry and will have to strategize accordingly. In considering banks' strategies, this study adopts the Resource Based View (RBV) of strategy. An important reality that these banks will have to acknowledge is that in this environment an increasing number of strategic resources and capabilities will reside outside their ownership and control, which means that banks will have to consider how they interact with these external strategic resources and capabilities, and whether and to what extent they seek to replicate or respond to them through developing or acquiring their own internal resources and capabilities.

2.3 – Strategizing in Contexts of Rising Interdependence

The world has become much more connected and digitalized since 2007-08; banking has not been immune to this, for example bank customers are increasingly conducting banking activities digitally instead of in branches[2]. Most banks have recognized that digitalization is part of their future and adapted their strategies to digitalize their channels; these strategies of channel digitalization have optimized banks' business models, yet they have not fundamentally changed them. However, the more recent emergence of fintechs challenge the fundamentals of banks' business models; in Europe, PSD2 and the Open Banking Standard have widened the scope of the digital disruption faced by banks, creating an environment where new value

[2]https://www.ebf.eu/facts-and-figures/structure-and-economic-contribution-of-the-banking-sector/

propositions are often created through a hybrid architecture of internal and external resources and capabilities. This creates an organization that is highly reliant on interdependence since most valuable resources and capabilities are not owned or controlled by a single entity. Thus, banks cannot afford to react to these disruptions as they have in the past, by simply developing resources and capabilities internally and through their supply chain (e.g., mobile banking) or in collaboration with other banks (e.g., SWIFT). In strategizing for interdependence, banks can draw on various managerial and economic perspectives that have tackled the notion of interdependence, such as the ecosystem, platforms, and networks literatures. With this in mind, in the current networked economy, banks will need to come to terms with interdependence, adopting new ways to assemble, manage and govern external resources and capabilities to architect new value propositions especially given the nature of the requisite new resources and capabilities (e.g., agile culture, skills in emerging technologies). They will need to coopetate (Brandenburger & Nalebuff, 1996) with an ecosystem of other actors to generate externalities that are beneficial to all. In a digital environment, these beneficial network externalities cannot be generated by a single actor in isolation, they are generated when an ecosystem of actors interact through a platform. Platforms are driven by a focal firm that orchestrates the activities of other participants. While all platform participants benefit from network externalities, focal firms can tailor ecosystem development in line with their own strengths (Gawer & Cusumano, 2002; Iansiti & Levien, 2004; Adner, 2006) and set the industry standards allowing them to control and internalized more of the network externalities that are generated.

Despite the multitude of disruptive forces, banks cannot be counted out; not only do they have the institutional legitimacy that fintechs lack as well as the financial expertise and long-lasting customer relationships that is missing in fintechs and bigtechs, but they also possess the unique and critical ability to originate new money, which means that fintechs and bigtechs can only challenge banks' ancillary functions – intermediating existing money – and not the core function of originating new money (unless they themselves become regulated banks); these unique strengths are elaborated on in Section 2.13. Thus, larger, diversified banks are in fact well suited to originate, lead, and control ecosystems to bring co-created value propositions to fruition. By taking this initiative, banks are more likely to control the ecosystems, platforms, and networks, and the subsequent generation, distribution, and internalization of network effects, as well as protecting their ancillary functions from disruption. Failing to do this will expose banks to the risk of becoming complementors on a platform controlled by others and will put their ancillary functions at risk of disintermediation. Banks can therefore capitalize on their strengths to

embrace the notion of interdependence in their strategies. Section 2.14 explores the strategies that banks can adopt in response to the growing forces of interdependence in their industry, Section 2.15 concludes by posing the managerial question that this study will seek to address. However, Sections 2.4 to 2.12 will start by elaborating on the main underlying contributors to the forces of interdependence.

2.4 – Emerging Technologies, Fintech, and Bigtech

Numerous forces have disrupted the financial services industry in the last 20 years and have challenged the established understanding about "*relationships among technology, business models and financial services*" (Gozman, et al., 2018). In particular, exogenous shocks such as the 2007-08 GFC have led to many central banks around the world adopting unconventional monetary policy interventions such as Quantitative Easing, Credit Easing, and zero interest rate policy. This has resulted in a sustained period of near-zero short-term interest rates and low long-term interest rates (a flatter yield-curve) which has directly contributed to the erosion of banks' Net Interest Income (NII), profitability and Return on Assets (ROA) (Alessandri & Nelson, 2015; Borio, et al., 2017). In fact, the effect of interest rates on banks' profitability is non-linear, its impact is much more pronounced when interest rates are very low; as such the erosion of banks' NII, profitability and ROA has been amplified by the prolonged period of low-interest rates after the 2007-08 global financial crisis (Borio, et al., 2017). The 2007-08 GFC also ushered in an era of more stringent banking and financial regulation and macroprudential oversight and reduced public trust in the banking sector.

2.5 – The Rise of Fintech

While banks struggled with tightening revenues and more stringent regulations, new start-up companies capitalized on new and rapidly evolving technologies as well as the emergence of the "digitally native" generation. These innovative new entrants termed fintechs (a neologism combining "finance" and "technology") applied disruptive technology to financial services to offer more efficient and flexible financial services that better met new consumer expectations (Puschmann, 2017). On the other hand, banks were ill-equipped and ill-prepared to address evolving consumer behaviour and consumer expectations, and were lumbered with expensive and entrenched legacy technologies (e.g., core banking systems, mainframes) while rapidly evolving technological innovation such as blockchain, cloud computing, and

artificial intelligence were having disruptive and transformational effects by supporting new business models (Gomber, et al., 2018). Fintechs were often the result of entrepreneurial activity of banking staff that had lost their jobs in the aftermath of the GFC, and which attracted significant investment from venture capital firms. They began to unbundle the value chains of incumbent financial services institutions and contest certain financial functions. In Europe, Fintechs were especially emboldened by favourable regulation such as PSD2 and the Open Banking Standard that facilitated their activities.

Fintechs challenged conventional banking business models across diverse segments and reshaped how customers bank. For example, Kabbage approves small business loans in minutes that would otherwise undergo longer, more rigorous due-diligence processes at banks[3]; Wealthfront is cheaper than conventional wealth managers[4]; PayPal had 578 billion USD in total payment volume in 2018[5]; Stripe facilitates frictionless online and mobile payments[6]; Lenddo generates credit scores by amalgamating mobile phone, internet browsing, and social media data with traditional transactional and credit data (Gomber, et al., 2018); digital-only bank Revolut, which provides retail customers engaging, socially-enabled experiences with lower fees has been valued at 5.5 billion USD[7] as of February 2020; Robinhood, a zero-cost trading platform, is already challenging revenue streams from banks' brokerage fees and as of August 2020 had over 10 million users and was valued at 11.2 billion USD[8]. By the end of 2017 there were 1,537 fintechs in 64 countries that had received 80.4 billion USD in venture capital funding, capital formation activities that were last seen during the dotcom boom of the late 1990s and which "*represent one of the largest historical expansions in entrepreneurship to date among modern economies*" (Gomber, et al., 2018). In 2018 alone, there was a record 40.6 billion USD in venture capital fintech financing globally and by Q3 2019, there were 58 fintech unicorns valued in total at 213.5 billion USD[9].

Fintechs participate in a variety of financial services subsectors[10] (Appendix 2 provides a categorization of fintech subsectors); the Bank for International Settlements (BIS) also provides a useful taxonomy of the fintech environment which this study aligns quite closely with. The BIS' taxonomy starts by splitting

[3]https://www.forbes.com/sites/darrendahl/2015/05/06/the-six-minute-loan-how-kabbage-is-upending-small-business-lending-and-building-a-very-big-business/#1b7f61959042
[4]https://uk.reuters.com/article/us-wealthfront-cash/robo-adviser-wealthfront-launches-cash-account-idUKKCN1Q32BY
[5]https://investor.paypal-corp.com/news-releases/news-release-details/paypal-reports-fourth-quarter-and-full-year-2018-results
[6]https://assets.kpmg/content/dam/kpmg/at/pdf/presse/fintech100-2018-report.pdf
[7] https://www.ft.com/content/7fa2a8ea-8e66-11ea-a8ec-961a33ba80aa
[8] https://www.reuters.com/article/us-robinhood-funding/robinhood-valuation-surges-to-112-billion-after-latest-funding-round-idUSKCN25D207
[9]https://www.cbinsights.com/research/report/venture-capital-q3-2019/
[10] There are various categorizations of fintech subsectors both in academic (e.g., (Haddad & Hornuf, 2019)) and practitioner literature (for example a fintech specializing in private wealth management may be categorized as a "wealthtech" in some literatures or a "roboadvisor" in others)

the fintech environment into a) fintech activities, b) enabling technologies, and c) policy enablers[11]. Under fintech activities, the BIS identifies the following subsectors: "deposit and lending" activities which includes "loan crowd-funding", "fintech balance sheet lending", "digital banking", "capital-raising" activities which includes "equity crowd-funding", "asset management" activities which includes "robo-advice", "payments, clearing, settlement" activities which includes "e-money" and "digital payment services", "insurance" which includes "insurtech business models" (this study excludes insurance as it is considered a separate industry with a different set of considerations than banking), and, "cryptoassets" which includes "financial activities related to cryptoassets"; under enabling technologies, the BIS highlights the importance of APIs, cloud, biometric technology, blockchain (distributed ledger technology), artificial intelligence and machine learning; under policy enablers, the BIS identifies "digital identity", "open banking", "data protection", "innovation facilitators", and "cyber security".

2.6 – Bigtech's Incursion into Banking

Another important set of actors that have recently entered into banking and financial services are bigtech companies such as Google, Amazon, Apple and Alibaba, and telecommunications firms like Vodafone. Unlike fintech start-ups, these firms have access to vast customer data and relationships, very large customer bases, institutional legitimacy, brand loyalty, large cash reserves, and expertise in emerging technologies that they can build upon to add financial services capabilities. Thus, the roadblocks facing fintechs such as the cost of building a customer base and cash reserves are speed-bumps for bigtech/techfins[12] and telecommunications firms (Hill, 2018). Google and Apple already offer payments services through Google Pay and Apple Pay; Google obtained a Payment License from the Bank of Lithuania in 2018[13], while Apple Pay already accounts for 5% of all global credit card purchase volume, a number that is estimated to grow to 10% by 2025[14]. M-Pesa, which started as a mobile phone money transfer service that was established by Vodafone and Safaricom in Kenya has grown into an integrated financial services company with over 25 million users[15]. The foray made by bigtech and telecommunication firms into banking and financial services can be considered only a first step in what can potentially be a far deeper, more disruptive incursion (Zetzsche, et al., 2017; Hill, 2018) especially in

[11] https://www.bis.org/fsi/publ/insights23.pdf
[12] The financial services related subsidiaries and affiliates of bigtechs are often referred to as techfins
[13] https://www.bloomberg.com/news/articles/2018-12-21/google-payment-expands-with-e-money-license-from-lithuania
[14] https://www.forbes.com/sites/johnkoetsier/2020/02/12/apple-will-manage-10-of-global-credit-card-transactions-by-2025-analyst-says/#5b6b2223369c
[15] https://www.reuters.com/article/kenya-banking/m-pesa-helps-drive-up-kenyans-access-to-financial-services-study-idUSL8N21L2HK

the west. This incursion has been far deeper and more pronounced in China, where Ant Financial (Alibaba's techfin affiliate) has rapidly grown to play a dominant role in many facets of financial services across China and beyond (Shim & Shin, 2016), through diverse services such as payments, wealth management, lending, insurance, and credit references. Ant Financial has been valued at between 200 billion USD and 300 billion USD as of August 2020 and serves 700 million people and 80 million businesses in China through its popular payments and financial services application Alipay, processing 118 trillion RMB (17 trillion USD) in China and 622 RMB (91 trillion USD) internationally in transactions in the 12 months ending June 2020[16] (by comparison the market capitalization of Bank of America was 203 billion USD as of June 2020[17] while Visa's payment volume was 8.8 trillion USD for the 12 months ending on 30 September 2020[13]). Much as Alibaba and Ant Financial have revolutionized e-commerce and financial services in the East, Amazon, Apple, Google and other bigtechs may yet do the same in the West (Zetzsche, et al., 2017; Hill, 2018).

2.7 – Cloud, Artificial Intelligence, Blockchain, and Other Emerging Technologies

The emerging technology that underlies fintech and bigtech innovations is itself rapidly evolving and, in many ways, promotes interdependence by its very nature. One example is blockchain technology which is underpinned by the notion of a network of stakeholders coming together on a decentralized, distributed ledger to record transactions as a single point of truth. Blockchain has seen significant adoption by banks who have joined or formed consortia to exploit the technology in different contexts such as trade finance (e.g., we.trade)[18], trade settlement (e.g., fnality)[19] and securities lending (e.g., HQLAx)[20]. Another example is application programming interfaces (APIs) which facilitate the technological integration among diverse stakeholders (Gomber, et al., 2018; Weiss & Gangadharan, 2010; Evans & Basole, 2016; Clemons, et al., 2017). The last decade has seen the advent of the fourth industrial revolution, or "Industry 4.0"[21], driven by technologies such as the Internet of Things (IoT), artificial intelligence, robotics and 5G, leading to cyberphysical systems (the combination of information technology and other real-world technologies), that have in turn lead to mass customization, intelligent manufacturing, real-time tracking, and the emergence of interconnected smart-manufacturing, smart-buildings, smart-grids, and smart-cities

[16] https://www.ft.com/content/b5f6fed2-2dcf-48dc-9097-a49bff5532dc
[17] https://www.pwc.com/gx/en/audit-services/publications/assets/global-top-100-companies-june-2020-update.pdf
[18] https://we-trade.com/
[19] https://www.fnality.org/about-fnality
[20] https://www.hqla-x.com/
[21] https://www.din.de/blob/76902/e8cac883f42bf28536e7e8165993f1fd/recommendations-for-implementing-industry-4-0-data.pdf

(Clemons, et al., 2017). The last decade has also seen the emergence of the "Sharing Economy"[22] whereby consumers adjust consumption to actual needs, increasing the economic utility of their assets, or in some cases preferring to access assets in the sharing markets rather than acquiring them outright (Benkler, 2004; Clemons, et al., 2017). The "Sharing Economy" is predicated on intermediaries that aggregate demand and supply of products and services to create sharing markets, which is often facilitated by technologies such as cloud-computing, big data analytics, and APIs; the "Sharing Economy" has contributed to shifting consumer and business behaviour from being centred on ownership to focusing on access, and by extension has contributed to increasing the forces of interdependence in business and in consumer behaviour (Weber, 2014, 2016; Clemons, et al., 2017). Moreover, the proliferation of data and information flows has changed the dynamic between firms and their customers, leading to greater levels of informedness, faster markets, faster innovation cycles on the supply side, and greater shifts in consumer behaviour on the demand side (Li, et al., 2014; Clemons, et al., 2017), this changing dynamic also means that there is a greater level of interdependence between firms and consumers.

The increasing forces of interdependence in banking directly benefit the activities of fintechs and bigtech whose increasing penetration into banking and financial services itself compounds the forces of interdependence, creating a more hypercompetitive banking environment. Thus, it is to the advantage of fintechs and bigtech to further promote the forces of interdependence in banking, either directly through their activities or indirectly through regulation, technological innovation, and support for/from other actors (e.g., innovation labs, incubators, accelerators, venture capital firms). In formulating their strategies, banks will therefore need to take into account that increasingly, the strategic resources and capabilities required to compete in a more hypercompetitive and interdependent banking environment reside outside their control and ownership, which will necessitate from banks strategies that deal with these externally held or controlled strategic resources and capabilities since seeking to only replicate them internally or acquire them is unrealistic given how dynamically they evolve.

[22] https://www.economist.com/technology-quarterly/2013/03/09/all-eyes-on-the-sharing-economy

2.8 – The Importance of Regulation and Public Policy Enablers

The 2007-08 global financial crisis brought to the forefront the important role of regulators in managing systemic risk. According to Awrey (2013), prior to the 2007-08 crisis, US policy-makers adopted a "*demand-side view of financial innovation*" that was "*predicated on the perceived efficiency of markets and the effectiveness of private risk management*". For example, US regulators took a non-interventionist stance toward the Over-the-Counter (OTC) derivatives market which was burgeoning both in size and complexity, instead of adopting a supply-side view of financial innovation that considers law and regulation as endogenous to finance to ensure that "*new financial innovations have a legitimate economic rationale and do not exacerbate systemic risk*" (Awrey, 2013). In the aftermath of the 2007-08 GFC regulators took a more interventionist approach with the enactment of stricter regulatory reforms (Molyneux & Wilson, 2017; Claessens , et al., 2018; Bao, et al., 2018) such as: the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 which limited the ability of banks to conduct proprietary trading and other high risk businesses; the formation by the European Commission of the European Banking Union in response to the GFC with its Single Supervisory Mechanism, Single Resolution Mechanism, and stronger prudential requirements for banks[23]; the passing in 2014 of the EU's Bank Recovery and Resolution Directive requiring banks to put in place recovery plans to overcome any financial distress[24]; the stricter capital adequacy, solvency, and liquidity requirements called for by the Basel Committee on Banking Supervision's Basel III reforms that banks need to implement by 1 January 2023[25]; the stricter rules for all banks and financial services firms across wide ranging activities (e.g., trading, research, investments) and covering all asset classes and derivatives that are traded on exchanges or over the counter that came into effect in Europe on 3 Jan 2018 as part of the revised Markets in Financial Instruments Directive (or Mifid II)[26]; more stringent financial reporting under the International Financial Reporting Standards' (IFRS) IFRS 9[27] that aligns with Basel III and which is effective for annual reports from 1 Jan 2018 onward; and, the regular financial stress-tests carried out by regulatory bodies which banks now have to pass following the GFC[28]. These more stringent regulations limit the activities that banks can undertake, which has a negative effect on banks' revenues. Banks have also incurred greater

[23] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/banking-union/what-banking-union_en
[24] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0059
[25] https://www.bis.org/bcbs/basel3.htm
[26] https://www.ft.com/content/ae935520-96ff-11e7-b83c-9588e51488a0
[27] https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments/
[28] https://www.bis.org/fsi/publ/insights12.pdf

costs in bolstering their risk and compliance functions to ensure that they stay abreast of individual regulatory changes, which have more than tripled since 2011 to around 200 revisions per day[29]. Moreover, banks also face the cost and reputational damaged of penalties, with risk and compliance breaches resulting in 372 billion USD worth of penalties being paid by banks globally since 2009 (145 billion USD of which was paid by European banks)[30].

2.9 – Regulatory Enablers of Fintech and Bigtech

While financial regulators imposed more stringent regulations on banks, they also enacted regulations that stimulated and empowered fintechs and bigtech. This is especially true of European regulators. In January 2018, the European Commission's Payments Service Directive 2 (PSD2) came into force[31]. The UK's Competition and Market Authority (CMA) established the Open Banking Standard which also came into force in January 2018 and is mandatory for the UK's largest banks[32]. Both these regulations open up banks' customer data to third parties like fintechs and bigtech, provided that the customer consents. PSD2 and the Open Banking Standard not only give third-party providers access to banks' customer data but also create two new types of payment system providers (Account Information Service Providers and Payment Initiation Service Providers) facilitating the emergence of new business concepts that further stimulate financial technology innovation. In a similar vein, the EU also passed the Electronic (e-money) Money Directive (EMD) which came into effect in 2011 to facilitate the emergence, innovation, and proliferation of secure e-money services in Europe[33]. These "open banking" regulations are expected to lead to the decoupling of banks' products from distribution channels, creating a marketplace model that lowers barriers to entry for fintechs and bigtech (Zachariadis & Ozcan, 2017).

The European Union's Capital Markets Union (CMU)[34] launched in 2015 includes a European Digital Strategy[35] to promote emerging technologies and digitalization in Europe by making EU rules more aligned with rapid technological advancements. Part of this European Digital Strategy includes a FinTech Action Plan[36], which among other things involves the establishment of an EU FinTech Laboratory, the

[29] https://uk.reuters.com/article/us-banks-fines-idUKKBN1692Y2
[30] https://image-src.bcg.com/Images/BCG-Creating-a-More-Digital-Resilient-Bank-Mar-2019_tcm9-217187.pdf
[31] https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32015L2366
[32] https://www.openbanking.org.uk/wp-content/uploads/Guidelines-for-Open-Data-Participants.pdf
[33]https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:32009L0110
[34] https://ec.europa.eu/info/business-economy-euro/growth-and-investment/capital-markets-union/what-capital-markets-union_en
[35] https://ec.europa.eu/digital-single-market/en/content/european-digital-strategy
[36] https://ec.europa.eu/commission/presscorner/detail/en/IP_18_1403

launching of the EU Blockchain Observatory and Forum[37], and proposed regulation relating to crowdfunding[38]. The EU's FinTech Action Plan also aligns with other related EU fintech initiatives such as the EU's Consumer Financial Services Action Plan in 2017 which seeks to strengthen the EU's retail financial services by exploiting technological advances and fintech[39] and the eIDAS (electronic Identification, Authentication and Trust Services) regulation that came into force in September 2014 and which, among other things, assists fintech activity by facilitating better electronic identification and trust services for electronic transactions in the EU[40]. Mifid II also benefits fintechs and bigtech, for example Mifid II encourages more securities trading to be conducted over electronic platforms rather than over the phone which is advantageous for more tech savvy fintechs and bigtechs. Mifid II also call for the unbundling of research fees from trading fees that banks hitherto bundled under one service which they provided to buy side clients; the unbundling may encourage buy side clients to seek alternative ways to execute trades or to access market research, for example via fintechs[41]. The UK's Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA) established the New Bank Start-up Unit (NBSU) in 2016, to support new banking start-ups in the UK[42]. A number of European regulators enacted laws that also facilitated the advancement of fintech and bigtechs' cryptocurrency (or cryptoasset) related activity. In France, the Autorité des Marchés Financiers (AMF) regulates "Digital Asset Services Providers (DASPs)" including the use of Initial Coin Offerings (ICOs) through the "Action Plan for Business Growth and Transformation (PACTE)"[43] law and Decree No.2019-1213[44], which both came into effect in 2019, these new laws seek to promote among other things fintech activity in the cryptocurrency and crowdfunding spaces. The Swiss Financial Market Supervisory Authority (FINMA) published a guideline for ICOs in 2018[45] and one for Stablecoins in 2019[46].

Several regulators have also established regulatory sandboxes to reduce the time and cost required to bring innovative financial services to consumers, while analysing the risks of underlying business models and technologies in order to regulate appropriately[47]. The UK's Financial Conduct Authority launched its

[37] https://ec.europa.eu/commission/presscorner/detail/en/IP_18_521
[38] https://ec.europa.eu/info/publications/180308-proposal-crowdfunding_en
[39] https://ec.europa.eu/info/publications/consumer-financial-services-action-plan_en
[40] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.257.01.0073.01.ENG
[41] https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/sep/Oliver_Wyman_Unbundling_Research_POV.pdf
[42] https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/new-bank/new-bank-start-up-unit-guide.pdf?la=en&hash=1CE8592195229B04C81AA18E82887A851A099ABB
[43] https://www.gouvernement.fr/en/pacte-the-action-plan-for-business-growth-and-transformation
[44] https://www.amf-france.org/sites/default/files/2020-01/decree-services-definitions-en.pdf
[45] https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/
[46] https://www.finma.ch/en/news/2019/09/20190911-mm-stable-coins/
[47] https://www.bis.org/fsi/publ/insights23.pdf

Project Innovate sandbox which onboarded its first 24 companies in late 2016[48]; the Netherlands' De Nederlandsche Bank (DNB) and Authority for the Financial Markets (AFM) also launched their regulatory sandbox and fintech innovation hub in 2016[49]. The UK's FCA also spearheaded an initiative in 2018 to create a global fintech sandbox that would facilitate cross-border fintech innovation, this initiative called the Global Financial Innovation Network (GFIN) has grown to a collaboration of 55 regulators (with an additional 7 observers) as of September 2020[50]. Hill (2018) remarks that one of the reasons why London has emerged as the global fintech capital[51] is the "principles-based" regulatory regime it adopts which offers the flexibility often required by fintechs and bigtech to innovate, while by comparison the US' "rules-based" approach requiring strict compliance with process often stifles innovation (although a number of regulatory initiatives have been taken in the US to counter this such as the Jumpstart Our Business Startups (JOBS) Act of 2012 and the Special Purpose National Bank Charters for Fintech Companies of 2016).

2.10 – Public Policy Enablers of Fintech and Bigtech

As well as financial regulations, there are also a number of public policy enablers that, in promoting a more digital economy, also support and help progress the activities of fintechs and bigtech[52]. Digital identity systems supported at different levels (e.g., national government, private sector, non-profit) allow governments and businesses to deliver digital services, such as secure remote identity identification and authentication, often using innovative, emerging technologies, which then catalyse fintech activity, for example BankID, initially launched in Sweden in 2003, is used by 8 million people as digital identification for financial transactions[53]. Robust data protection and cybersecurity frameworks are also more likely to encourage customers to adopt financial technology. European policy makers have taken the lead in establishing comprehensive data protection laws such as the General Data Protection Regulation (GDPR) that came into effect in May 2018[54], and have well established cybersecurity regulations at the national and sectoral level, that build on a number of frameworks including the 2016 G7 Fundamental Elements of Cybersecurity for the Financial Sector (G7FE)[55], the 2017 G7 Fundamental Elements for Effective

[48] https://www.fca.org.uk/firms/innovation/regulatory-sandbox
[49] https://www.dnb.nl/en/news/dnb-nieuwsbrieven/nieuwsbrief-banken/nieuwsbrief-banken-augustus-2019/dnb385252.jsp
[50] https://www.thegfin.com/about
[51] https://www.cnbc.com/2019/09/22/london-just-overtook-new-york-for-fintech-investment-research-shows.html
[52] https://www.bis.org/fsi/publ/insights23.pdf
[53] https://www.bankid.com/en/om-bankid/detta-ar-bankid
[54] https://gdpr.eu/what-is-gdpr/
[55] https://www.ecb.europa.eu/paym/pol/shared/pdf/G7_Fundamental_Elements_Oct_2016.pdf

Assessment of Cybersecurity in the Financial Sector (G7FEA)[56], and the Guidance on Cyber Resilience for Financial Markets Infrastructure that was issued in 2016 by the Committee on Payments and Market Infrastructures (CPMI) and the Board of the International Organization of Securities Commissions (IOSCO)[57].

2.11 – Banks' Rising Net Regulatory Burden

Kane (2000) describes the concept of the "net regulatory burden", which is imposed by regulators, as being the gross burden regulations place on the profits of the regulated entity minus the benefits that entity derives from the regulation in terms of improved customer service, customer confidence, and market power. As such, "*regulators that impose burdensome regulations on the industry segment they supervise invite penetration of this segment's markets by more lightly regulated domestic and foreign competitors*" (Kane, 2000). Thus, while the net regulatory burden for banks has increased significantly since the GFC, numerous new financial regulations supported by public policy enablers that promote digitalization have fortified the activities of fintechs and bigtech, especially in Europe. This regulatory dynamic means that, increasingly, innovation in banking and financial services is occurring outside of the incumbent banks who are having to deal with their much-increased net regulatory burden. This increases interdependence in the banking industry with banks having to devise strategies to address how they deal with the proliferation of strategic resources and capabilities residing outside their control and ownership.

2.12 – The Role of Investors and Innovation Partners

Funding, particularly from venture capital firms, has been an important driving force behind the fintech boom[58] as have the entrepreneurship programs, such as incubators, accelerators, and innovation hubs, which are supported by government, supranational organizations, and the private sector. A formidable player in fintech financing is venture capital[59]. Venture capital are pooled funds that usually invest in maturing start-ups that have developed products and have started generating revenues. Venture capital contributes to the board of the fintechs they invest in or undertake advisory roles and therefore often have

[56] https://www.treasury.gov/press-center/press-releases/Documents/(PRA)_(BCV)_4728453_v_1_G7%20Fundamental%20Elements%20for%20Effective%20Assessment.pdf
[57] https://www.iosco.org/news/pdf/IOSCONEWS433.pdf
[58] https://www.bloomberg.com/news/articles/2019-10-09/from-mobile-banking-to-facebook-cryptocurrency-a-fintech-guide
[59] https://www.americanbanker.com/list/why-venture-capitalists-love-fintechs

a say on the direction and strategy the fintech takes (Hill, 2018). As such, the strategy adopted by fintechs can be influenced by the objectives of its funders who may push it to collaborate with, compete against or be acquired by incumbents. There are several forms of venture capital, private venture capital and corporate venture capital. The goals of private venture capital are focused on making successful investments with manageable exit strategies. Corporate venture capital firms are owned by large established firms and also have non-financial goals such as business strategy and technology (Block, et al., 2018). In the aftermath of the GFC, governments also sought to fund and encourage competition in the banking sector, especially in the small and medium enterprises (SME) banking segment, for example as part of the European Commission's approval for the UK Government to provide state aid to The Royal Bank of Scotland (RBS), RBS had to divest part of its retail banking business and its SME business as part of an Alternative Remedies Package[60]. The UK government established Banking Competition Remedies Limited (BCR) to implement the Alternative Remedies Package[61]. BCR manages the 425 million GBP Capability and Innovation Fund (CIF)[62] that is aimed at promoting fintech and innovative SME banking solutions and which helped fund challenger banks, digital only banks, and fintechs such as Metro Bank, Starling Bank, Tide[63], iwoca, Atom Bank, and Modulr Finance[64].

Another important source of support and an important driving force behind the fintech boom is that of the formal entrepreneurship and innovation programs supported by governments or government-linked entities, supranational organizations, and the private sector in the form of incubators, accelerators, and innovation labs. Innovation labs (sometimes called "innovation hubs" or "innovation spaces") are "*a safe place for organizations to run experiments and iterate on projects, and they're an important investment for firms that have rigid approaches or that work in highly regulated industries*"[65]. Incubators are programs that provide start-up companies with the mentorship and support to develop and grow, while accelerators are more targeted programs for established start-ups that are aiming to scale for rapid growth[66]. Examples of innovation labs, incubators, and accelerators include Level 39 (owned by Canary Wharf Group), Innotribe (supported by SWIFT) and the FinTech Innovation Lab (supported by Accenture and the Partnership Fund for New York City). Puschmann (2017) and Cassis & Wójcik (2018) emphasize

[60] https://www.gov.uk/government/publications/rbs-state-aid-alternative-remedies-package/introduction-to-the-alternative-remedies-package-information-pack
[61] https://www2.deloitte.com/uk/en/blog/deloitte-private/2020/capability-and-innovation-fund.html
[62] https://www.fintechfutures.com/2019/06/five-winners-in-latest-rbs-derived-funding-round/
[63] https://www.ft.com/content/0e93a22e-3676-11e9-bb0c-42459962a812
[64] https://www.uktech.news/news/modulr-finance-iwoca-currencycloud-and-atom-bank-awarded-banking-competition-remedies-fund-20190815
[65] https://hbr.org/2019/07/why-innovation-labs-fail-and-how-to-ensure-yours-doesnt
[66] https://www.inc.com/fernando-sepulveda/the-difference-between-a-business-accelerator-and-a-business-incubator.html

the important role played by government-linked organizations that support entrepreneurship in the success of London and Singapore as fintech hubs, while (Gozman, et al., 2018) highlight the importance of incumbents like SWIFT in fostering and facilitating fintech innovation.

2.13 – The Uniqueness of Banks

The majority of academic literature considers banks as standard firms that are susceptible to disruptive technological forces in much the same way as firms from other industries such as retail, transport, and media (this is also common in practitioner literature). They consider that banks compete with new entrants such as bigtech and fintechs for the intermediation of existing money. This view is influenced by Neoclassical Economics which assumes a pre-existing form of money that is deposited with banks and which they lend out (Fama, 1980). This view excludes a fundamental reality that is the basis of what makes banks different from bigtech, fintechs, and other financial intermediaries: that banks, and only banks, create new money, in fact 97% of all broad money (currency and bank deposits) in circulation is created by banks[67]. Banks create new money by lending out "*claims on their own debt which the public accepts and uses as money*" (Bossone, 2001). Schumpeter (1934) understood that the uniqueness of banks was not in transferring existing purchasing power between depositor and borrower, but in fact stemmed from their unique ability to add to the existing money supply by lending out claims on their debt, which meant that the credit in the overall system exceeds the money supply as bank money is composed of claims on future output. Bossone (2001) provides a good comparison of banks and non-bank financial intermediaries:

> *"(1) Banks allow the circuit to start by providing new money for new production. Such money is in the form of banks' own liabilities, or debt claims on the banks themselves, that are made available to the borrowers under loan contract terms. Banks do not intermediate existing money, but add to it every time they extend new loans to firms in the form of new deposit claims, while simultaneously committing to honor the deposit claims already outstanding. Banks specialize in selecting borrowers to whom they allocate the new deposit claims.*

[67] https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/money-creation-in-the-modern-economy.pdf?la=en&hash=9A8788FD44A62D8BB927123544205CE476E01654

(2) Nonbank financial intermediaries allocate existing liquidity (bank deposits) from investors with long liquidity positions to fund users with short liquidity positions. Unlike banks, the money intermediated by financial intermediaries does not represent claims on the intermediaries themselves; such money consists of claims on banks (i.e., deposits) and, as such, it can only move across bank accounts. Thus, while intermediaries transfer money across agents with different liquidity preferences, in no case do they create money. By funding investment, financial intermediaries enable capital goods producing firms at circuit end to appropriate the money spent in production and to service their short-term debt obligations to banks." (Bossone, 2001)

Bossone (2001) infers a number of important structural implications from this. Banks extract seigniorage since they finance loans by issuing new deposit claims, "*the interest charged on the loans are not a compensation for foregone consumption and intermediation services. The interest rate (net of the resource costs to process lending and remunerable deposits) is a pure rent that banks extract from borrowers by virtue of their exclusive power to create money*". On the other hand, seigniorage is not extracted by non-bank financial intermediaries who are only reallocating existing liquidity, "*interest payments on a company's debt to a financial intermediary represents a production cost item against the company's revenues*". Moreover, smaller banks have lower money creation capacity than large banks and have larger reserve requirements against their debt (Bossone, 2001).

Academic studies on banks strategies should not ignore the unique and fundamental ability of banks to create money. Fintechs, bigtech, and other non-bank financial intermediaries cannot compete with banks on money creation unless they obtain a banking license thus becoming banks themselves – with all the regulatory ramifications that that would entail – or if there is a global seismic change in the way that money is created (cryptocurrency is an example of this fundamental disruption but it would need to be universally and sustainably adopted for it to have an effect, which so far it has not); however they can disrupt banks' ancillary functions, for example in the intermediation of existing money such as transfers and investments. Banks' unique ability to originate money provides them with a competitive advantage; it also means that other participants and new entrants such as fintechs and bigtech are compelled to seek to increase the forces of interdependence in banking since by doing so they would be better positioned to make significant inroads in the areas in which they can compete against banks – the intermediation of existing money – which may empower them to eventually obtain banking licenses and challenge banks in

their core functions. With this in mind, and having considered the multitude of forces of interdependence in the banking industry (Sections 2.4 to 2.12) that are increasingly driving the formation of strategic resources and capabilities outside the control and ownership of incumbent banks, what strategies are European banks adopting? Section 2.14 will explore this further.

2.14 – Banks' Strategic Options

The rise of fintech, supported by venture capital, innovation labs, incubators, and accelerators, the penetration of bigtech into financial services, the emergence of innovative technologies, new financial regulations, and public policy enablers that have been conducive to the proliferation of financial technology and innovation in banking, have combined to inject significant forces of interdependence and hypercompetition into the banking industry (see Diagram 1). However, this is not the first time banks have had to contend with disruption to their industry. For example, during the 1980s and 1990s, capital markets were considered as disruptive competitors to banks (Allen & Gale, 1994; Allen & Santomero, 1997; Drucker & Puri, 2007; Diamond, 1991; 1997). Boot and Thakor (2000) asked, almost two decades ago, whether banks' relationship banking model can survive competition from capital markets who rely on arms-length transactional banking. They suggested that "*rapid changes in financial services are threatening commercial banks. In the United States, mutual funds such as Fidelity and Merrill Lynch compete for banks' core deposits. Investment banks, armed with a variety of financial market innovations, challenge banks' traditional lending products*". However, they concluded cautiously that "*banks engage in both relationship and transaction banking. Moreover, how much of each the bank does is a matter of strategic choice, and is affected by technology, competition, regulation, and other factors. To make this choice, banks must examine their distinctive competitive edge*" and that "*future research could further develop our thesis that the boundaries between banks and capital markets are blurring. This means banks can return to their relationship lending roots or become more like the capital market underwriters they compete with. This is a fundamental choice for banks, and also of great relevance for regulators because much of bank regulation is rooted in the way banks fund themselves and in the types of loans they make*" (Boot & Thakor, 2000). Boot & Thakor's (2000) cautious conclusion came to fruition and by the early 2000s it was accepted that banks have not been disintermediated and had instead developed a complementary relationship with capital market participants (Bossone, 2001). The outcome of the

disruption caused to banks by fintechs, bigtech and the increase in interdependence, may yet unfold in the same way.

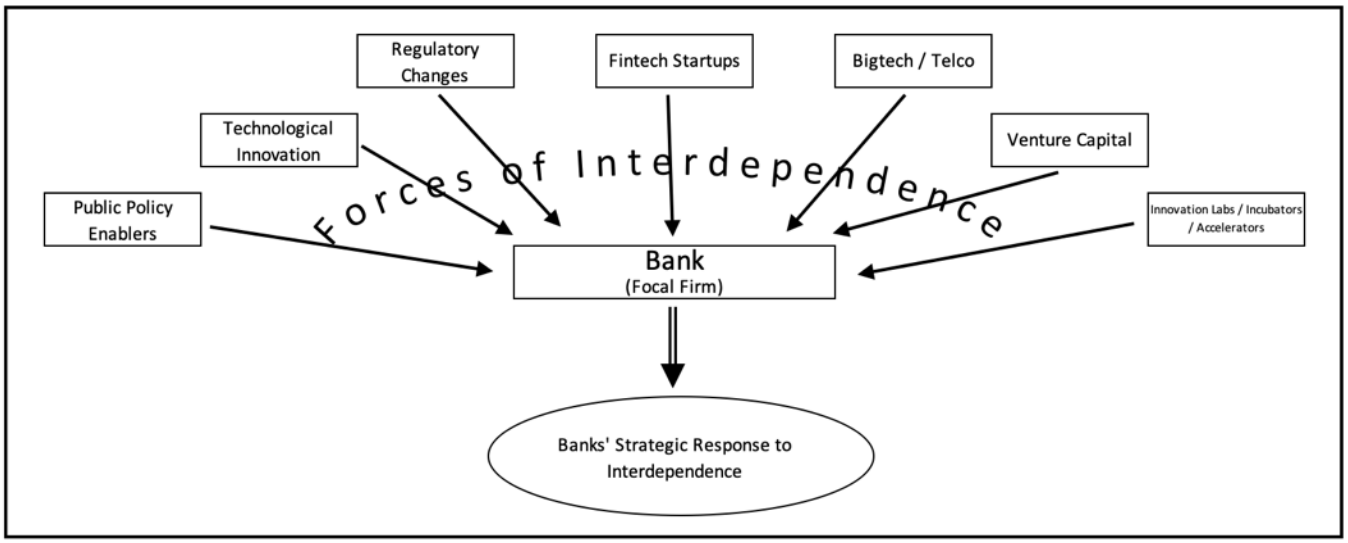

Diagram 1: The Forces of Interdependence Impacting the Banking Industry

In the aftermath of the GFC, there was much fanfare about the risk of fintechs, bigtech, changing consumer trends, technological advances coming together to make banks obsolete[68] [69] [70] [71]; however, toward the end of the 2010s, it started to appear that this risk was overstated and that banks will have to coexist with fintechs, bigtech and other actors and will have to make sense of emerging technologies, new regulations and the forces of interdependence in their sector[72] [73] [74] [75]. As the 2010s came to a close, a number of high profile events served to underscore this new realization, such as the fraud and subsequent bankruptcy of Wirecard[76], one of Europe's most renowned fintechs which two years prior to its collapse was valued at 24 billion EUR and had replaced Commerzbank in the prestigious Dax 30 index[77], and Facebook's cryptocurrency project Libra which has been scaled back significantly in the light of concern from multiple regulators[78] as well as being abandoned by key partners such as Mastercard, Visa, PayPal, eBay and

[68] https://www.digitalbankingreport.com/trends/the-millennial-mind/
[69] https://www.forrester.com/report/Leading+Banks+Embrace+Digital+Core+Banking/-/E-RES137376
[70] https://www.americanbanker.com/opinion/traditional-banks-continue-to-flirt-with-obsolescence
[71] https://www.mckinsey.com.br/~/media/mckinsey/industries/financial%20services/our%20insights/bracing%20for%20seven%20critical%20changes%20as%20fintech%20matures/fintechnicolor-the-new-picture-in-finance.ashx
[72] https://www.ey.com/Publication/vwLUAssets/ey-unleashing-the-potential-of-fin-tech-in-banking/$File/ey-unleashing-the-potential-of-fin-tech-in-banking.pdf
[73] https://www.americanbanker.com/opinion/a-vetting-guide-for-banks-mulling-fintech-partnerships
[74] https://assets.kpmg/content/dam/kpmg/ke/pdf/thought-leaderships/Forging-with%20bleeds.pdf
[75] https://www.accenture.com/t20170720T034938Z__w__/us-en/_acnmedia/PDF-57/Accenture-Fintech-Did-Someone-Cancel-The-Revolution.pdf
[76] https://www.wsj.com/articles/wirecard-bankruptcy-scandal-missing-$2billion-11593703379
[77] https://www.ft.com/content/284fb1ad-ddc0-45df-a075-0709b36868db
[78] https://www.ft.com/content/79376464-72b5-41fa-8f14-9f308acaf83b

Vodafone[79]. Thus, while fintechs and bigtech can replicate some banking functions more efficiently at a lower cost using innovative new technologies, they lack the financial expertise and the ability to establish and curate customer relationships that banks have established over decades[80], fintechs also lack the size and institutional legitimacy of banks (bigtechs are better positioned in this regard) not to mention that both fintechs and bigtechs lack banking licenses and the ability to originate new money which banks possess (Hill, 2018). Consequently, as Hill (2018) remarks quoting from the findings of the World Economic Forum's 2017 report on fintech disruption[81], fintechs "*have materially changed the basis of competition in financial services, but have not yet materially changed the competitive landscape*".

However, just as it is important not to overstate the impact of fintech and bigtech, it is also important not to underestimate the significant impact their activities have had on banks. While prolonged periods of low interest rates and flattening yield curves have a negative impact on banks' net interest income, they positively impact banks' non-interest income for example those derived from fees and commissions (Borio, et al., 2017). However, it is precisely in the areas that generate non-interest income that fintechs and bigtech are challenging banks (for example, robo-advisors challenging wealth management, transfers and remittances fintechs and bigtechs such as PayPal, Apple Pay and Google Pay challenging traditional retail banking, and SME financing and crowdfunding fintechs challenging traditional SME banking and corporate banking). This means that in prolonged periods of low interest rates and flatter yield curves – while banks' net interest income is being eroded – any potential positive impact to their non-interest income is itself being contested by fintechs and bigtechs. The rise of fintech and the incursion of bigtech into banking and financial services thus are serious challenges that banks need to address.

2.15 – The Managerial Question

The combination of bigtech, fintechs, key regulatory and policy enablers, venture capital funding, innovation labs, incubators, accelerators, and emerging technologies has injected the forces of interdependence and hypercompetition into the banking industry, this has consequently accelerated the propagation of financial services innovation outside of banks and incumbent financial services firms. Consequently, this has nurtured the strategic resources and capabilities that underpin these financial

[79] https://www.bbc.com/news/business-51200446
[80] https://www.ibm.com/downloads/cas/DAZBRZLM
[81] http://www3.weforum.org/docs/Beyond_Fintech_-_A_Pragmatic_Assessment_of_Disruptive_Potential_in_Financial_Services.pdf

services innovations, and which reside outside the ownership and control of banks and other incumbents. Banks have recognized that they need to respond strategically to these developments, and it follows that this study's managerial question can be posed as follows:

> **How have large European banks been strategically responding to the rising forces of interdependence?**

By addressing this managerial question, this study seeks to make managerial contributions that would be relevant and useful to practitioners, particularly top management at banks and other financial institutions who can draw upon this study's findings to better strategize in response to the rapidly growing forces of interdependence that are assailing their organizations.

Section 3 refines this managerial question into a research question that this study will address empirically. In doing so, this study's understanding of strategy will be based on the Resource Based View (RBV) and its theoretical framework will draw on business and management academic literatures that tackle the concept of interdependence (two managerial perspectives: ecosystems, and, platforms; one economic perspective: networks) as well as the notions of coopetition and hypercompetition.

This study adopts an internal realist ontology; thus, it maintains that while banks' strategies of interdependence are objective truths, they can best be understood by observing the modalities of banks' strategic responses; Section 3 expands on these modalities. Section 4 details how this study sets about to capture these modalities empirically for the selected European banks and in the time frame considered. The modalities of banks' strategies of interdependence are derived from academic literature (e.g., Hill (2018)) and practitioner literature. In strategizing for interdependence banks have often sought to either replicate, collaborate with, influence, or otherwise tap into innovative and strategically important externally owned or controlled resources and capabilities. For example, some banks have acquired fintechs, such as Groupe BPCE which acquired the leading German fintech Fidor in 2016[82], some have invested in fintechs such as BBVA's 39% stake in UK fintech Atom Bank[83], others have entered into partnerships with fintechs such as ING's partnership with US fintech Kabbage[84], others still have sought

[82] https://www.reuters.com/article/us-bpce-m-a-fidor-idUSKCN1082DV
[83] https://www.ft.com/content/9dd3f234-21e3-11e8-add1-0e8958b189ea
[84] https://www.bloomberg.com/news/articles/2015-10-21/ing-picks-kabbage-to-expand-small-business-lending-in-europe

to establish their own fintech subsidiaries such as Royal Bank of Scotland's (renamed NatWest as of July 2020) establishment of fintech subsidiaries Mettle and Bó[85] (which were subsequently consolidated under Mettle). A large number of banks partnered with bigtechs like Apple and Google to facilitate customer payments through Apple Pay and Google Pay, while some like BNP Paribas and Deutsche Bank have gone so far as to collaborate with both bigtechs (Tencent's WeChat) and fintechs (Symphony) to facilitate more innovative foreign exchange trading processes for their customers[86]. Many banks have established their own corporate venture capital arms, such as Barclays UK Ventures (established by Barclays)[87], Propel Venture Partners (established by BBVA)[88] and Santander InnoVentures (established by Santander)[89]. Many banks have established their own internal innovation labs, accelerators, and incubators, such as UBS' Centre for Design Thinking and Innovation in Singapore[90] or Lloyds Banking Group's Digital Tech Hub in Scotland[91], many have also established their own external innovation labs, incubators, and accelerators that are open to external participants such as BNP Paribas' Plug and Play in Paris[92] and Barclays' Rise innovation lab and its Barclays Accelerator, powered by Techstars in London, New York, Tel Aviv and Mumbai[93] [94], moreover many banks participate in consortium innovation labs, incubators and accelerators such as the Fintech Innovation Lab which is run by Accenture in New York (in collaboration with the Partnership Fund for New York City)[95], London[96], and Asia Pacific[97] with participation from numerous banks such as Credit Suisse, Deutsche Bank, Rabobank, HSBC, and Intesa Sanpaolo. Many banks have joined blockchain consortia, such as the trade finance platform we.trade which is owned by IBM and 12 European banks including HSBC, Deutsche Bank, Santander, Société Générale, UniCredit, UBS, Nordea, and Rabobank[98]. Some banks have taken the initiative to originate new ecosystems that collaborate on platform projects such as UBS' initiation of the Utility Settlement Coin (USC) project to use blockchain technology to settle security trades and that was spun out into the fintech Fnality which is owned by 15 financial institutions including UBS, Santander, Credit Suisse,

[85] https://www.euromoney.com/article/b1bwpg6gc0zflw/rbs-kicks-off-wave-of-digital-bank-offshoots
[86] https://symphony.com/2019/12/18/symphonys-new-wechat-integration-engages-customers-on-preferred-platform-in-compliance-with-regulatory-requirements/
[87] https://www.reuters.com/article/us-barclays-fintech-idUSKBN1HN21K
[88] https://bankinnovation.net/allposts/operations/comp-reg/the-inside-story-on-why-bbva-launched-propel-ventures/
[89] https://www.reuters.com/article/us-banco-santander-tech-investment-idUSKBN15W1WB
[90] https://www.businesstimes.com.sg/banking-finance/ubs-launches-innovation-centre-in-singapore
[91] https://www.bbc.com/news/uk-scotland-scotland-business-48214339
[92] https://group.bnpparibas/en/news/open-innovation-bnp-paribas-plug-play
[93] https://rise.barclays/
[94] https://home.barclays/who-we-are/innovation/barclays-accelerator/#/
[95] https://www.fintechinnovationlab.com/new-york/new-york-fintech-innovation-lab/
[96] https://www.fintechinnovationlab.com/london/london-fintech-innovation-lab/
[97] https://www.fintechinnovationlab.com/asia-pacific/asia-pacific-fintech-innovation-lab/
[98] https://we-trade.com/company/company-overview

Barclays, Lloyds Banking Group, and ING[99] [100]. Most European banks have established Open API portals, developer kits, and sandboxes in response to PSD2 and the Open Banking Standard, but some have also established open innovation platforms such as ING's Touchpoint Platform which facilitates open innovation among the bank's staff, customers and external parties[101], or intrapreneurship programs such as Société Générale's Internal Startup Call[102] and Royal Bank of Scotland's Entrepreneur Development Academy (EDA)[103]. Certain banks have sought to influence the establishment or development of regulatory and industry standards, such as HSBC which partnered with SWIFT in 2019 to define a common API standard in Hong Kong[104].

Section 3 presents the theoretical framing which is based on the Resource Based View of strategy and poses the research question. Section 4 presents the research design that addresses the research question empirically with the findings presented in Section 6. Section 4 also collects financial and segmentation data for the 20 banks, these contribute to the creation of a contextual presentation which is detailed in Section 5. Section 7 discusses this study's findings and Section 8 concludes.

[99] https://www.fnality.org/
[100] https://www.forbes.com/sites/andreatinianow/2019/10/17/blockchain-start-up-backed-by-big-banks-ushers-in-new-era-of-banking/#35e14ddfb6a2
[101] https://ing.ro/ithub#services
[102] https://www.societegenerale.com/en/digital-and-innovation/open-innovation/internal-startup-call
[103] https://www.entrepreneurial-spark.com/index.php/intrapreneurs/
[104] https://www.fintechfutures.com/2019/10/swift-and-hsbc-team-up-for-common-api-standard-in-hong-kong/

3 – Theoretical Framing

The previous section concluded by posing a managerial question about the strategies of European banks in response to the growing forces of interdependence that they face; the purpose of this section is to present a theoretical framing that can refine this managerial question into a research question that can be addressed empirically. Central to answering this question is the notion of strategy, this study's underlying understanding of strategy is informed by the Resource Based View (RBV). The RBV is an "*efficiency-based explanation of performance differences*" which suggests that "*competitive advantage derives from firm-specific resources that are scarce (rare) and superior in use, relative to others*" where performance differences "*are viewed as derived from rent differentials, attributable to resources having intrinsically different levels of efficiency*" and which is thus "*at once, a theory of sustainable competitive advantage and a theory of rents*" (Peteraf & Barney, 2003). The RBV is a "*resource-level and enterprise-level tool*" and is not a substitute for other levels of analysis such as industry analysis and the analysis of the macro-environment (Peteraf & Barney, 2003).

Section 3.1 provides a summary of the foundations of the RBV including its underlying assumptions, key definitions, and early historical developments, as well as how it has evolved and matured over the years through knowledge and insights developed from diverse academic fields such as psychology and economics. Section 3.1 also discusses several critiques of the RBV such as Kraaijenbrink, et al. (2010); this study will seek to, where possible, contribute to addressing these critiques. Interdependence is a key notion of this study, this is elaborated on in Section 3.2. Section 3.2 also presents the work of Dyer & Singh (1998) and Lavie (2006) who sought to refine the RBV to incorporate interdependence. However, there have since been significant technological, regulatory, and business model developments which need to be taken into account. Thus, this study does not take a theory testing approach, but rather a theory development approach that builds on Dyer & Singh (1998) and Lavie (2006) yet takes into considerations more recent developments to propose an RBV that is further adapted to cater for interdependence in the platform economy age. To do this, in Section 3.3, I draw on a number of perspectives that deal with interdependence, deriving from them considerations that need to be infused into this reformulated RBV, starting with hypercompetition and the notion of temporary competitive advantage, an economic perspective (networks), and two managerial perspectives (ecosystems, platforms). I demonstrate how the

considerations derived from these literatures can be incorporated into a reformulated RBV and how they contribute to addressing some of its critiques.

Having proposed a reformulated RBV that is adapted for interdependence, this will thus be the theoretical framework with which this study answers the research question. Given this study's internal realist ontology, the reality of banks' strategies can best be understood by observing the modalities of banks' strategic responses, thus Section 3.4 elaborates on a number of modalities and submodalities that this study considers. Section 3.4 also demarcates the universe of banks that will be considered as well as the time boundary that will be taken into account for longitudinal examination. With all this in mind, Section 3.5 poses the research question.

3.1 – The Resource-Based View

3.1.1 – Strategic Management and Sustained Competitive Advantage

While the concept of strategy can have several definitions – Mintzberg (1987) for example offers five definitions – a consensual definition of strategic management was formulated by Nag, et al. (2007) based on a large scale survey of strategic management scholars, their definition presents strategic management as dealing with "*the major intended and emergent initiatives taken by general managers on behalf of owners, involving utilization of resources, to enhance the performance of firms in their external environments".* The broad aims of the discipline of Strategic Management are primarily "*to explain firm performance and the determinants of strategic choice*" drawing on theories of the firm from both economics and organization theory (Grant, 1996b), or as Makadok (2011) articulates, to answer the question as to why/how some firms persistently earn profits, while others do not and what managers can do about it. There are four major causal mechanisms through which firms earn profits, sustained competitive advantage, rivalry constraints, information asymmetry, and commitment timing (Makadok, 2011). Identifying and interpreting sources of firms' sustained competitive advantage has been an enduring and important focus of Strategic Management. Barney (1991) provides a useful definition of sustained competitive advantage, he states that a firm has "*a sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when the other firms are unable to duplicate the benefits of this strategy*". The value that

is being created can be defined as the difference between the price customers are willing to pay for a firm's products and services and the cost incurred by the firm to produce them (Brandenburger & Stuart, 1996). Competition drives prices down which means more value is captured by customers and less value is appropriated by firms; however, firms that can create a differential advantage that rivals cannot fully compete away will be able to appropriate more of the Ricardian rent that is generated and sustain a competitive advantage (Demsetz, 1973). Having reflected on their earlier contributions ((Barney, 1991) and (Peteraf, 1993)), Peteraf & Barney (2003) later refined their definition of competitive advantage as follows "*An enterprise has a Competitive Advantage if it is able to create more economic value than the marginal (breakeven) competitor in its product market*" and "*The Economic Value created by an enterprise in the course of providing a good or service is the difference between the perceived benefits gained by the purchasers of the good and the economic cost to the enterprise*".

The positioning school of strategy (Mintzberg, et al., 1998), popularized by Porter (1980, 1985) presented an approach to achieving sustained competitive advantage that became dominant during the 1980s. Building on Industrial Organization's structure-conduct-performance (SCP) paradigm (Bain, 1959), the positioning school's proposition was that a firm derives sustained competitive advantage against competitive forces by undertaking strategies that use its internal strengths while limiting internal weaknesses to capitalize on external opportunities and counteract any external threats (Hofer & Schendel, 1978; Porter, 1980, 1985; Ansoff, 1965). Many researchers focused on further understanding these four elements (strengths, weaknesses, opportunities, and threats) and analysing how the interplay between them leads to the generation and selection of strategies.

3.1.2 – Resource Based View and Sustained Competitive Advantage

Although the positioning framework is useful in highlighting the impact of environment on a firm's performance, some of its underlying assumptions have been disputed. Barney (1991) disputes two assumptions made by the positioning framework, first the assumption that all firms within an industry or group control identical strategically relevant resources; and second, if a new entrant injects any source of resource heterogeneity, any resultant competitive advantage will be short-lived due to high resource mobility. Based on the understanding that firms with a differential advantage can appropriate more of the value generated (Demsetz, 1973) and on Ricardo's (1817) theory of scarcity rents, Barney's (1991)

analysis of the sources of firms' sustained competitive advantage led him to propose instead the Resource-Based View (RBV) which assumes that firms in an industry or group may be heterogeneous in terms of their strategic resources and that this heterogeneity can be long-lasting as resources are not perfectly mobile. Firms' resource heterogeneity means that firms of varying capabilities can compete in the market with those controlling superior resources able to derive Ricardian or monopoly rents (Peteraf, 1993).

While Barney's 1991 article in the Journal of Management was critical to the popularization of the RBV, its adoption by practitioners and the large body of academic research that subsequently sought to deepen and enrich it, the roots of RBV go further back to Penrose (1959) who theorised how firms could generate economic value and profitable growth through the effective management of resources as well as their idiosyncratic combination and deployment as innovative products and capabilities. Penrose (1959) also made the link between how firms manage resources and the sustaining of the competitive advantage those resources afford the firm, as well as highlighting important characteristics of resources and capabilities such as path-dependencies and social-complexity (the evolution of idiosyncratic, firm-specific knowledge) (Kor & Mahoney, 2004). The foundations of the RBV continued to evolve during the 1980s in an era dominated by the positioning school of strategic management. Wernerfelt (1984) built on Penrose (1959) calling for firms to be considered in terms of their resources and not just their products when studying their strategic options. Wernerfelt (1984) – who coined the term Resource-Based View – noted that "*economic units in terms of their resource endowments has a long tradition in economics*", the analysis of which is typically confined to "*categories such as labour, capital, and perhaps land*" crediting Penrose (1959) for the idea of looking at firms as a broader combination of resources. Other important academic contributions during the 1980s included Barney's (1986) work on organizational culture, Lippman & Rumelt's (1982) work on causal ambiguity and inimitability, and Dierickx & Cool's (1989) work on substitutability.

3.1.3 – Underlying Assumptions of the Resource Based View

The RBV considers that a firm's resources and capabilities are "*bundles of tangible and intangible assets, including a firm's management skills, its organizational processes and routines, and the information and knowledge it controls that can be used by firms to help choose and implement strategie*s" (Barney, et al., 2011). These resources and capabilities can be defined as physical capital resources (for example physical

technology, plant and equipment, and access to raw material), human capital resources (including training, expertise, judgement, and relationships of individual managers), and organizational capital (including firms' reporting structures, planning, and coordination systems) (Barney J. , 1991). Barney (1991) goes on to provide a model for applying the RBV to create strategies for achieving sustained competitive advantage. Based on the assumptions of resource heterogeneity and resource immobility, firms can achieve sustained competitive advantage by exploiting resources that have the following attributes: a) value, b) scarcity, c) imperfectly imitable, and d) imperfectly substitutable. A resource is valuable if it helps firms create strategies that capitalize on opportunities and/or neutralize threats. The rarity of resources is important because if a large number of firms possess and exploit a valuable resource using a common strategy, no single firm will have a competitive advantage. Valuable and rare resources can only be sources of sustained competitive advantage for firms if other firms that do not possess them cannot easily imitate them. A firm can derive sustained competitive advantage from valuable, rare and imperfectly imitable resources only if other firms cannot implement the same strategy in a different way by using strategically equivalent resources (substitutes).

Imperfect imitability and imperfect substitutability are cornerstones of what Peteraf (1993) calls *ex-post* limits to competition that sustains competitive advantage. Barney (1991) provides three factors that contribute to a resource's imperfect imitability. The first factor relates to the impact of unique historical conditions on a firm's ability to obtain resources. The second factor relates to causal ambiguity, whereby the link between a firm's resources and the firm's sustained competitive advantage is not understood or imperfectly understood. The third factor is social complexity, a firm's resources may have arisen through a socially-complex construct (e.g., interpersonal relationships between managers, culture, reputation) whose conditions cannot be imitated at other firms. Dierickx and Cool (1989) also break down the factors contributing to imperfect imitability. As well as causal ambiguity they identify the following factors: a) interconnectedness (the velocity of an asset's accumulation is influenced by the accumulation of other assets), asset erosion, asset mass efficiencies (the velocity of an asset's accumulation is influenced by its initial level), and time compression diseconomies.

Dierickx and Cool (1989) make a further distinction between tradeable and non-tradeable assets, elaborating that non-tradeable assets are usually firm-specific and idiosyncratic assets that firms accumulate internally. These non-tradeable assets can be deployed to generate greater sustained competitive advantage as they tend to be difficult to imitate, are usually immobile and highly path-

dependent. This notion is built upon by (Prahalad & Hamel, 1990) who propose the concept of core competencies as the "*collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies*". Core competencies are by nature imperfectly imitable, thus firms developing portfolios of core competencies are better positioned to derive sustained competitive advantage.

3.1.4 – Evolution of the Resource-Based View

The RBV has continued to advance and evolve since Lippman & Rumelt (1982), Wernerfelt (1984), Barney (1986), and Dierickx & Cool (1989) built upon Penrose (1959) to develop its conceptual foundations, culminating in the seminal work by Barney (1991) in the Journal of Management's first special issue that was devoted to resource-based inquiry in 1991. Harrison, et al. (1991) considered resources in relation to diversification strategies in mergers and acquisitions finding that "*complementary resource flows between acquiring and target firms may produce performance-enhancing synergies*" and that firms are better served in terms of performance by focusing on specific resources rather than the accepted wisdom at the time which was strategy type (firms that are considered related or unrelated to them). Castanias & Helfat (1991) focused on the role of the CEO and the top management team as valuable resources possessing firm-specific, idiosyncratic attributes that generate rent for firms. Fiol (1991) proposed organizational identity as an organizational core competency that contributes to sustained competitive advantage. Mahoney & Pandian (1992) demonstrated how the RBV encourages dialogue between scholars from different perspectives by intertwining it with three literatures: distinctive competencies, organizational economics (arguing that RBV could be considered as a fifth branch of organizational economics along with positive agency theory, property rights, transaction cost theory, and evolutionary economics), and industrial organization literature.

Amit & Schoemaker (1993) made the distinction between resources and capabilities, defining resources as "*stocks of available factors that are owned or controlled by the firm*" that are "*converted into final products or services by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, incentive systems, trust between management and labor, and more*" and which consist "*inter alia, of knowhow that can be traded (e.g., patents and licenses), financial or physical assets (e.g., property, plant and equipment), human capital, etc.*", while capabilities

are defined as referring to "*a firm's capacity to deploy Resources, usually in combination, using organizational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's Resources*". Amit & Schoemaker (1993) also expand on the factors that contribute to the inimitability, heterogeneity, and low mobility of resources and capabilities, which include "*imperfect and hard to predict decisions by boundedly rational managers facing high uncertainty (a la Schumpeter), complexity, and intrafirm conflict*". The distinction made by Amit & Schoemaker (1993) between resources and capabilities was a cornerstone of much of the subsequent deepening of the RBV and of the offshoots that emerged from it such as Dynamic Capabilities; a distinction, that it must be said finds support in Penrose's (1959) seminal work, since Penrose suggested that resources contribute to firm competitive advantage when they are exploited such that they provide valuable services (Newbert, 2007).

Peteraf (1993) presented four theoretical conditions that underlie competitive advantage in the RBV: resource heterogeneity that provide Ricardian or monopoly rents, *ex post* limits to competition to sustain rents, imperfect resource mobility to enable the firm to benefit from those rents, and *ex ante* limits to competition to limit costs eroding the rent generated. Coff (1999) highlighted a shortfall in the RBV related to its lack of attention to rent appropriation. Coff (1999) suggests augmenting the RBV to not only deal with rent generation but also appropriation of the generated rent, drawing on the bargaining power literature to consider the role of stakeholders in the configuration of firm capabilities and how this impacts how the rent generated from those capabilities are appropriated/distributed. Miller & Shamsie (1996) empirically tested the relationship between two types of inimitable and immobile resources (property-based resources and knowledge-based resources) against performance in the context of the Hollywood film studios between 1936 to 1965 finding that while both types of resources contributed to performance (return on sales, operating profits, market share), periods of stability and predictability rewarded firms with property-based resources but not those with knowledge-based resources, while the opposite was true for the same firms during periods of uncertainty. Oliver (1997) combined institutional theory with the RBV to address the social context in resource selection (such as regulatory pressures or network ties) to explain firm heterogeneity. Oliver (1997) argues that resource selection and competitive advantage are influenced by the institutional context at the individual level (e.g., decision makers' norms and values), at the firm level (e.g., organizational culture and politics) and at the inter-firm level (e.g., industry norms, public pressure, regulatory pressure). Oliver (1997) notes in particular that "*Resource differences will be*

more likely to lead to firm heterogeneity and differential rents when regulatory environments do not impose similar resource rules and standards on all firms in the same industry" and that strategic alliances "*allow firms to procure assets, competencies, or capabilities that are not readily available in competitive factor markets, particularly specialized expertise … and intangible assets, such as reputation*" enabling firms to "*tap into time compression diseconomies and history-dependent competencies that are difficult to trade in strategic factor markets*" thus reducing firm heterogeneity and differential rents.

3.1.5 – Resource Based View Spin-Offs

These developments and evolution of the RBV, which occurred during the 1990s, broadly align with what Barney, et al. (2011) describe as the "growth stage" of RBV. During this growth stage, a number of spin-off perspectives emerged from the RBV, including the Natural-Resource-Based View of the firm (NRBV) (Hart, 1995), the Knowledge-Based Theory of the firm (Grant, 1996b) and Dynamic Capabilities (Teece, et al., 1997).

Hart (1995) identified the natural environment as an important source of competitive advantage (especially in the future) for firms, proposing connections between three interrelated strategic capabilities – pollution prevention, product stewardship, and sustainable development – and sustained competitive advantage. Since Hart's introduction of the NRBV in 1995, substantial progress has been made in academic research on the link between competitive advantage and pollution prevention as a strategic resource (the "pays to be green" literature) (Hart & Dowell, 2011). This is exemplified by the reviews on the relationship between organizations and their natural environment conducted by Berchicci & King (2007) and Etzion (2007) which among other things highlight how firms can mobilise resources and capabilities to simultaneously pursue financial and environmental success. Empirical studies were also conducted by Hart & Ahuja (1996) who found that "*the marginal costs of reducing emissions seldom exceed marginal benefits*" in an analysis of the S&P 500 firms, while King & Lenox's (2002) empirical study on the link between firms' pollution prevention strategies and their financial performance found that innovation capabilities were a key factor for those firms that were able to profit from pollution prevention. Much less progress was made in academic literature in relation to the link between product stewardship as a strategic capability and competitive advantage – with the exception of Sharma & Vredenburg (1998) – while almost no progress was made on the link between sustainable development as a strategic capability and sustained

competitive advantage, which may be due to the difficulty of defining sustainable development in a business context although the subsequent separation of sustainable development into two distinct areas (clean technology and base-of-pyramid or BoP) present promising avenues for further NRBV research (Hart & Dowell, 2011). In a related vein to NRBV, McWilliams & Siegel (2011) proposed the extension of the RBV to incorporate Corporate Social Responsibility (CSR) as a strategic capability that can lead to sustained competitive advantage for firms that are engaged in it. McWilliams & Siegel (2011) draw from economic concepts and methods such as hedonic pricing and contingent valuation to determine the value of social goods that are not traded in markets and demonstrates how firms can capture the value of the social goods they generate through enhanced reputation which becomes a strategic resource they can use to generate rents through consumer loyalty and premium pricing while motivating staff thus reducing costs associated with high staff-turnover. Tate & Bals (2018) propose that the RBV/NRBV be expanded to include the social dimension, focusing on firms' social capabilities such as social entrepreneurship and sustainable supply chain management for the purpose of achieving a positive triple bottom line (social, environmental, and financial).

Grant (1996b) considers "*knowledge as the most strategically important of the firm's resources*" and the knowledge-based view of the firm as "*an outgrowth of the resource-based view*". For Grant (1996b), knowledge resides in the individuals employed by a firm, as such the role of the firm should not be – as was widely proposed at the time – to create knowledge but rather to use coordinating mechanisms to apply and integrate the specialist knowledge of its individual members who are the creators of knowledge. Before the emergence of the knowledge-based view of the firm, Kogut & Zander (1992) had also stressed the importance of knowledge – consisting of information and know-how – as a strategic firm resource. Kogut & Zander (1992) introduced the concept of a firm's combinative capabilities, a strategic capability that allows new knowledge and exploitable opportunities to be created by synthesising a firm's information and know-how, its internal learning (e.g., through experiments, serendipity), and external learnings (e.g., through joint ventures).

Teece, et al. (1997) introduced Dynamic Capabilities as a spin-off from the RBV that is particularly relevant in a Schumpeterian environment of "*innovation-based competition, price/performance rivalry, increasing returns, and the 'creative destruction' of existing competences*". As well as the significant influence of the RBV, Teece, et al.'s (1997) Dynamic Capabilities also built on Schumpeterian economic

theory including considerations on how dynamic capabilities generate Schumpeterian rents (Schumpeter, 1934), on Nelson & Winter's (1982) view of firms as a collections of interdependent operational and administrative routines, and, on the notion of core competencies, which Prahalad & Hamel (1990) describe as "*the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies*" across organizational boundaries. Dynamic Capabilities refer to firms' abilities to "*integrate, build, and reconfigure internal and external competences to address rapidly changing environments*" and thus reflect their "*ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions*" (Teece, et al., 1997); as such dynamic capabilities differ from operational capabilities which according to Winter (2003) are the *status quo* capabilities that allow firms to make a living in the present. The Dynamic Capabilities view emphasizes that while ownership of inimitable assets can create competitive advantage for a firm, for that competitive advantage to be sustained, those inimitable resources must be converted to inimitable dynamic capabilities that "*continuously create, extend, upgrade, protect, and keep relevant the enterprise's unique asset base*" (Teece, 2007). As Helfat, et al. (2007) elaborate, there are numerous forms of dynamic capabilities "*Some dynamic capabilities enable firms to enter new businesses and extend old ones through internal growth, acquisitions, and strategic alliances. Other capabilities help a firm to create new products and production processes. Yet others involve the capabilities of the managers responsible for leading profitable firm change and growth*."

Eisenhardt & Martin (2000) present dynamic capabilities as an organizational process and emphasizes the importance of resource configuration as a source of competitive advantage. Zollo & Winter (2002) highlighted how dynamic capabilities impact organizational routines. Adner & Helfat (2003) introduce the term "dynamic managerial capabilities" to indicate the capacity of managers to create, extend, and modify firms resources, while Helfat & Peteraf (2015) drew on cognitive psychology, cognitive science, social psychology, cognitive neuroscience, and behavioural decision theory to present the cognitive capabilities that are at the base of the dynamic managerial capabilities to sense, seize, and reconfigure when faced with the demands of a rapidly changing environment. Helfat & Peteraf (2003) go further suggesting that all organizational capabilities should be considered from a "dynamic resource-based view" since "*all capabilities have the potential to accommodate change*" and introduce the concept of the capability lifecycle (CLC). In a similar vein, Helfat & Winter (2011) emphasize that the distinction between dynamic capabilities and operational capabilities is often blurry, since a) some capabilities can

act as both, b) dynamic capabilities often support incremental changes and *status quo* businesses, c) many dynamic capabilities develop from operational capabilities, and, d) the level of observed change and what constitutes "dynamic" is subject to biases. Karna, et al. (2016) warn against making too strict a distinction between dynamic and ordinary capabilities, suggesting that mutually-dependent, complementary relationship may instead exist between them.

Dynamic capabilities are particularly valuable in environments of rapid technological change as this gives firms the opportunity to more actively employ these dynamic capabilities thus better subsidizing the cost of developing them (Fainshmidt, et al., 2016; Schilke, 2014). With this technological focus in mind, dynamic capabilities literature has recently recognized the emergence of the platform economy suggesting that dynamic capabilities can exist across different levels (individual, firm, ecosystem) leading to the notion of collective dynamic capabilities for ecosystems (Rothaermel & Hess, 2007; Kay, et al., 2018). However, literature on dynamic capabilities may have focused too heavily on technological aspects and scholars have called for a consideration of broader economic aspects (Dunning & Lundan, 2010; Fainshmidt, et al., 2016).

3.1.6 – From Resource Based View to Resource Based Theory

After RBV's "growth stage" during the 1990s which saw the deepening and development of the RBV, its integration with other perspectives, and the emergence of spin-offs, the RBV entered into its "maturity stage" in the 2000s (Barney, et al., 2011). During this "maturity stage" RBV began to be increasingly referred to RBT (resource-based theory) emphasizing that what began as a "view" had evolved into something more closely resembling a "theory" (Barney, et al., 2011). The "maturity stage" saw a number of academic studies on the micro-foundations of the RBV and on a number of critiques of the RBV that need addressing for the RBV to progress to a full-fledged theory. Academic studies on the micro-foundations of the RBV were part of a broader reductionist call to explore micro-foundations in strategic management (Barney, et al., 2011; Foss, 2011). The micro-foundations of a subject are "*the definitions of its basic elements and the allowable operations that can be performed using these element*s" (Lippman & Rumelt, 2003b) and are typically "*rooted in individual action and interaction*" (Foss, 2011). In many ways, the RBV itself represents a reductionist, micro-foundations orientated progression in a strategic management field that during the 1980s was dominated by the macro-orientated positioning school,

particularly in the RBV's focus on firm resources and capabilities in contrast to the positioning school's emphasis on aggregate environmental characteristics such as industry structure and competitors (Foss, 2011). This allowed the RBV to more closely integrate with diverse fields such as organization theory, human resource management, and information and communications technology (Foss, 2011).

Further developments in the study of the RBV's micro-foundations that mostly occurred during the RBV's "growth stage" centred on a number of themes such as the link between knowledge and sustained competitive advantage which was largely driven by the knowledge movement in strategy and management (Eisenhardt & Santos, 2006), the need to account for individual-level heterogeneity when considering firm-level performance (Felin & Hesterly, 2007), how macro variables are mediated by behavioural micro-mechanisms (Abell, et al., 2008), value appropriation (Lippman & Rumelt, 2003a; Coff, 1999), and resource value (Lippman & Rumelt, 2003b).

This period also saw progress in studies on the micro-foundations of dynamic capabilities including Teece's (2007) study on the links between strategic dynamics and individual characteristics and behaviour in economies that are becoming more open and more globalised, and Gavetti's (2005) study on the role of cognition and hierarchy in dynamic capabilities. However, Foss (2011) points out that micro-foundations should be problem-driven for them to contribute more deeply to knowledge development and that "*the search for any specific set of behavioral assumptions that can underpin all parts of RBT must be futile. However, it can certainly be argued that what are proper micro-foundations for RBT depend on the problem that an RBT scholar tries to solve*".

The RBV's "maturity stage" saw further developments and refinement. Many of these developments were related to better understanding the "black-box" that separates resources and capabilities on one hand from superior rents and sustained competitive advantage on the other (Sirmon, et al., 2007). The attempt to shed light onto this "black-box" advanced considerations about resource orchestration (Sirmon & Hitt, 2003; Sirmon, et al., 2007; Sirmon, et al., 2008; Helfat, et al., 2007; Adner & Helfat, 2003), entrepreneurial capabilities (Alvarez & Busenitz, 2001; Sirmon & Hitt, 2003; Zhao, et al., 2013; Priem, et al., 2012; Kellermanns, et al., 2016), resource acquisition versus internal development (Maritan & Peteraf, 2011; Wernerfelt, 2011; Ahuja & Katila, 2004; Sears, 2017), and resource/capability vulnerability (Le Breton-Miller & Miller, 2015) among other considerations.

3.1.7 – Resource Orchestration, Entrepreneurial Capabilities, and Resource Vulnerability

The notion of resource orchestration is predicated on the idea that possessing valuable, rare, inimitable, non-substitutable resources is a necessary but insufficient condition for firm competitive advantage, and that what a firm does with these resources is also fundamental to sustaining competitive advantage (Eisenhardt & Martin, 2000; Barney, 1997; Newbert, 2007). Sirmon & Hitt (2003), Sirmon, et al. (2007) and, Sirmon, et al. (2008) looked more closely at the question of what a firm does with strategic resources to create and sustain competitive advantage, suggesting that for this to be achieved, strategic resources must be managed through the effective synchronization of: a) structuring the resource portfolio through resource acquisition, accumulation/development, and, divestiture, b) bundling capabilities to stabilize (e.g., incremental innovation) and enrich (e.g., extension) existing capabilities or to pioneer new capabilities, and, c) leveraging capabilities by mobilizing, configuring, and deploying them. Concurrent to the development of Sirmon, et al.'s (2007) resource management framework, was a similar body of work that emerged from dynamic capabilities that focused on the importance of asset orchestration (Helfat, et al., 2007; Adner & Helfat, 2003) for the generation and sustaining of competitive advantage. Asset orchestration consists of a search/selection process to identify and invest in assets and then govern them, and a configuration/deployment process to coordinate and guide those assets. Sirmon, et al. (2011) suggested combining both the resource management and the asset orchestration frameworks into an integrated resource orchestration framework. Sirmon, et al. (2011) proposed that this extended resource orchestration framework also consider breadth (the scope of resource orchestration within firms e.g., product diversification, international diversification, differentiation, cost-leadership), depth (the levels within a firm e.g., top management, bottom-up, middle management, flat organizations, hierarchical organizations), and life cycle (start-up, growth, mature, decline).

The resource orchestration stream highlights the importance of firm management's entrepreneurial capabilities that allow managers to structure, bundle, and leverage resources and capabilities in ways that generates new sources of value and sustained competitive advantage for the firm (Sirmon & Hitt, 2003; Sirmon, et al., 2011). The entrepreneurial ability of recognizing new value creation opportunities and assembling and deploying the necessary resources and capabilities to bring these opportunities to fruition has been recognized as a strategically important managerial capability that should be integrated into the RBV (Alvarez & Busenitz, 2001; Sirmon & Hitt, 2003). Studies on the links between entrepreneurship

and RBV were advanced by many scholars such as Zhao, et al. (2013) who considered the relationship between a venture's founding team and its performance, Priem, et al. (2012) who looked at the role of demand-side, consumer driven innovation in entrepreneurial discovery, and Kellermanns, et al. (2016) who proposed that entrepreneurial ventures require or use resources differently compared to larger incumbents, a distinction that should be catered for when integrating entrepreneurship and the RBV.

The orchestration and entrepreneurial streams also emphasize the importance of acquiring and/or developing resources and capabilities necessary for value creation and sustained competitive advantage. The nuances between resource acquisition and internal resource development or accumulation are rooted in the academic debates regarding the origins of the heterogeneous resources required to create value and sustained competitive advantage. Barney (1986) presented the concept of strategic factor markets through which firms acquire (or divest) strategically significant resources, while Dierickx & Cool (1989) critiqued the concept of strategic factor markets as being incapable of dealing with non-tradable strategically important resources such as trust and reputation, and presented an alternative mechanism through which firms can achieve sustained competitive advantage through the accumulation of internally developed resources. Maritan & Peteraf (2011) proposed building bridges between both notions, for example through the interplay between acquisition and internal development ("buy-to-build", "build-to-buy", mutually reinforcing build/buy mechanisms) or through the heterogeneities related to how firm management assess acquisition and/or internal development opportunities (entrepreneurial capabilities that drive opportunity identification, resource complementarities, managerial cognitive processes). Wernerfelt (2011) also explored the links between resource acquisition and internal development proposing that "*a firm's cost of acquiring a new resource and/or the value that it can create with this resource depends on the resources already possessed. This leads to an asymmetry in the resource market and allows supernormal profits to be had*", it follows that different firms will acquire different resources leading to heterogeneities that augment over time. Ahuja & Katila (2004) examined how resources emerge and found that idiosyncratic situations such as technological exhaustion and international expansion trigger path dependent, heterogeneous resource acquisition and/or development evolutionary processes.

Le Breton-Miller & Miller (2015) argued that some of the resource characteristics that sustain competitive advantage may in some circumstances reduce it. While resource path dependency increases inimitability, "*if significant lapses in behavior erode these resources, their path-dependent nature then serves as a*

barrier to resuscitating them". Causal ambiguity of resource value increases inimitability, but it also makes it difficult for firms to manage that resource. Context dependency increases resource value and inimitability, but what happens when the context changes? As such, Le Breton-Miller & Miller (2015) identify three ways in which the sustained competitive advantage of strategic resources can be threatened: erosion ("*the degrading or loss of a resource or capability due to appropriation or mismanagement*"), ambiguity (resulting from not understanding how resource contribute to value, as well as the ambivalent and tacit nature of some resources), and, alignment (not being able to align a resource or capability "*with a context that sustains or enhances its value*"). To guard against resource vulnerability, Le Breton-Miller & Miller (2015) draw lessons from the field of curatorship and identify three mechanisms to combat erosion, ambiguity and misalignment, which are – respectively – preservation (extending the life of valuable resources), connoisseurship ("*identification and evaluation of resources and the qualities that make them valuable*"), and orchestration ("*realizing the value of a resource by embedding it in complementary collections*").

Other academic streams also contributed to uncovering the process underpinning the "black-box" that links resources/capabilities to sustained competitive advantage, as well as advancing the RBV in general. These streams include considerations about: the psychological factors that influence how firms structure and develop their portfolio of resources and capabilities (King, 2007; Powell, et al., 2006; Garbuio, et al., 2011), an improved, multi-disciplinary approach to valuing intangible assets (Molloy, et al., 2011; Cohen, 2005), the establishment mode firms adopt in international expansions (Klier, et al., 2017), resource fungibility (Mannor, et al., 2016) and, historical strategic resources (Cailluet, et al., 2018). Bromiley & Rau (2014) proposed a Practice-Based View that takes into consideration imitable activities such as widely known firm practices and techniques that managers can use to advance strategic objectives and drive performance. Dyer & Singh (1998) and Lavie (2006) advanced the Relational View which took into account external resources and capabilities not owned or controlled by a firm, this development will be expounded on in Section 3.2 as it relates closely to this study's proposed adaptation of the RBV to take into account the forces of interdependence.

3.1.8 – Critiques of the Resource Based View

RBV's "maturity stage" also saw a number of critiques, such as that of Priem & Butler (2001) and Barney's (2001) retort, which brought to attention certain aspects of the RBV that needed further refinement for the RBV to evolve into a more complete theory. Kraaijenbrink, et al. (2010) compiled a list of eight categories of critiques of the RBV – which include many of Priem & Butler's (2001) critiques that Barney (2001) sought to address – dismissing five as having been addressed, while emphasizing that the remaining three critiques cannot be readily dismissed and need to be tackled and further researched. The first critique is that the attributes of resources and capabilities (valuable, rare, inimitable, non-substitutable) as well as a firm's organizational abilities to absorb and apply them are not sufficient or necessary for sustained competitive advantage. The second critique is that resource value is too indeterminate since the value of a resource and the value of the sustained competitive advantage it generates are defined in the same way. Kraaijenbrink, et al. (2010) propose that future research should seek to address this tautology by decoupling the definition of value on the *explanans* side from the definition on the *explanandum* side, either by determining independently the value of a firm's resources and capabilities compared to the value of the products and services these resources and capabilities generate, or, by considering the time lag between acquiring resources and capabilities and gaining the sustained competitive advantage they generate. The third critique is that the definition of resource is too broad, and while Barney (2001) counters that this all-inclusiveness is part of the RBV's strength, Kraaijenbrink, et al. (2010) nevertheless maintain that the RBV "*could improve substantially if its basic logic were refined by explicitly recognizing differences among types of resources—static, dynamic; tangible, intangible; financial, human, technological; deployed, in reserve; perishable, nonperishable; and so on—and among types of resource ownership*".

3.1.9 – Developing the RBV Into a Full-Fledged Theory

This study concurs with Barney, et al. (2011) that the RBV has reached a "maturity stage" and that "*resource-based research has reached a level of precision and sophistication such that it more closely resembles a theory than a view*". However, this study also recognizes the remaining constructive critiques of the RBV and that addressing these critiques would contribute to deepening and strengthening the RBV as a theory. Thus, as much as possible, this study will seek to incorporate the calls for further research emanating from these critiques to humbly contribute to the further development of the RBV.

A good starting point are the suggestions for further research and theorizing called for by Kraaijenbrink, et al. (2010) which correspond to the three significant critiques they highlighted. The first suggestion is to better demarcate and define resources. A distinction should be made between building, acquiring, and possessing resources and capabilities, as well as the managerial processes required to deploy them. Moreover, the traditional RBV trivializes the concept of ownership, failing to recognize that ownership of some resources and capabilities can in some cases be partial or constrained, which has strategic ramifications, for example knowledge is more difficult to fully control than physical property. On the topic of knowledge, Kraaijenbrink, et al. (2010) make the further distinction between rivalrous and non-rivalrous resources which the RBV overlooks. The RBV's neoclassical economic view of resources holds for rivalrous resources such as scarce resources that can only be deployed once. But what of those resources and capabilities that increase when they are deployed more broadly by other firms or in other contexts, for example knowledge can be redeployed by the same firm in different contexts or by other firms, which results in that knowledge increasing and which generates externalities that can be internalized by several firms. Thus cooperation, coopetition, and codevelopment between firms in some circumstances can be effective ways of exploiting strategically important – though not scarce – knowledge. This type of non-rivalrous resource and capability requires a different management approach than rivalrous resources (e.g., efficient deployment versus wide and frequent deployment). Furthermore, the RBV should not limit its focus to the characteristics of individual resources but should also cater for the managerial capabilities of configuring and integrating those resources, which as Newbert (2007) and Grant (1996a) argue, are better determinants of sustained competitive advantage. Thus, to enhance the RBV, future studies should consider that different types of resources and the managerial capabilities of resource configuration contribute to sustained competitive advantage in different ways (Kraaijenbrink, et al., 2010).

Kraaijenbrink, et al.'s (2010) second suggestion is to advance a subjective and firm-specific notion of resource value. The RBV assumes that value is a characteristic of firm resources based on bounded rationality and an underlying assumption of the continuity and predictability of markets. However, as Kraaijenbrink, et al. (2010) point out, this assumption does not necessarily hold in unpredictable, fast evolving, and immature environments, which is consistent with Penrose's (1959) argument that while the market may give resources a certain price, the value that a firm generates and internalizes from those resources is not fully determined by that price. Thus, in considering the value of resources and capabilities, the subjective, entrepreneurial capabilities of a firm's management to deploy resources and capabilities in

innovative ways that generate and internalize value should also be taken into account (Kraaijenbrink, et al., 2010; Witt, 2007; Baker & Nelson, 2005; Foss, 2011; Kor, et al., 2007). This line of thinking moves the RBV beyond the confines of neoclassical economic thought (Kraaijenbrink, et al., 2010) adapting it to rapidly changing and unpredictable environments where value creation may reside in the entrepreneurial capabilities of management within firms rather than from resources obtained through markets (Denrell, et al., 2003). While agreeing that the entrepreneurial capabilities of firm management are critical to resource value creation, Kraaijenbrink, et al. (2010) extend this view to the specific institutional contexts of firms and consequently include other stakeholders such as regulators in the shaping of resource value. This call to consider the subjective, entrepreneurial capabilities of managers to deploy resources in innovative value generating ways resonates with Priem, et al., (2012) and Priem, et al.'s (2013) calls for a greater consideration of the demand side in an RBV that has traditionally been skewed toward the supply side. Incorporating more demand-side considerations into the RBV would enable it to accommodate the strategies firms adopt in response to consumer heterogeneity as a source of competitive advantage.

The third suggestion according to Kraaijenbrink, et al. (2010) is to develop the RBV into a more viable theory of sustained competitive advantage. RBV's focus on building and possessing resources and capabilities supports a notion of sustained competitive advantage that relates to the potential of a firm to outperform its rivals when the resources and capabilities it possesses have a higher value in a future market than the current market. However, to effectively predict firm performance and firms' generation and appropriation of economic rents, the RBV needs to take into account the context and processes of resource deployment, including the subjective, entrepreneurial managerial capabilities that transform resources into services (Kraaijenbrink, et al., 2010). Thus, as Kraaijenbrink, et al.'s (2010) propose, beyond just managing resources the RBV should also consider the management of the "*imaginative processes that enable the firm to grasp the strategic disjunction between its resource set and the market situation in which it is operating*" and that with its focus on possessing resources and capabilities "*the RBV is inherently static, not well equipped to explain the timing of when value is created, when rents are appropriated, and how firms innovate and generate new sources of SCA* (sustained competitive advantage)".

3.1.10 – Challenging the Resource Based View's Overly Neoclassical Economic Microfoundations

According to Kraaijenbrink, et al. (2010), underlying the three critiques of the RBV that need to be addressed is an unaccommodating adherence to firm neoclassical economic rationality, which overestimates the importance of resource ownership and underestimates the importance of resource bundling and human involvement in the interpretation and generation of value. This results in insufficiently capturing the essence of sustained competitive advantage (Kraaijenbrink, et al., 2010). Through their examination of the links in the RBV between economic rents and sustainable competitive advantage, Lippman & Rumelt (2003b) also challenged the neoclassical economic micro-foundations that underpin many assumptions on economic rent in the RBV, particularly the concept of opportunity cost. In fact, an injection of Austrian economic thought into an overly neoclassical RBV, and the consequent incorporation of time, space, uncertainty, and change, would be in line with the Penrosian roots of the RBV, given the influence of Austrian economics on Penrose (a student of Fritz Machlup who in turn was a student of Ludwig von Mises, both eminent Austrian economists) and her seminal *The Theory of the Growth of the Firm* (1959) that was foundational to much of what later developed into the RBV (Connell, 2009; Connell, 2007; Kraaijenbrink, et al., 2010; Foss, et al., 2008).

The RBV already accommodates a number of Austrian economic influences, for example its focus on resource and firm heterogeneity aligns with Austrian capital theory that emphasizes the heterogeneity and temporal dimension of capital goods (Hayek, 1941; Lachmann, 1956; Foss & Ishikawa, 2007), the RBV's notions of causal ambiguity, path dependency, and social complexity have parallels with Austrian economics' recognition that the sources of firms' success are often unobservable and that management's entrepreneurial decisions can be mistaken leading to non-optimal firm trajectories (Lockett & Thompson, 2001). However, while the idea advanced by Austrian economics that entrepreneurial discovery, and the identification and exploitation of opportunities are key to firms' success is compatible with the RBV (Lockett & Thompson, 2001), the RBV has nevertheless maintained an implicit adherence to the neoclassical economic notion of competitive equilibrium or the idea of perfect competition that assumes that resources are always put to their best use (Foss & Ishikawa, 2007). Drawing on Lachmann (1956), Foss & Ishikawa (2007) argue that the characteristics, functions and uses of resources and characteristics are not inherent, they are instead constructed through entrepreneurial appraisal and are actualized through entrepreneurial activity. As such, Foss & Ishikawa (2007) suggest the incorporation of further Austrian

economic thought in RBV particularly to emphasize the role of entrepreneurial action in value creation and sustained competitive advantage, which is not adequately treated in traditional RBV. Peteraf & Barney (2003) also acknowledge that "*a resource-based theory of competitive advantage and rent generation applies to the case of Schumpeterian competition in the midst of rapidly changing conditions, as well as to the case of Ricardian rents in a more stable environment*" and that if "*competitive advantage is not readily imitable, the rents are Ricardian in nature. If the advantage is inherently imitable, the rents are Schumpeterian*" thus what may start as Schumpeterian rents may be converted into Ricardian rents if the firm is able to create barriers to imitation.

3.2 – Incorporating Interdependence Into the RBV

Sections 3.1 highlighted the evolution, versatility, and adaptability of the RBV, as well as its ability to bring together disparate perspectives. This is exemplified by RBV's contributions to different fields such as human resource management (Wright, et al., 2001), entrepreneurship (Alvarez & Busenitz, 2001; Ireland, et al., 2003; Foss, et al., 2008), marketing (Srivastava, et al., 2001), corporate social responsibility (McWilliams & Siegel, 2011), and economics (Makadok, 2011; Lippman & Rumelt, 2003b; Peteraf, 1993; Wernerfelt, 2011; Lockett & Thompson, 2001; Combs & Ketchen, 1999; Conner, 1991), as well as the spin-offs that the RBV has generated, such as the NRBV (Hart, 1995), the knowledge-based view (Grant, 1996b), and dynamic capabilities (Teece, et al., 1997). RBV has also brought together isolated perspectives (Conner, 1991) or integrated with different perspectives such as institutional theory (Oliver, 1997) and organizational economics (Combs & Ketchen, 1999). In the concluding remarks of Barney, et al.'s (2011) editorial in the special twenty-year anniversary issue on the RBV in the Journal of Management, they called for "*scholars who are interested in discovering how and to what extent RBT explains important relationships among organizational phenomena (…) to be mindful of the need to further innovate*" to "*help ensure that RBT achieves revitalization and avoids decline*". With Barney, et al.'s (2011) call in mind and building on the versatility of the RBV, while taking into account Kraaijenbrink, et al.'s (2010) three suggestions for further refining the RBV, this study proposes an adaptation to the RBV to better equip it to deal with the growing forces of interdependence in business and management (and specifically in the context of the banking industry) in the platform economy age.

The growing forces of interdependence are related to the accelerated pace of change. Rapid changes driven by technological innovation, globalization, the "Knowledge Society", the platform economy, and

pluralism create what Drucker (1969) calls the "Age of Discontinuity". D'Aveni (1994) acknowledges an additional force that drives such changes: the blurring of industry boundaries. The growth of the phenomenon of "Open Innovation" whereby firms embrace collaboration and co-innovation with external parties has also accelerated the forces of interdependence among firms (Chesbrough, 2003). These forces can produce exogenous shocks that can lead to radical, transformational changes in business environments (Handy, 1989), and hypercompetitive environments (D'Aveni, 1994). As Christensen (1997) notes, otherwise dominant firms that do not adapt to these transformational changes – particularly disruptive technologies – will risk losing their competitive advantage; in such environments, firms need to adopt strategies that allow them to compete at the edge of chaos (Brown & Eisenhardt, 1998), which includes the consideration of temporary competitive advantage (D'Aveni, et al., 2010). Barney (1986, 1991) also emphasized that just because a competitive advantage is sustained, does not mean it will remain so indefinitely, as structural revolutions or Schumpeterian shocks force firms to reconsider and redefine which of their resources and capabilities are strategic sources of competitive advantage over time.

In a globalized world of rapidly evolving disruptive technologies, hypercompetition, and overlapping industry boundaries, firms are unable to acquire and/or develop all of the rapidly emerging, evolving, and sometimes obsolescing resources and capabilities required to bring certain value propositions to fruition, as such firms are cooperating (or coopetating) to combine their resources and capabilities across firm boundaries leading to new models of value creation, value capture, and value distribution – such as platforms and ecosystems – predicated on the notion of interdependence (Adner, 2006, 2017; Brandenburger & Nalebuff, 1996; Jacobides, et al., 2016; Gawer & Cusumano, 2002, 2008, 2014; Katz & Shapiro, 1986; McIntyre & Srinivasan, 2017; Rochet & Tirole, 2003). Hypercompetitive forces are therefore linked to the forces of interdependence, with greater hypercompetition leading to greater interdependence.

The notion of interdependence has received increasing attention in academic literature especially in light of the rapid rise of e-commerce and online firms such as Amazon, Alibaba, PayPal, and eBay in the early 2000s and the more recent growth of peer-to-peer companies such as AirBnB and Uber. Banking, which is the context of study, has undergone a number of Schumpeterian shocks since the 2007-08 Global Financial Crisis, propelled by regulatory changes, the rise of fintechs, and the emergence of new technologies, which have all driven and reinforced the forces of interdependence in banking. Numerous

interrelated perspectives have emerged that borrow and build on other disciplines and fields such as Industrial Organization economics and Social Network Theory to describe how interdependence leads to new models of value creation, value capture, and value distribution. Of particular interest is an economic perspective (networks), and two managerial perspectives (ecosystems, platforms).

The RBV can offer managers at firms a valuable strategy framework with which to sustain their competitive advantage given the transformational changes in their industries and the rising forces of interdependence, however the RBV needs to be adapted in two ways in the light of these new forces. The first way the RBV should be adapted is so that it takes into account external resources and capabilities, in other words the resources and capabilities a firm can make use of in collaboration with others to create value, that are not owned or controlled by that firm and are instead owned or controlled by other firms. The second way the RBV should be adapted is to consider temporary competitive advantage as a component of broader strategies for long-term sustained competitive advantage, especially in hypercompetitive conditions.

3.2.1 – Current Interdependence Related Adaptations to the Resource Based View

Regarding the first proposed adaptation, the call to extend the RBV to consider external resources and capabilities that a firm does not own or control is not novel. The link between firms collaborating with external parties and the surplus economic rents leading to competitive advantage that is consequently generated and which those firms can internalize was made by numerous scholars such as Asanuma (1989), Dyer (1996), and Parkhe (1993). A number of scholars also advanced the notion of a firm's "network resources" as important sources of value creation (Gulati, 1999). A focal firm's network can be a source of "*inimitable and non-substitutable value (and constraint!) as an inimitable resource by itself, and as a means to access inimitable resources and capabilities*" (Gulati, et al., 2000) especially owing to the idiosyncratic and path dependent process through which networks are created (Gulati & Gargiulo, 1999). Gulati, et al. (2000) decompose the value creation elements of network resources into three elements "*network structure as a resource*", "*network membership as a resource*", and "*tie modality as a resource*" while Kale, et al. (2000) and Shankar & Bayus (2003) consider a focal firm's ability to manage its network a value creating capability in itself, which resonates with McIntyre & Srinivasan's (2017) emphasis on the importance of firms strategically managing their network of complementors. Adner (2017) emphasizes

that "*beyond focusing on competition for acquiring key resources (…) competition can extend to aligning key partners*". However, it was Dyer & Singh (1998) who explicitly called for an expanded view that takes into account resources and capabilities not owned or controlled by the focal firm, proposing the Relational View as complementary to the RBV, and later Lavie (2006) who integrated it into an expanded RBV.

Dyer & Singh (1998) propose that a firm can combine its resources and capabilities with those of other firms to create unique, idiosyncratic combined resources and capabilities that generate relational rents and competitive advantage. Dyer & Singh (1998) define Relational Rents as "*a supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners*". Dyer & Singh (1998) elaborate that relational rents are in fact a form of quasi-rents (returns exceeding a factor's short-term opportunity cost and its next best use, which can often be generated as added value through firms' idiosyncratic, specialized resources and capabilities) and as such "*are not permanent in nature*". Lavie (2006) built on Dyer & Singh's (1998) Relational View as well as social network theory to propose a reformulation of the RBV that takes into consideration the impact of network resources. Lavie (2006) grouped relational-rents (quasi-rents) that a focal firm can internalize from its inter-organizational activities along with the Ricardian rents it can derive from valuable, scarce non-shared resources and capabilities into what Lavie (2006) calls "Internal Rent". Lavie (2006) also identified other sources of rent created by interdependence beyond relational rent: inbound spillover rent and outbound spillover rent. Inbound spillover rent is generated when the focal firm can access knowledge that is unintentionally leaked from partnering firms and that is beyond the scope of the partnership; outbound spillover rent is the rent that can be appropriated from the focal-firm by partners who obtain unintentionally leaked knowledge from the focal firm beyond the scope of the partnership (Lavie, 2006). Lavie (2006) also made the point that a focal firm's non-shared resources and capabilities may be affected positively or negatively by complementarities with a partner or network's non-shared resources and capabilities, which means that interdependence impacts the focal firm beyond the scope of the resources and capabilities it has decided to share. Thus, as Lavie (2006) suggests, strategies of interdependence can be value-destructive and not always value-creative depending on how they are employed (for example, the cost of managing diverse relational initiatives may be greater than the value derived from them).

3.2.2 – Dyer & Singh's (1998) Relational View

Dyer & Singh (1998) considered how firms can generate and appropriate relational rents. Dyer & Singh (1998) found that relational rent is increased:

a) the more partners are invested in relation-specific assets
b) the greater the volume of their exchanges
c) the greater the safeguards in place that protect from opportunistic behaviour
d) the more knowledge-sharing routines they establish
e) the greater the partner-specific absorptive capacity
f) the more aligned incentives are towards transparency and reciprocity and the more they discourage free-riding
g) the greater the proportion of synergy-sensitive resources that can be pooled to create valuable, rare, inimitable combined resources/capabilities
h) the greater experience partnering firms have in managing alliances and the greater their investment in internal search and evaluation capabilities (e.g., a specialized department responsible for alliances and partnerships)
i) the more central a firm is in its network and the stronger its network ties which allow it to occupy an information-rich position in its network
j) the greater the compatibility among partners' organizational systems, process, and cultures (Dyer & Singh, 1998).

Effective governance also maximizes the generation of relational rents, both directly by lowering transaction costs, and indirectly by incentivizing the other factors identified by Dyer & Singh (1998) relating to commitment of interfirm relation-specific assets, knowledge-sharing, and complementarities. More specifically, the more partners can employ self-enforcing safeguards (e.g., trust) instead of third-party ones (e.g., contracts), the lower the contracting, recontracting, monitoring, and adaptation costs, and the higher the incentives to conduct value-creation collaborative initiatives; consequently relational rent is maximized through the lowering of marginal costs and the inimitability of the collaborative arrangements between partners (Dyer & Singh, 1998).

In a similar vein Lavie (2006) found that a focal firm can appropriate more of the relational rent generated if at the time of alliance formation it negotiated favourable contractual agreements, has committed a smaller scale and scope of resources to the formation of the joint value proposition relative to its other partners, and the relationship with partners is not opportunistic; while it can continue to appropriate a greater proportion of relational rents after the alliance is formed, the greater its absorptive capacity and bargaining power. These considerations also impact the inbound spillover rents a focal firm can appropriate or the outbound spillover rents it risks giving away. Focal firms with stronger bargaining power and absorptive capacity will be able to appropriate more inbound spillover rent from the shared and non-shared resources and capabilities of its partners thus enhancing their competitive advantage, while focal firms partnering with partner firms that have strong bargaining power and absorptive capacity will risk the partnering firms internalizing outbound spillover rent from the focal firm thus reducing the focal firm's competitive advantage. Similarly, focal firms with strong isolating mechanisms will lose less outbound spillover rent to partner firms thus protecting their competitive advantage, while partner firms with strong isolating mechanisms will prevent focal firms from appropriating much inbound spillover rent thus reducing the focal firm's competitive advantage (Lavie, 2006). These relational rents can be maintained through a number of isolating mechanisms, many of which have already been identified by RBV literature, for example self-enforcing safeguards like trust are subject to causally ambiguous, socially complex processes, and the development of partner-specific absorptive capacity is affected by time-compression diseconomies. Other isolating mechanisms include partner scarcity (complementary partners may have already partnered with first mover focal firms), resource indivisibility, and idiosyncrasies in the institutional environment (for example whether government regulation facilitates the formation of trust relationships among networks) (Dyer & Singh, 1998).

3.2.3 – Lavie's (2006) Adaptation of the Resource Based View

In formulating the Relational View, Dyer & Singh (1998) noted that "*Although an individual firm's ability to work effectively with other firms may be classified as a firm-specific capability (which may generate relational rents), there is value in distinguishing a relational view, which offers a distinct, but complementary, view on how firms generate rents. A relational view considers the dyad/network as the unit of analysis and the rents that are generated to be associated with the dyad/network. Although complementary to the RBV, this view differs somewhat in terms of unit of analysis and sources of rent, as*

well as control and ownership of the rent-generating resources". On the other hand, Lavie (2006) sought to extend the RBV, through knowledge developed from the Relational View and from Social Network Theory, to make the RBV more suited to dealing with situations in which firms collaborate to create value and sustained competitive advantage through relational and spillover rents (Diagram 2). In seeking to expand the RBV in this way, Lavie (2006) examined whether extending the RBV to account for value generation through resources and capabilities not owned or controlled by a focal firm created contradictions with the underlying assumptions of the RBV, and was able to defend the proposed extension. Lavie (2006) tackles the question of ownership, suggesting that the emphasis in the RBV of resources being "*tied semipermanently to the firm*" (Wernerfelt, 1984) or controlled by the firm (Barney, 1991) was possibly a product of the time in which the RBV was developed when competitive strategy and the Industrial Organization perspective were dominant, leading to collaborative strategies being assumed away. Lavie (2006) proposes instead that ownership and full-control of resources is not a necessary condition for competitive advantage, and that "*resource accessibility, which establishes the right to utilize and employ resources or enjoy their associated benefits, may suffice*". According to Lavie (2006), the idea of resource accessibility is supported by Penrose (1959) who proposed that firms generate value and sustained competitive advantage through the services that resources provide, not through the underlying resources in and of themselves, and has been supported empirically through various studies that demonstrated the link between firm performance and resources and capabilities they do not own (usually through partnerships and alliances) for example in the context of: performance and partner reputation (Saxton, 1997), IPO performance and technological partnerships (Stuart, et al., 1999), performance of biopharmaceutical companies and complementary technology partners (Rothaermel, 2001), and revenue growth of semiconductor firms and their partners' technological capabilities (Stuart, 2000).

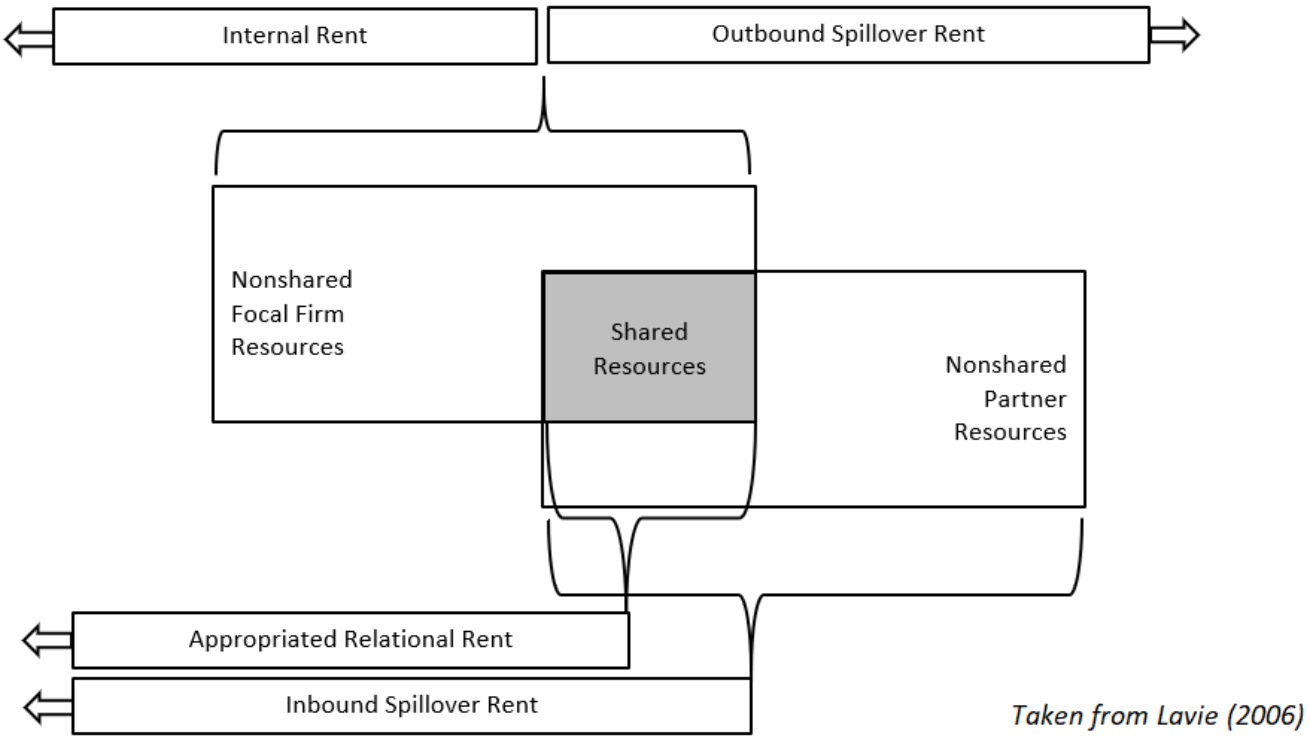

Diagram 2: Rent Extraction by Focal Firm in Dyadic or Multi-firm Alliances

Lavie (2006) also addresses the two fundamental assumptions of the RBV, resource heterogeneity and imperfect resource mobility. While Lavie (2006) acknowledges that interdependence reduces resource heterogeneity by facilitating the flow of resources and capabilities among interconnected firms, interdependence does not invalidate resource heterogeneity as under perfect resource homogeneity firms will only adopt strategies of interconnectedness to collude, in which case mergers and acquisitions would better serve this purpose, instead the purpose of firms collaborating is for access to heterogenous complementary resources. This is even more true given the new business models that have emerged after Lavie published his seminal study in 2006, such as platforms, whereby collaborating firms create new, highly heterogenous value generating capabilities that can only be achieved through the comingling of their individual resources and capabilities, even if this may lead to the reduction (but not elimination) in the heterogeneity of these underlying resources and capabilities. In terms of resource mobility, strategies of interdependence weaken the imperfect resource mobility condition by enabling value extraction and distribution from erstwhile immobile resources, but the condition is not nullified as under perfect mobility there would be no need for strategies of interdependence since complementary resources could simply be traded (Lavie, 2006). Lavie (2006) also highlighted the potential impact of interdependence on decreasing

resource inimitability by exposing the path dependencies, reducing the causal ambiguity, and unravelling the social complexity related to the development of heterogenous resources. On the other hand, resource inimitability, as well as resource non-substitutability, can be protected as other firms can access such resources through strategies of interdependence rather than seeking to imitate or substitute them. Thus, as Lavie (2006) points out, when it comes to strategies of interdependence, the impact on resource imitability and substitutability depends on the nature of the relationships formed rather than the resources shared.

3.2.4 – Why Further Adaptation of the Resource Based View is Required in Light of Interdependence in the Platform Economy Age

While Lavie (2006) and Dyer & Singh's (1998) seminal works will be foundational to my proposed adaptation of the RBV, it is important to note that both were written at a time when strategies of interdependence were predominantly dyadic or multipartner alliances such as those in the Japanese automobile industry and the US technology industry. At that time, the platform economy (Parker, et al., 2016) was still in its infancy and neither the technologies (e.g., cloud computing, blockchain, smartphones) nor the firms (e.g., Facebook, Uber, PayPal, Google, Alibaba) that came to define it were prevalent. Open source technology and notions such as "Strategic Openness", which Alexy, et al. (2018) explain is whereby firms "*voluntarily surrender control over resources to gain a competitive advantage*", were also still in early developmental stages. In the context of banking and financial services, Lavie (2006) and Dyer & Singh's (1998) works preceded the 2007-08 Global Financial Crisis, the regulations that increase the forces of interdependence such as PSD2 and Open Banking, and the rise of fintechs.

This study builds on Lavie (2006) and on insights from Dyer & Singh's (1998) Relational View to propose a reformulated RBV that takes into account the forces of interdependence in the context of the rise of the platform economy in the last 15 years (Diagram 3). This reformulation proposes that the RBV:

a) takes into consideration externally owned or controlled resources and capabilities in the platform context rather than only in the dyadic or multi-firm context previously proposed by Lavie (2006) and Dyer & Singh (1998), whereby these externally held resources and capabilities generate ongoing rents for the focal firm through new business models rather than the temporary rents generated through dyadic/multi-firm-alliances that have more limited scope
b) takes into consideration temporary competitive advantage as a component of overall sustained competitive advantage

To effectuate both components of this reformulation, considerations that are key to both components need to be integrated into the RBV.

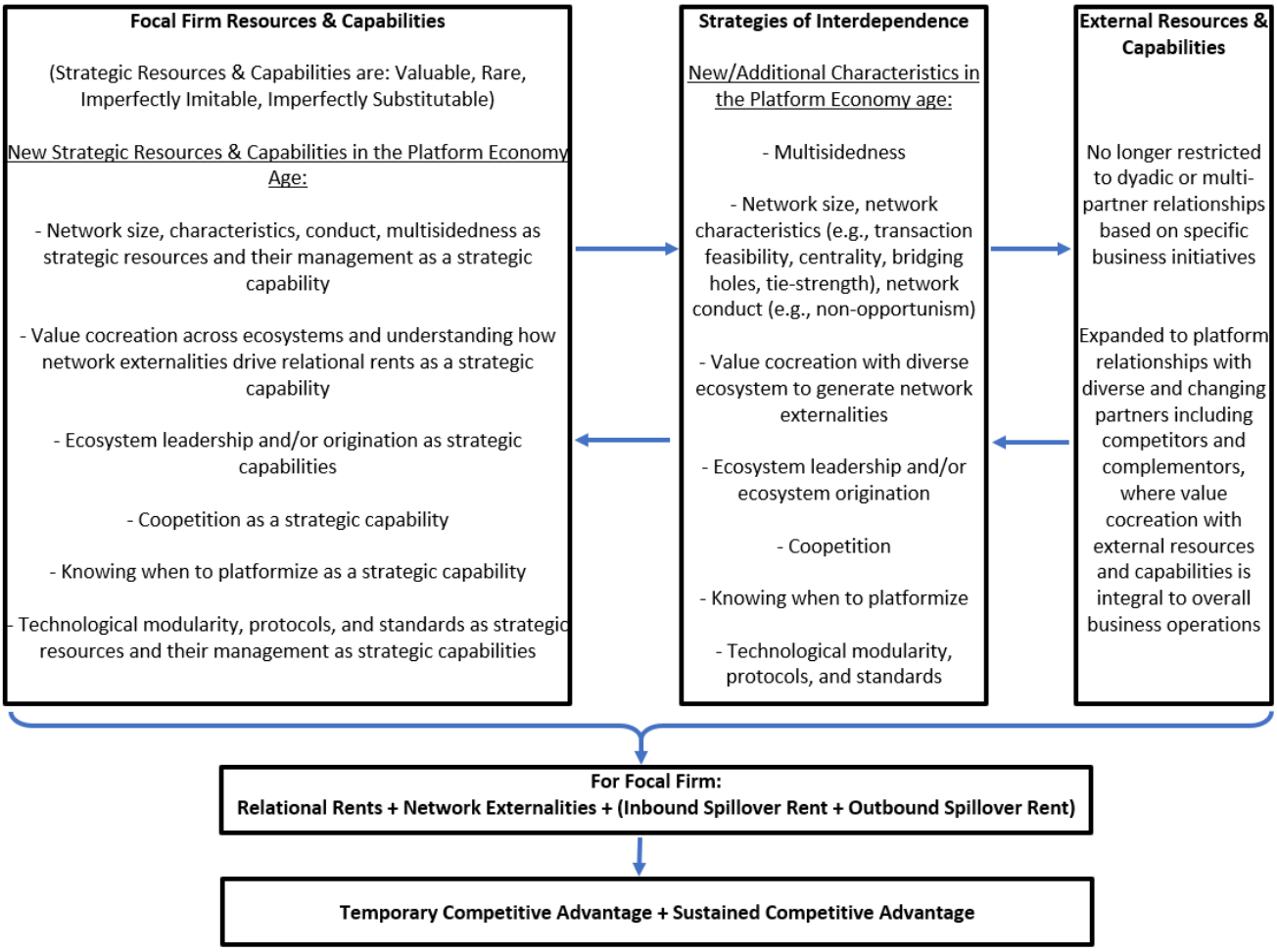

Diagram 3: Theoretical Framework – Reformulated RBV for Strategies of Interdependence in the Platform Economy Age

Considering the first component of the proposed reformulation of the RBV (accounting for externally held resources and capabilities in the platform context), the key underlying considerations that need to be integrated into the RBV relate to: a) the economic benefits of considering externally held resources and capabilities in the platform context, b) the alignment mechanisms needed to interact with them, and, c) the technological platforms through which that interaction takes place. The networks economic perspective provides powerful arguments around the economic phenomena that make interdependence desirable and how firms can maximize these phenomena. Lavie (2006) and Dyer & Singh (1998) both drew on the networks perspective in their reformulations of the RBV, for example in their proposed

inclusion of network structure considerations, like network behaviour, centrality and tie-strength, as strategically important resources and capabilities. This study proposes the integration of other considerations from the networks perspective that are especially relevant for platform-mediated network business models, which are not sufficiently elaborated on by Lavie (2006) and Dyer & Singh (1998), especially as the networks perspective has itself continued to develop in the platform economy age. These considerations include the direct and indirect network externalities that contribute to economic rents and competitive advantage for firms interacting with externally held resources and capabilities through platform-mediated networks. These considerations also include additional structural features that generate or maximize network externalities, such as multi-sidedness, network size, and network holes.

Considerations around the alignment mechanisms needed to interact with externally held resources and capabilities can be drawn from the ecosystems managerial perspective, which has grown and developed in parallel with the rise of the platform economy age, as well as the concept of coopetition. Considerations drawn from the ecosystems perspective emphasize the alignment and collaboration mechanisms through which firms can interact with externally resources and capabilities, such as *de novo* ecosystem origination, and the role of complementors. The concept of coopetition also informs the alignment mechanisms that firms can adopt to interact with externally held resources and capabilities in a way that leads to win-win outcomes for all involved.

Considerations relating to the technological interfaces that mediate interactions between firms and externally held resources and capabilities, can be drawn from the platforms managerial perspective, which overlaps with the ecosystems perspective, and like it developed alongside the growth of the platform economy. Considerations drawn from the platform perspective relate to technological characteristics, which are missing from Lavie (2006) and Dyer & Singh (1998), such as architectural modularity, technological standards and protocols, and the decision whether to platformize. The combination of these considerations will result in an updated framework for an adapted RBV that takes into account external held resources and capabilities in the platform context, making it better suited to inform firms' strategies for sustained competitive advantage in environments experiencing strong forces of interdependence in the platform economy age.

To address the second component of the proposed reformulation of the RBV (accounting for temporary competitive advantage), the concept of hypercompetition and its related literature are used to inform how temporary competitive advantage can be integrated into the RBV. Lavie (2006) and Dyer & Singh (1998) both advance a more nuanced, less static notion of rent-generation – and by extension competitive advantage – than that presented by the traditional RBV. However, the considerations relating to relational-rent, internal rent, inbound spillover rent, and outbound spillover rent were presented more in the context of dyadic and multi-firm alliances rather than the platform networks that have since become prevalent. As such, the relational rents derived from strategies of interdependence were predominantly considered short-run quasi-rents. However, the business models that have since emerged as part of the platform economy can also result in conditions whereby relational rents drive the generation of Ricardian or even monopoly rents, for example a network of firms can commit resources and capabilities for the origination of a new, idiosyncratic value proposition that is predicated on a platform-mediated network through which the participating firms can internalize a portion of the generated rent, which are sustained through various isolating mechanisms (e.g., barriers to imitability) and thus become long-lasting differential/Ricardian rent. This is a point that Kay, et al. (2018) allude to in that a value proposition based on platform-mediated ecosystem "*is not reducible to what any firm has, or even to any single aggregation of the various capabilities of all individuals and sections of the firm*" and that firms can internalize rents generated at an ecosystem level by developing capabilities that allow it to participate or lead the ecosystem and coevolve its own capabilities in line with those of the ecosystem (Teece, 2007; Kay, et al., 2018). Furthermore, the combination of quasi-rents/relational-rents (short term) and Ricardian rents (long term) in Lavie's (2006) internal rent component creates a duality between short-run and long-lasting rents; this creates tension (but not contradiction) with the avowed aim of the RBV which is to examine sources of sustained competitive advantage, this necessitates the second adaptation to the RBV that I propose, the inclusion of temporary competitive advantage as part of broader strategies of sustained competitive advantage. This not only aligns with the inclusion of short-term and long-term rents when considering RBV strategies of interdependence, but also accounts for the hypercompetitive forces which are key drivers underlying the forces of interdependence. Moreover, this inclusion of temporary competitive advantage as part of overall strategies for sustained competitive advantage also further develops Lavie (2006) and Dyer & Singh (1998) more nuanced treatment of economic rents by more explicitly accommodating for Schumpeterian rents – often overlooked by traditional RBV – that can arise in strategies of interdependence, particularly in hypercompetitive environments.

Section 3.3 therefore extracts a series of considerations that constitute the two components of the proposed reformulation of the RBV. Section 3.3 starts by tackling the inclusion of temporary competitive advantage. Section 3.3, then proceeds to extract considerations related to the inclusion of externally held resources and capabilities in the context of the platform economy, by examining the networks, ecosystems, and platforms perspectives, and the concept of coopetition.

3.3 – Reformulating the RBV to Account for Interdependence in the Context of the Platform Economy

This section proposes a reformulation of the RBV to account for the forces of interdependence in the context of the platform economy. It builds on the contributions of Lavie (2006) and Dyer & Singh (1998) but caters for considerations that have since emerged in the platform economy age. Section 3.3.1 tackles the first component of this proposed reformulation, the inclusion of temporary competitive advantage, by drawing on the literature around hypercompetition. Sections 3.3.2, 3.3.3, and 3.3.4 deal with the second component of the proposed reformulation, the consideration of externally held resources and capabilities in the platform economy context, by drawing considerations from the networks perspective (3.3.2), the ecosystems perspective and the concept of coopetition (3.3.3), and the platforms perspective (3.3.4). In proposing this reformulation of the RBV, it will be important to reinforce the base, therefore where possible the suggestions/critiques made in Section 3.1 to enhance the theoretical base of the RBV – particularly those of Kraaijenbrink, et al.'s (2010) – will be addressed.

3.3.1 – Temporary Competitive Advantage and Hypercompetition

It is important to consider a key phenomenon that contributes to increasing and amplifying interdependence, hypercompetition, and the ramifications this phenomenon has on the RBV. While hypercompetition is not the only contributor to increasing interdependence – globalization for example promotes greater interdependence – it does necessitate a rethinking of one aspect of the RBV which is the sustainability of competitive advantage. According to D'Aveni, et al. (2010) conditions whereby firm-specific advantages are not enduring arise in situations of "*fast-paced competitive actions and counter responses among rivals, or where frequent endogenous and exogenous competence destroying disruptions and discontinuities make sustaining one's advantage impossible*". This is especially true in environments that are high-tech, globalized, and where industries are converging (D'Aveni, et al., 2010). This highly

dynamic setting has been described by D'Aveni (1994) as "hypercompetitive", D'Aveni defines hypercompetition as "*an environment of fierce competition leading to unsustainable advantage or the decline in the sustainability of advantage*". Hypercompetition is supported in terms of economic theory by the Austrian School of economics which stresses the notion of "market process" and the importance of continuous innovation, entrepreneurial discovery, flexibility, disequilibrium, and intemporal heterogeneity (Hayek, 1937; Kirzner, 1979; Jacobson, 1992). The Schumpeterian forces of creative destruction (Schumpeter, 1934) are also key causes of hypercompetition (although hypercompetition and Schumpeterian forces are not identical as hypercompetition is also caused by other factors such as the distribution of firm resources and the changes to those resources over time (D'Aveni, et al., 2010)).

As environments become more dynamic so should strategy (D'Aveni, et al., 2010), in this context the Learning School of Strategic Management becomes more relevant and helpful with its emphasis on strategic behaviour rapidly evolving to address environmental changes (Mintzberg, et al., 1998) as well as the notion of knowledge as a strategic firm resource (Eisenhardt & Santos, 2006; Kogut & Zander, 1992; Grant, 1996b). Even successful firms can fall into the "paradox of success" whereby they persist in utilizing their resources and capabilities in the same way without realizing that disruptive forces in their environment require them to adapt (Audia, et al., 2000). In an environment where factor markets are evolving rapidly through innovation and Schumpeterian creative destruction there will be frequent changes to the value, uniqueness, tradability, and imitability of resources and capabilities (D'Aveni, et al., 2010). Hypercompetition does not invalidate the RBV but requires an adaptation towards the consideration of temporary as well as sustained competitive advantage in situations of hypercompetition. Since resources and capabilities in hypercompetitive markets lose value through imitation or substitution and thus new resources and capabilities are needed to replace them, firms can be strategically agile (Weber & Tarba, 2014) and mobilize their resources and capabilities in ways to obtain temporary advantage, while seeking to replace them with more relevant ones should hypercompetitive markets render them obsolete (D'Aveni, 1994; D'Aveni, et al., 2010) through "*simple, experiential, unstable processes that rely on quickly created new knowledge and iterative execution to produce adaptive, but unpredictable outcomes*" (Eisenhardt & Martin, 2000). This is reinforced by Lee, et al.'s (2010) empirical study of the independent software vendor (ISV) market – which is particularly susceptible to hypercompetitive conditions – between 1990 and 2002. The study found that firm level complementarities were mutually dependent on and needed to evolve with the changes in industry level complementarities; thus, the advantages of ISVs'

complementarities were temporary and needed to be constantly renewed in line with industry level shifts. It is important to note that in an adapted RBV, sustained and temporary competitive advantage can coexist and are not mutually exclusive; a firm can adopt multiple or combined strategies for temporary and sustained competitive advantage (D'Aveni, et al., 2010). This coexistence of long and short term strategies is supported theoretically by Chaos Theory which studies non-linear, dynamic systems (Gleick, 1988; Levy, 1994; D'Aveni, 1994). Furthermore, the consideration of temporary competitive advantage alongside sustained competitive advantage in an adapted RBV aligns with Lavie (2006) and Dyer & Singh's (1998) proposed incorporation of relational rents as a component of firms' internal rents since these include short-run (temporary) quasi-rents and longer term (sustained) Ricardian rents.

3.3.1.1 – Addressing RBV Critiques Through Incorporating Temporary Competitive Advantage

Incorporating hypercompetition as a contextual consideration of an expanded RBV that caters for interdependence, as well as temporary competitive advantage as a component of a broader strategy for sustained competitive advantage, contributes particularly to addressing Kraaijenbrink, et al.'s (2010) suggestion that the RBV should advance a more firm-specific notion of resource value. Hypercompetition and temporary competitive advantage challenge RBV's neoclassical, boundedly-rational assumption that resource value is predictable, especially in rapidly evolving environments. By taking into account both temporary and sustained competitive advantage, an adapted RBV can better cater to the call by Kraaijenbrink, et al. (2010), Witt (2007), Baker & Nelson (2005), Foss (2011), Kor, et al. (2007) and Denrell, et al. (2003) for the RBV to focus on the idiosyncratic, entrepreneurial capabilities of managers to configure and deploy resources and capabilities in innovative ways to create greater value in the future which is not fully reflected in the state of the resources and capabilities in question in their present state.

Hypercompetition and temporary competitive advantage also relate to Kraaijenbrink, et al.'s (2010) suggestion that the RBV should better demarcate resources; this study proposes a further demarcation between resources contributing to temporary competitive advantage and those that contribute to sustained competitive advantage. Moreover, the interplay between the two (temporary and sustained competitive advantage), especially how temporary advantage can be a component of sustained advantage, relates to a specific point in Kraaijenbrink, et al.'s (2010) suggestion for the RBV to better demarcate resources, which is the call to emphasize managerial capabilities of resource configuration and deployment for value

creation (for example, configuring and deploying resources and capabilities for temporary competitive advantage at one level, then configuring and deploying these temporary strategies into one of long-term sustained competitive advantage at a higher level). The notion of temporary competitive advantage also directly addresses Kraaijenbrink, et al.'s (2010) suggestion for a more viable theory of sustained competitive advantage by enriching it with temporary competitive advantage as a potential composite of sustained competitive advantage, which helps make the RBV's notion of competitive advantage less static by bringing in temporal considerations into questions of value creation and rent appropriation.

Given the strong Austrian economic roots of hypercompetition, by incorporating hypercompetition and temporary advantage in an RBV adapted for interdependence, the infusion of Austrian economic thought into an overly neoclassical RBV, particularly the role of managerial entrepreneurship and the potential generation of Schumpeterian rents, that has been called by several academics such as Connell (2007, 2009), Kraaijenbrink, et al. (2010), Foss, et al. (2008), Foss & Ishikawa (2007) and Lippman & Rumelt (2003b) can, to an extent, be achieved. Moreover, while Peteraf & Barney (2003) accommodate both Schumpeterian and Ricardian rents in the RBV and in its treatment of competitive advantage, their emphasis is on the potential for Schumpeterian rents to be converted into Ricardian rents providing that the resources and capabilities that generate them are protected from imitation, however, I would take this line of thought one small step further to propose that for Schumpeterian rents to be comprehensibly accommodated, the notion of temporary competitive advantage needs to be injected as a component of an overarching notion of sustained competitive advantage. The inclusion of the notion of temporary competitive advantage, derived from the literature on hypercompetition, facilitates this adaptation.

3.3.2 – Networks

The previous section highlighted how transformational changes and exogenous shocks in a businesses and management context lead to greater forces of interdependence. However, are there economic benefits to interdependence and how can firms benefit from and maximize these? How can the RBV be adapted to take into account the economic benefits of interdependence and thus better serve firms strategizing for sustained competitive advantage in environments of high interdependence? While Lavie (2006) and Dyer & Singh (1998) highlighted that interdependence can be a source of economic rents (specifically relational and spillover rents) for firms adopting strategies of interdependence, and that firms can seek to maximize

these rents through structural and behavioural considerations such as network centrality, network tie strength, and limiting opportunistic behaviour, they did not touch on the notion of direct and indirect network externalities which are particularly important in network contexts (as opposed to dyadic or multi-firm alliances) nor did they tackle other structural considerations such as multi-sidedness. This section seeks to answer these questions on the economic benefits of interdependence, by building on Lavie (2006) and Dyer & Singh's (1998) seminal works, but also by incorporating additional considerations.

The concept of networks describes the interdependencies and interconnectedness of nodes (participating individuals or firms) (McIntyre & Srinivasan, 2017). Economists from the Industrial Organization field have studied networks and their benefits since the 1980s and have observed "network externalities" or "network effects" which are the external benefits that participants in a network (such as end users, firms, complementors, suppliers) derive through the participation of others in that network (Katz & Shapiro, 1986). Participants can maximize network externalities by ensuring that their products and services are compatible with others in their network (Katz & Shapiro, 1986). Markets that experience network externalities are more often than not multi-sided markets where a platform usually mediates the interaction of network participants from the different sides (Rochet & Tirole, 2003); for example the Netflix platform mediates the interaction of video streaming consumers who value greater number and variety of movies or programs, and film studios or other content providers who value the large viewer base (McIntyre & Srinivasan, 2017). Direct network externalities arise when a network participant can interact with a large number of other participants in the network (Katz & Shapiro, 1986; Farrell & Saloner, 1985). Indirect network externalities arise among the different sides of a network when they can mutually benefit from each other's size and characteristics (Rochet & Tirole, 2003; Evans, 2003). The size and characteristics of a network are important in determining the strength of direct and indirect network externalities and which participant(s) are ultimately able to internalize them the most. Consequently, a winner-takes-all situation is possible in which the platform with the dominant installed base and complementors "tips the market" in its favour (Katz & Shapiro, 1994; Venkatraman & Lee, 2004). However, network size as measured by installed base and number of complementors does not *ipso facto* lead to winner-takes-all outcomes; network characteristics are also important, for example embeddedness (Venkatraman & Lee, 2004; Afuah, 2013; Suarez, 2005), variety and differentiation of complementary features (Cennamo & Santalo, 2013; Hagiu, 2009), any exclusivity agreements that a focal firm secures with complementors (Cennamo & Santalo, 2013), and multi-homing (affiliating with several networks) costs (Hagiu, 2009).

Direct and indirect network externalities can therefore act as components of, or contributors to, firms' sustained competitive advantage, this will be expanded upon in Section 3.3.2.1. Moreover, a firm's ability to manage multi-sidedness as well as network size and characteristics for the purpose of maximizing the generation and internalization of direct and indirect network externalities are also strategically important capabilities; multi-sidedness will be addressed in Section 3.3.2.2 and network size and characteristics in Section 3.3.2.3 and Section 3.3.2.4. Section 3.3.2.5 will discuss how these considerations drawn from the networks literature can be integrated into an adapted RBV.

3.3.2.1 – Direct and Indirect Network Externalities as Contributors to Relational Rents and Competitive Advantage

The benefit a network participant extracts from the consumption of a good or service depends on the number of other network participants consuming compatible goods and services (Farrell & Saloner, 1985; Katz & Shapiro, 1986). Many examples of this have been given in academic literature like in the video game industry: the more video game developers create games for a video game console, the more consumers will buy the console and the more consumers who buy a console, the greater the number of video game developers who will want to create games that run on it (Venkatraman & Lee, 2004; Cennamo & Santalo, 2013). These mutually-reinforcing positive feedback loops create network externalities and can be observed across industries and settings: credit card issuers, credit card users, merchants; operating systems, application developers, clients/users; newspapers, readers, advertisers (Katz & Shapiro, 1986; Rochet & Tirole, 2003). These network effects can be direct when they result from a participant valuing a network for their ability to transact with other participants, for example a credit card customer may be attracted to the American Express network because it is widely accepted by merchants that are relevant to the customer. Network effects are considered indirect when a platform participant values a particular network for the variety of complementary products and services, for example, the same credit card customer may be attracted to the American Express network because it gives them priority access at hotels and VIP lounge access at airports. Indirect network externalities are particularly driven by the presence of complementors whose presence increases the value and dominance of a network (Brandenburger & Nalebuff, 1996; Rochet & Tirole, 2003; McIntyre & Srinivasan, 2017; Gupta, et al., 1999). Thus, direct and indirect network externalities can act as contributors to short term relational rents and temporary competitive advantage, and if sustained, Ricardian rents and sustained competitive advantage.

Network externalities are not the only economic benefits of interdependence, however in proposing an RBV adapted for interdependence, in the platform economy age it is important to incorporate the notion of direct and indirect network externalities as contributors to sustained competitive advantage. Outside of network externalities, interdependence also presents other economic benefits and sources of competitive advantage, for example by strategically embracing interdependence firms can benefit from Schumpeterian shocks and the Schumpeterian rents derived from innovation rather than being the victims of such shocks and innovations. Firms can also benefit from the forces of interdependence to modernize their resources and capabilities to keep them useful and relevant and to avoid obsolescence, thereby sustaining the Ricardian rents these resources and capabilities generate.

3.3.2.2 – Multi-Sidedness as a Strategic Resource/Capability

Direct and indirect network externalities describe the economic value of interdependence. Network externalities are economic effects or consequences; a major cause of these effects is the underlying economic structure, specifically multi-sidedness. Most markets that exhibit network externalities (Katz & Shapiro, 1986; Farrell & Saloner, 1985) are multi-sided in that multiple participants (sides) benefit by interacting through a platform. The focal firm that owns or sponsors the platform needs to ensure that both sides are compelled to interact through the network, this can be coordinated through the manipulation of different factors such as the price level, the structure of services, and the availability of complementary services (Rochet & Tirole, 2003; Evans & Schmalensee, 2008). Examples of multi-sided markets include, credit card providers such as Visa and American Express who need to attract both credit-card holders and merchants to transact on their platform-mediated networks and video game platforms such as Nintendo and Sony who need to attract both video game players and video game developers.

However, as Rochet & Tirole (2006) highlight, given that all markets involve transactions between several participants, it can be misleading to label them all as multi-sided markets. Rochet & Tirole (2006) propose a number of factors that make a market multi-sided, which include the ability of the focal firm controlling the platform to do six critical things: a) impact transaction volumes by manipulating price structures and levels between the different sides; b) reduce or remove asymmetric information between the different sides; c) charge transaction costs or membership costs among participants; d) limit the ability of the different sides to set prices bilaterally; e) limit the ability of prices to be set through direct bargaining and

monopoly price-setting between buyers and sellers; and, f) impose constraints on pricing between participants (Rochet & Tirole, 2006). Multi-sided markets also coordinate the participation of complementors through which indirect network effects are generated (Boudreau & Jeppesen, 2015; Rochet & Tirole, 2003).

While multi-sidedness is a foundational structural cause of the economic benefits of interdependence, there are other aspects of network structure such as size and characteristics as well as network conduct that impact the magnitude and sustainability of economic benefits. The following section will explore these in more detail.

3.3.2.3 – Networks as a Strategic Resource and Network Size and Characteristics as Determinants of Resource Value

Academic literature on networks initially emphasized the importance of size, according to Katz & Shapiro (1986) "*the extent of consumption externalities depends only on the final network size*". Driven by forces of standardisation and compatibility, a network can grow rapidly and be widely adopted, reaching a "tipping" point that allows it to pull far ahead of the competition (Katz & Shapiro, 1994). This winner-takes-all outcome can even lead to the dominance of technically inferior products that benefit from compatibility, standardisation, and a large installed-base, as exemplified by the dominance of JVC's Video Home System (VHS) videocassettes over Sony's technically superior Betamax (Gawer & Cusumano, 2008) and the dominance of the "QWERTY" typewriter keyboard over better alternatives such as the Dvorak Simplified Keyboard (Farrell & Saloner, 1985).

While the importance of network size in reaching the "tipping" point of market dominance has been clearly emphasized in academic literature (Katz & Shapiro, 1994; Venkatraman & Lee, 2004; Farrell & Saloner, 1985; Arthur, 1989; Caillaud & Jullien, 2003), ignoring non-size related network aspects such as structure and quality, can lead to strategic myopia for academics and practitioners (Suarez, 2005; Afuah, 2013; McIntyre & Srinivasan, 2017). According to Suarez (2005) the overemphasis on network size (or installed-base) at the exclusion of other factors derives from the Industrial Economics literature and specifically its assumption that network participants are identical; Suarez (2005) suggests that by drawing on Social Network Theory literature and its emphasis on the non-uniformity of networks, a more holistic framework can be achieved.

Size is only one of several aspects of network structure, another aspect is the relationships among members which is impacted by their heterogeneity and characteristics (Afuah, 2013; Suarez, 2005). Moreover, network structure itself is not the sole consideration as it is also important to analyse network conduct (Afuah, 2013). The heterogeneity and characteristics of network participants are manifested in participants' transaction feasibility, centrality, and tie strength as well as network participants' ability to bridge structural holes; these all play critical roles in the value-appropriation capabilities of network participants (Afuah, 2013; Suarez, 2005; Uzzi, 1997; Hansen, 1999; Ahuja, 2000). Transaction feasibility refers to the ability of network members to transact with one another, for example a member in a phone network can call any other member, however a credit-card holder participating in a credit-card network can only transact with merchants and not with other credit-card holders; the more a network participant can transact with other participants the greater the value of the network to that participant and to the focal firm providing that network (Afuah, 2013). Centrality refers to a network participant's position in the network, the more that participant transacts or interacts with others the more central they are in the network; the more central a network participant is the more value they can create for the network and the more value they can appropriate from it, providing that their behaviour is non-opportunistic (Sparrowe, et al., 2001; Soh, 2010; Afuah, 2013).

Networks also tend to have clusters of sub-networks, which creates "holes" between sub-networks; a participant that can (non-opportunistically) bridge a hole between sub-networks creates more value for the network and is able to appropriate more value from it (Ahuja, 2000; Afuah, 2013; Burt, 1992). The strength of the ties between network participants is also an important consideration, these can be classified as either strong ties or weak ties (Ahuja, 2000; Suarez, 2005), the strength of ties is not only a function of the frequency of interaction between participants but also the level of reciprocal obligations, emotional intensity, and trust (Granovetter, 1973). Weak ties can be beneficial for proliferating diverse information that is explicit for many sources across a network (Granovetter, 1973); strong ties are beneficial for transferring tacit knowledge and building the loyalty and reputation to coordinate more valuable outcomes (Afuah, 2013; Suarez, 2005; Uzzi, 1997). In environments of uncertainty and complexity, the higher the proportion of strong ties the greater the network externalities generated (Suarez, 2005; Hansen, 1999).

Participants that have resources and capabilities that are highly inimitable or unsubstitutable can play critical roles in a network and generate greater network externalities, this is providing that they do not act

opportunistically and that they have the necessary resources and capabilities to internalize those network externalities (Afuah, 2013). Moreover, by having unique resources and capabilities a participant can avoid the network overlap density that erodes value (Venkatraman & Lee, 2004). A network participant's centrality, the importance of their role in the network, their ability to bridge the holes between sub-networks, and the strength of their ties with other participants are not only elements that describe the nature of relationships but are also the dissected elements of the overarching structural concept of network embeddedness (Granovetter, 1985; Gulati & Gargiulo, 1999; Venkatraman & Lee, 2004; Uzzi, 1997; McEvily & Zaheer, 1999). Paradoxically, being too deeply embedded in a network can be counterproductive for a participant in that it may limit the adaptability required in rapidly changing environments especially if a dominant technology or standard has not emerged (Venkatraman & Lee, 2004; Uzzi, 1997; Brown & Eisenhardt, 1997; Schilling, 2002).

3.3.2.4 – Network Conduct as a Determinant of Resource Value

As well as the structure of a network, the conduct of network participants also impacts the network externalities that are generated. Opportunistic behaviour – "*calculated efforts to mislead, distort, disguise, obfuscate or otherwise confuse*" (Williamson, 1985) – can create the information asymmetries that drive away high quality participants leaving a network mostly composed of Akerlof's (1970) famous "lemons". On the other hand, network participants' reputation for retaliation, honesty, trustworthiness, and reliability discourages short-term opportunism and encourages less reputable participants to exist the network (Afuah, 2013; Fombrun & Shanley, 1990). In networks, there are various mechanisms by which the reputation of a participant can be signalled to others, for example eBay sellers' public reviews or AirBnB hosts' public reviews and specifically AirBnB's concept of a "superhost". Trust – confidence that a participant will not exploit the vulnerabilities of the other (Barney & Hansen, 1994) – also has the effect of discouraging opportunistic behaviour and reinforcing reputation (Gulati, et al., 2000; Uzzi, 1997; Afuah, 2013; Granovetter, 1985). Network externalities are increased when network participants conduct themselves in ways that maximizes positive reputation and trust while avoiding opportunistic behaviour; moreover, the impact of reputation, trust and opportunistic behaviour is amplified the more a participant's role is crucial, embedded and central to a network and when the participant bridges network holes and exhibits strong ties.

In recent years, scholars have empirically studied networks with a more holistic approach that accounted for the different facets of network structure and network conduct. Venkatraman & Lee (2004) examined how network structure (density overlap and embeddedness) and technological characteristics (dominance and newness) affected the strategies adopted in the US video game industry. Cennamo & Santalo (2013) studied the same industry and found that the winner-takes-all outcome predicated upon the primacy of network size can be overestimated and that multiple platform-mediated networks can in fact thrive concurrently driven by strategies of attracting a large variety of complementors or securing exclusivity with certain key complementors (though both strategies – variety and exclusivity – cannot be executed concurrently as they are incompatible). Still in the same industry, Zhu & Iansiti (2012) showed that network size alone does not sustain the first mover advantage of a platform-mediated network, a higher quality platform-mediated network can either dethrone the incumbent or successfully compete alongside it; while Shankar & Bayus (2003) found that small networks that have strong network ties, defined as the marginal impact of a unit increase in network size on demand, can outperform larger networks that have weaker ties. These studies highlight a shift in the way that strategies for platform-mediated networks are analysed, from the implications of the mere presence of network externalities toward their relative influence (McIntyre & Srinivasan, 2017), however these studies tend to focus on high-technology industries such as video games whereas studying a wider array of industries may yield additional useful contributions to the existing literature.

3.3.2.5 – Integrating Key Considerations from the Networks Literature into the RBV

An adaptation to the RBV that allows it to take into account interdependence by catering for externally owned or controlled resources and capabilities needs to take into account the economic benefits of firms having recourse to these externally held resources and capabilities. These economic benefits have been discussed by both Lavie (2006) and Dyer & Singh (1998) who propose the consideration of relational rents in an adapted RBV, which are short-run quasi-rents derived from the actualization of value propositions that are co-created by multiple firms, as well as the inbound spillover rents a focal firm gains and the outbound spillover rents it risks giving away through the exchange of unintended leaked knowledge between partnering firms. However, as emphasized in Section 3.2.4, Lavie (2006) and Dyer & Singh's (1998) work is particularly geared towards dyadic or multi-firm alliances, rather than the business-models that proliferated as part of the platform economy. As such, a key economic benefit of platform-

mediated networks, the notion of direct and indirect network externalities (Katz & Shapiro, 1986; Farrell & Saloner, 1985), as an important source of relational rent was not considered. Building on Lavie (2006) and Dyer & Singh (1998), the adapted RBV that this study proposes also considers direct and indirect network externalities as contributors to relational rents, and potentially longer-lasting Ricardian rents, and therefore to both temporary and sustained competitive advantage.

A key contributor to the generation of direct and indirect network externalities is the mechanism of multi-sidedness, which was also not elaborated on by Lavie (2006) and Dyer & Singh (1998). True multi-sidedness as defined by (Rochet & Tirole, 2006) is a strategic capability that a firm can use to gain sustained (and temporary) competitive advantage through the generation and internalization of direct and indirect network externalities in relation to that firm's interactions with external stakeholders that own and control valuable resources and capabilities that that firm would not otherwise be able to benefit from. The ability of a firm to create a truly multi-sided network with Rochet & Tirole's (2006) six critical characteristics (ability to: manipulate price structures/levels between different sides, reduce asymmetric information between different sides, charge transaction/membership costs, limit bilateral price setting, limit direct bargaining and monopoly price-setting, and, impose pricing constraints) is a valuable, heterogenous capability that generates competitive advantage; whether the firm is able to sustain the competitive advantage derived from multi-sidedness depends on whether it is able to configure the six critical characteristics of multi-sidedness in a way that is inimitable and unsubstitutable to create *ex post* limits to competition. A firm could achieve inimitability and unsubstitutability of its multi-sided network through a combination of the unique historical conditions, socially complex factors (e.g., its reputation, relationships, culture), path dependencies, and potential asset mass efficiencies that relate to the way in which it combines the six critical characteristics of multi-sidedness into a platform-mediated network. For example, Mastercard began in 1966 as Interbank Card Association that was formed by a group of banks in the US, which quickly expanded into Europe through alliances to eventually become a globally dominant credit card provider[105].

In hypercompetitive contexts, a firm's ability to create a truly multi-sided network allows it to benefit from the rapidly evolving value creating innovations that emerge from external firms (while potentially gaining a certain level of protection from the value destruction that those innovations may have in other

[105] https://www.mastercard.co.uk/en-gb/about-mastercard/who-we-are/history.html

fields), without having to heavily commit its own resources and capabilities to any of the multitudes of emerging innovations; thus a firm's ability to create multi-sided networks can in certain contexts of hypercompetition also provide temporary competitive advantage as part of a broader strategy for sustained competitive advantage. The ability of a firm to create or lead a multi-sided network is particularly relevant to this study as it focuses on large banks who have the ability to create multi-sided networks (this relates to the consideration in 3.3.3.2 regarding firms' abilities to originate *de novo* ecosystems or lead existing ones), however, from the point of view of participating in multi-sided networks to generate direct and indirect network externalities the capability to assess the benefits of different multi-sided networks is also strategic, as is the capability of maximizing the internalization of network externalities and the decision making capabilities related to selecting when to commit exclusively to a multi-sided network, when to participate in a portfolio of multi-sided networks, and when to cease participation.

As well as the mechanism of multi-sidedness, firms seeking to benefit from the forces of interdependence and from external resources and capabilities need to consider a) the networks that bring them into contact with these other firms as a strategic resource, and, b) the managerial abilities to assess the value (determined by network size, structure, and conduct) of networks as a strategic capability. Network size (Katz & Shapiro, 1986; Farrell & Saloner, 1985; Venkatraman & Lee, 2004), network conduct (Afuah, 2013; Uzzi, 1997; Gulati, et al., 2000; Fombrun & Shanley, 1990), and network structure (Ahuja, 2000; Afuah, 2013; Uzzi, 1997; Suarez, 2005; Hansen, 1999) all determine how valuable a network is as a resource. The conditions that lead to firms adopting central positions in networks that bridge structural gaps with other firms with whom they have strong ties and non-opportunistic relationships, are often the result of a combination of heterogenous characteristics, causal ambiguity, unique historical conditions, path-dependencies, socially-complex relationships, asset-mass efficiencies, and time-compression diseconomies that make the firm's critical position in the network a valuable, heterogeneous, and inimitable resource. Additionally, a network that has achieved a size and structure that allows it to become dominant leads to reduced resource mobility and thus the sustaining of competitive advantage, in that external complementors and other network participant are less likely to move their valuable network externalities-generating resources and capabilities to competing networks. Moreover, if a firm's ability to assume such a position in an network is a result of the firm's own set of highly inimitable and unsubstitutable resources and capabilities, it will be able to internalize more of the resultant direct and indirect network externalities as it will reduce the level of value-eroding network overlap density

(Venkatraman & Lee, 2004; Afuah, 2013); such a firm would therefore be able to obtain competitive advantage through the direct and indirect network externalities produced through the network itself and can sustain that advantage by ensuring that other firms cannot displace it from its position in the network.

The ability of a firm's management to assess the value of networks as strategic resources as well as their ability to assess the optimal network strategies to adopt under different conditions is itself a strategic, heterogenous, inimitable capability that is built on a combination of socially complex individual relationships, path dependencies, and specialized knowledge. For instance, the ability of a firm's management to assess the value of different networks and strategize accordingly is a strategically valuable capability, which may entail for example firms deciding between adopting a "winner-takes-all" approach predicated on network size versus a strategy of coexistence with rival networks, or, between driving network value through a high variety of valuable complementors versus driving network value through exclusivity agreements with key complementors, or, between becoming highly embedded in critical networks versus reducing high embeddedness to increase adaptability in hypercompetitive environments (Cennamo & Santalo, 2013; Zhu & Iansiti, 2012; Shankar & Bayus, 2003; Venkatraman & Lee, 2004; Uzzi, 1997; Schilling, 2002; Brown & Eisenhardt, 1998). In proposing an RBV adapted for interdependence, this study builds on Lavie (2006) and Dyer & Singh (1998) who took into account network behaviours as well as certain structural considerations (centrality, tie strength), but expands these to include other structural considerations that are particularly salient in platform-mediated networks such as the ability to bridge network holes and embeddedness.

3.3.2.6 – Addressing RBV Critiques Through Incorporating Considerations Derived from the Networks Perspective

By adapting the RBV to take into account the sustained (and temporary) competitive advantage a firm obtains through the resources and capabilities of external firms by the direct and indirect externalities that are generated – particularly via the mechanism of a multi-sided market – a number of the critiques of the RBV (Kraaijenbrink, et al., 2010) can also be partially addressed. Direct and indirect network externalities and multi-sidedness contribute to addressing the suggestion of demarcating resources and capabilities, specifically the distinction between rivalrous and non-rivalrous resources and capabilities called for by Kraaijenbrink, et al. (2010) with the wide deployment of non-rivalrous external resources and capabilities (which resonates with the notion of complementors) being encouraged and facilitated through the multi-

sided network for the generation of network externalities. They also contribute to Newbert (2007) and Grant's (1996a) calls to consider the managerial capability of configuring and integrating resources (albeit taking into account external resources) that the multi-sided network helps achieve. Direct and indirect network externalities and multi-sidedness also contribute to Kraaijenbrink, et al.'s (2010) suggestion to advance a subjective and firm-specific notion of resource value, specifically, the call by Kraaijenbrink, et al. (2010), Witt (2007), Baker & Nelson (2005), Foss (2011) and Kor, et al. (2007) for considering the entrepreneurial capabilities of a firm's management to deploy resources and capabilities in innovative ways that generate and internalize value, in this case extending the scope of these capabilities to include external resources and capabilities as proposed by Kraaijenbrink, et al. (2010) and extending the notion of value to include internalized direct and indirect externalities. Furthermore, direct and indirect network externalities and multi-sidedness also address Kraaijenbrink, et al.'s (2010) suggestion that the RBV integrates the entrepreneurial managerial capabilities to transform resources into services and the management of the "*imaginative processes that enable the firm to grasp the strategic disjunction between its resource set and the market situation in which it is operating*", with the multi-sided network acting as the entrepreneurial mechanism through which resources are transformed into services, while extending the focus to include external resources and capabilities.

Incorporating the considerations on network size, structure, and conduct derived from the networks literature into an RBV adapted for interdependence also contributes to addressing some of the critiques of the RBV. In terms of better demarcating and defining resources, the distinction suggested by (Kraaijenbrink, et al., 2010) between rivalrous and non-rivalrous resources and the call for more focus on the strategic capability of firm management to configure and integrate resources (Newbert, 2007; Grant, 1996a) are central points in the strategic options firm management have to contend with, which are driven by network size, structure, and conduct considerations, such as network dominance against network coexistence, complementor variety or complementor exclusivity, high or low network embeddedness. These strategic options and their underlying drivers, particularly management's subjective, entrepreneurial capabilities to a) transform resources (including external ones through the network) into valuable services and, b) manage rent generation and appropriation through network externalities, touche on Kraaijenbrink, et al.'s (2010) third suggestion for a more viable theory of sustained competitive advantage. The specific dilemma of high versus low network embeddedness helps address Kraaijenbrink, et al.'s (2010) second suggestion to advance firm-specific notions of resource value, especially in terms

of management's entrepreneurial, idiosyncratic capabilities to create value – in this case through network management – in rapidly changing environments.

Section 3.3.2 has considered the economic benefits of interdependence, specifically the notion of direct and indirect network externalities, which should be incorporated as contributors to relational rents and sustained (and temporary) competitive advantage in the context of extending the RBV to incorporate external resources and capabilities. This section also highlighted the mechanisms by which firms interacting with the external resources and capabilities owned or controlled by other firms can maximize the generation and internalization of these externalities, specifically: multi-sidedness, network size, network characteristics, and the conduct of network participants. This section also discussed how these considerations could be integrated into an adapted RBV that better addresses the forces of interdependence. The following section will examine the relevant considerations that can be extracted from the ecosystems managerial perspective, which focuses on the alignment mechanisms of interdependence.

3.3.3 – Ecosystems

Ecosystems is one of the broadest concepts used to describe the notion of interdependence. Ecosystems can be described as "*the collaborative arrangements through which firms combine their individual offerings into a coherent, customer facing solution*" (Adner, 2006) or as "*the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize*" (Adner, 2017). Adner (2017) makes the distinction between a) ecosystem-as-affiliation, which focuses on the interdependent, symbiotic relationships between actors across traditional industry boundaries that form communities which are defined by their affiliation to a platform-mediated network; and, b) ecosystem-as-structure, which looks at how actors configure their activities around a value proposition. The ecosystem-as-affiliation and ecosystem-as-structure approaches are not mutually exclusive, the former tends to look at aggregates resulting in more general strategic insight on governance, while the latter has the potential of uncovering the specifics of value creation through the examination of actors, their activities, their position in the system, and the links between them (Adner, 2017).

The first definition of ecosystem in the context of business and management was presented by Moore (1996) and is useful for framing the underlying considerations of ecosystems; Moore (1996) defined ecosystems as:

> "*An economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organism also include suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles, and tend to align themselves with the direction set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles*."

Moore's definition highlights two key considerations: 1) the wide array of actors involved in an ecosystem, particularly complementors, and 2) the existence of a focal firm that can trigger and subsequently manage ecosystem creation. A further consideration that is alluded to by Moore, but which is developed by future literature such as Adner (2006, 2017) are alignment mechanisms such as coopetition. These three considerations will be elaborated on in the next four sections. Section 3.3.3.5 will then consider how these considerations can be integrated into an RBV that is adapted for interdependence, and Section 3.3.3.6 demonstrates how integrating considerations from the ecosystems literature into the RBV helps address certain critiques of the RBV.

3.3.3.1 – Cocreation of Value as a Strategic Capability and the Importance of Complementors

The alignment and coordination of diverse stakeholders – especially complementors – to cocreate value propositions that none could have achieved in isolation and which generates direct and indirect network externalities that can be beneficial to all participants is a central theme of the ecosystem literature (Moore, 1996; Adner, 2006, 2017). These diverse stakeholders include "*the community of organizations, institutions, and individuals that impact the enterprise and the enterprise's customers and supplies. The relevant community therefore includes complementors, suppliers, regulatory authorities, standard-setting bodies, the judiciary, and educational and research institution*" (Teece, 2007). The relationship between these stakeholders in an ecosystem is also non-linear in that they can be both horizontal and vertical as

opposed to traditional supply chain and value chain constructs (Autio & Thomas, 2014). However, ecosystem strategies may also involve risks; depending on others for your success creates risks beyond the traditional initiative risks related to managing projects: "*interdependence risks – the uncertainties of coordinating with complementary innovators; and integration risks – the uncertainties presented by the adoption process across the value chain*" (Adner, 2006).

As Autio & Thomas (2014) point out, a key differentiator of the ecosystem managerial perspective from other network-centric constructs is the inclusion of "*side participants, including complementary asset providers and customers*" (Autio & Thomas, 2014). As industries are evolving away from vertical integration to more horizontal structures (Casadesus-Masanell & Yoffie, 2007) an increasingly important actor that is key to the ecosystem perspective is the complementor; "*a complement to one product or service*" as defined by Brandenburger & Nalebuff (1996) "*is any other product or service that makes the first one more attractive*". Complementors are especially visible in the context of information technology, for example the dominance of Microsoft's Windows platform and IBM's dominance during the 1980s of personal computers, both of whom benefited greatly from the proliferation of third-party complementary software developers (McKenzie, 2000; Bresnahan & Greenstein, 1999); however, complementors are widespread across non-technology industries as well, such as automobiles and auto-insurance (Brandenburger & Nalebuff, 1996). The importance of complementors in value creation and the generation of indirect network effects has been emphasized by many scholars, including Brandenburger & Nalebuff (1996), Jacobides, et al. (2016), Gawer (2009), Cennamo & Santalo (2013), McIntyre & Srinivasan (2017), and, Adner & Kapoor (2010). For the created value to be harnessed, focal firms and complementors (and complementors among themselves) need to coordinate their activities as they are dependent on one-another for success, however they cannot rely on established coordination mechanisms like long-term contracts and equity investments (Gawer & Cusumano, 2002). As such, key considerations for focal firms seeking to employ ecosystem approaches will be the orchestration strategies they adopt to select, attract, retain and control heterogenous complementors with the aim of maximizing the value created and the value subsequently captured.

Some studies have considered the relationship between focal firm and complementor. Kapoor & Lee (2013) considered how the different ways in which hospitals were organized in relation to their complementors affected their investments in new medical imaging technology, stressing the benefits of

focal firms effectively managing complementors. Venkatraman & Lee, (2004) studied how network structure and technology characteristics of platforms influenced interorganizational coordination in the US video game industry over an 8-year period. In terms of network structure, they considered density overlap (how crowded the platform is) and embeddedness (the level of lock-in on a platform) and in terms of technology characteristics of platforms, they considered platform dominance (the level of market dominance and consequent legitimacy and stability a platform has) and newness (how technologically innovative and advanced a platform is compared to other platforms). Venkatraman & Lee (2004) found that complementors are more likely to link to platforms that have low density overlap, have little lock-in, are dominant, and technologically innovative. However, Venkatraman & Lee's (2004) study looked at the relationship more from the complementors' point of view and did not touch on the strategic actions of focal firms. Casadesus-Masanell & Yoffie (2007) analysed the relationship dynamics of two complementors: Microsoft and Intel; the implications of their study, particularly with respect to value capture strategies and the prevention of "free-riding" is a powerful analysis of the relationship between focal firms and complementors, specifically when one actor is more concerned about maximizing the installed base than the other. In Schilling's (2002) study of what contributes to the dominance of a certain technology standard (usually championed by a focal firm), the availability of complementors was a key contributor. The availability of complementors also played an indirect role in relation to another key contributor, installed base, in that both installed base level and the number of complementors exist in a self-reinforcing virtuous cycle. Adner (2006) highlights the integration risk faced by the focal firm that is generated by their dependence on complementors adopting their products and services, while Adner & Kapoor (2010) found that if focal firms encounter challenges in complementors adopting their products and services, the risk of substitutability rises and sustained competitive advantage is reduced.

However, as McIntyre & Srinivasan (2017) underline, few academic studies examine in depth the strategic options that focal firms can adopt vis-à-vis heterogenous complementors to maximize the generation, control, and internalization of network externalities. Moreover, few studies have considered the strategies that focal firms use to manage their portfolio of complementors over time, particularly in periods of rapid, disruptive technological change. The academic literature also considers network effects from a binary perspective (present or absent) rather than examining the relative strength of network effects (Afuah, 2013). Similarly, academic literature often neglects to examine complementor heterogeneity and the relative importance of certain powerful complementors over others (McIntyre & Srinivasan, 2017). While

the importance of complementors to the generation of indirect network externalities is often emphasized (Rochet & Tirole, 2003; Kapoor & Lee, 2013; Gupta, et al., 1999) there are only sparse studies on how focal firms can strategically attract, incentivize, and manage complementors (McIntyre & Srinivasan, 2017; Gawer, 2014).

Identifying the different types of participants in an ecosystem is important in understanding how value is created through the interaction of different stakeholders. The role of complementors is particularly important in generating some of that value through indirect network externalities. However, ecosystems are not phenomena that arise without cause and are only to be observed; ecosystems can be created, *de novo*, through the strategic agency of one or more focal firms. The following section will explore the important role of focal firms especially in the *de novo* creation of ecosystems.

3.3.3.2 – Ecosystem Focal Position and the Ability to Originate De Novo Ecosystems as Strategically Important Firm Capabilities

A focal firm in an ecosystem (also often referred to as keystone firm, ecosystem leader or ecosystem champion) has "*deliberate intent*" in the creation of the ecosystem (Jacobides, et al., 2016), manages the health of the ecosystem as a key business priority (Iansiti & Levien, 2004), aligns partners (Adner, 2017), tailors ecosystem development in line with its own strengths (Gawer & Cusumano, 2002; Iansiti & Levien, 2004; Adner, 2006) manages risks associated with technological components and complements (Adner & Kapoor, 2010), and eventually sets the *de facto* industry standards once an ecosystem has achieved a critical mass of users (Bonardi & Durand, 2003). However, research on how focal firms create *de novo* ecosystems is sparse (Dattée, et al., 2018). *De Novo* ecosystem creation is complex, not least as it raises a strong causality dilemma in that focal firms need to persuade complementors and other stakeholders to commit to partaking in an ecosystem whose success and value depends on all parties partaking in it. However, firms that are able to originate *de novo* ecosystems, assume a leadership position in existing ecosystems or influence the evolution of an existing ecosystem to their benefit can strategically influence the generation, distribution, and internalization of network externalities (McIntyre & Srinivasan, 2017; McIntyre & Subramaniam, 2009; Gawer, 2014) which makes these abilities strategically important firm capabilities.

Ozcan & Eisenhardt's (2009) study on focal firms' origination of alliance portfolios provides useful insights on focal firms' potential strategies for *de novo* ecosystem creation. They found that executives at focal firms with high-performing alliance portfolios had a holistic vision of their entire network, including "*possible interdependencies among types of firms, the locations of unconnected firms, and the presence of industry uncertainties*" (Ozcan & Eisenhardt, 2009); they did not view interdependencies in a sequential or dyadic way. With this in mind, they suggest three key strategies that focal firms can use to create high performing alliance portfolios: 1 – advocating a unique industry architecture that define the specific interdependence that are advantageous to the focal firm and potential partners, which clarifies the roles and actions of potential partners as well as structuring and motivating the interactions among partners; 2 – coordinating among unconnected partners that expands a focal firm's reach to more distant parts of their industry network and consequently raises the focal firm's centrality and importance; and, 3 – adding multiple ties around areas of critical emerging industry uncertainties to better defend against them (Ozcan & Eisenhardt, 2009). Santos & Eisenhardt (2009) studied how entrepreneurs addressing nascent, ambiguous markets shape their organizational boundaries using power – defined as an actor's ability to influence the behaviour of others in ways that produce advantageous outcomes to them – as the unifying boundary logic. They suggest that focal firms should start with strategies that reduce ambiguity by shaping meaning to become "*the cognitive referent in a market*" and enforcing favourable market structures that create roles for other powerful actors. Once the focal firm has claimed and demarcated the nascent market through these strategies and once that market has crystalized, the focal firm can proceed to strategies that aim to control the market by owning as much of the market space as possible.

Dougherty & Dunne (2011) also studied emergence of complex innovation that can keep systems balanced in periods of disequilibrium. They identified three dynamics of emergence: 1 – enough connections of actors so that new patterns emerge; 2 – the presence of deviation-amplifying activities that move the system towards a new equilibrium; 3 – coordinating mechanisms that "*recombine, reuse and recreate existing elements into a new order that increases the system capacity*". However, in complex systems of innovation – such as banking and financial services – new products, knowledge, and applications emerge that cannot be planned in advance (Dougherty & Dunne, 2011). This therefore impedes the extent of a focal firm's ability to envision, shape meaning, and create structures as suggested by Ozcan & Eisenhardt (2009) and Santos & Eisenhardt (2009). Dattée, et al. (2018) sought to address focal firms' process of *de novo* ecosystem creation in situations where a meaningful vision cannot be generated and when focal firms

do not have enough insight to strategize in advance around how they appropriate value from any ecosystem that is eventually established. They suggest that *de novo* ecosystem creation is a "*process of collective discovery*" that needs to be orchestrated by the focal firm. The focal firm should aim to control the ecosystem creation process, ensuring that it influences, monitors and updates strategies in a way that leads it to control points in the emerging and evolving value proposition through which it can capture some of the value created. At the same time, the focal firm should avoid becoming a "*fortress in the desert*" whereby actors it had originally considered as complementors or suppliers in fact circumvent it through alternative technologies (Dattée, et al., 2018). Several scholars have presented models rooted in academic research that can help practitioners address *de novo* ecosystem creation, such as, Talmar, et al.'s (2020) Ecosystem Pie Model (EPM), which considers structural elements of ecosystems while considering interdependency, complementarities, and alignment risks, and Simone Cicero's Platform Design Toolkit[106].

Sections 3.3.3.1 and 3.3.3.2 highlighted the wide array of participants in an ecosystem and emphasized specifically the important role played by the focal firm in orchestrating existing ecosystems and originating new ones, as well as the important role played by complementors in value creation. However, the relationships between participants is also important, and traditional relationship dynamics, for example supply-chain, "win-lose", and price competition may not be applicable in an ecosystem setting where a diverse group of participants, often from the same industry or who would otherwise compete, need to collaborate to create value. The next section considers the concept of coopetition whereby firms collaborate to create value before competing to capture it.

3.3.3.3 – Coopetition as a Strategic Capability

By applying Game Theory to Strategic Management, Brandenburger and Nalebuff (1996) challenged traditional ideas about business competition and cooperation, suggesting that business can succeed without necessitating the failure of their competitors and that a "win-win" situation can be achieved when businesses cooperate to create a new pie or enlarge an existing pie and subsequently compete when dividing it up. Co-opetition was the term they coined to describe this simultaneous competition and cooperation. Brandenburger and Nalebuff (1996) identified five elements to the game of co-opetition:

[106] www.platformdesigntoolkit.com

players (represented by the value net of a firm's suppliers, customers, competitors, and complementors), added-value, rules (for example regulation and industry standards), tactics (how players can change perceptions), and scope (how disparate games can be linked to create a desired outcome). Coopetition has been cited as an important underlying consideration of ecosystems and platforms in many of the key studies in these perspectives such as Adner & Kapoor (2010), Adner (2017), and, Autio & Thomas (2014). From the point of view of the focal firm, coopetition is key to creating the common benefits that will attract complementors and other actors to the ecosystem they are proposing to form, which necessitates a shift in logic from *tertius gaudens* to *tertius iungens* (Ozcan & Eisenhardt, 2009). Fundamental to the notion of coopetition is the simultaneous presence of two conflicting forces – competition and collaboration – and the tensions that this creates, as well as the intent of coopetating firms to generate common value that each can partially internalize.

While scholars like Brandenburger & Nalebuff (1996), Gnyawali & Park (2011), and Le Roy & Czakon (2016) have highlighted the positive outcomes of coopetition – value creation that can be internalized collectively by the coopetating firms – the success of coopetative strategies is nevertheless determined by a number of factors which in various circumstances can lead to negative outcomes collectively or for individual firms that are coopetating. Environmental contingencies, for example, is a key factor that influences the success of coopetative strategies. Hypercompetitive, complex, uncertain environments with rapidly evolving technologies (Gnyawali & Park, 2011; Cozzolino & Rothaermel, 2018; Bouncken & Kraus, 2013) increase the likelihood of firms adopting coopetative strategies. Specifically, Cozzolino & Rothaermel (2018) found that in hypercompetitive environments with high levels of technological discontinuities, incumbents benefit from coopetating with new-entrants when technological innovation protected by strong intellectual property rights renders incumbents' core knowledge and capabilities obsolete, while they benefit from acquiring the new-entrants if the technological innovation is protected by weak intellectual property rights, however if the technological innovation challenges incumbents' complementary resources (such as manufacturing, sales, and distribution) rather than incumbents' direct core capabilities, then incumbents are better served by coopetating with other incumbents to compete against new entrants. Power differences, size, and mutual dependence are other environmental contingencies that influence firms' adoption of coopetative strategies (Akpinar & Vincze, 2016). For example, Chiambaretto, et al. (2020) found that small firms are often motivated by cost-reduction and learning when coopetating with larger firms, while larger firms are more likely to coopetate with smaller

firms when they want to reduce their time-to-market. While these environmental contingencies determine the level of firm adoption of coopetative strategies, a number of inter-organizational and intra-organizational elements determine the success of these strategies. At the inter-organizational level, these elements include network position, relative bargaining power, technological compatibility, and coopetition capabilities (Ritala, et al., 2017; Wilhelm & Sydow, 2018; Czakon, et al., 2020), while at the intra-organizational level, important elements include the presence of knowledge brokers, firm culture, and a firm's ability to assess coopetative situations (Chiambaretto, et al., 2019; Czakon, et al., 2020). The inter-organizational elements resonate closely with the considerations derived from the networks literature, specifically those related to network structure and behaviour, as well as stakeholder alignment related questions raised by the ecosystems literature, and technological compatibility which is elaborated on in the platforms literature (Section 3.3.4) specifically considerations about modularity and standards. A fundamental firm-level contingency that determines whether or not firms adopting coopetative strategies in certain contexts can obtain beneficial outcomes is the effectiveness of a firm's coopetition-related capabilities.

Firms seeking to benefit from the external resources and capabilities owned or controlled by other firms through coopetition need to possess the managerial capabilities that are conducive to successful coopetative strategies (Czakon, et al., 2020; Gnyawali, et al., 2016). These managerial capabilities include, management's ability to: understand the opportunities and challenges that are unique to the paradoxical tensions inherent in coopetition (Czakon, et al., 2020; Le Roy & Czakon, 2016), assess the potential value that can be generated from coopetative relationships (Czakon, et al., 2020; Chiambaretto, et al., 2016), manage coopetative relationships including the tensions that arise at different levels (Le Roy & Czakon, 2016; Czakon, et al., 2020), know when to create organizational separation between competitive and cooperative activities withing an overall strategy of coopetition (Fernandez, et al., 2014), and when to encourage embracing the tensions underlying the coopetition paradox (Gnyawali & Park, 2011), co-manage collaborative activities (Czakon, et al., 2020), arbitrate in situations of conflict (Pellegrin-Boucher, et al., 2018), establish appropriate governance structures (Czakon, et al., 2020), determine what firm resources and capabilities are committed to coopetition engagements (Czakon, et al., 2020), and co-manage at the interfirm working-group level (Le Roy & Fernandez, 2015). An under-researched coopetition-specific managerial capability is the ability of management to have processes to design, form, exploit, and terminate coopetative relationships (Czakon, et al., 2020). These coopetition-specific

managerial capabilities are different from firms' alliance capabilities which are not suitable for dealing with the tensions arising from simultaneous competition and collaboration (Bouncken & Fredrich, 2016).

3.3.3.4 – Coopetition at the Platform Level

A lot of coopetition research is based on dyadic coopetition, however coopetition is not limited to dyadic relationships but can occur at multiple levels (Czakon, et al., 2020). Czakon & Czernek (2016) considered coopetition in network settings, emphasizing that coopetition in networks is more complex than in dyadic relationships, for example the influence of any single firm is diluted in a network while non-cooperative, opportunistic behaviour is diffused and anonymized, information is not always evenly distributed across a network, and there are several avenues for firms to join networks which is not the equivalent of partner selection in dyadic coopetition. Sanou, et al. (2016) also considered coopetition in network settings focusing specifically on a key consideration from the networks literature: network centrality. Sanou, et al. (2016) found that firms that have a central position in coopetative networks are more likely to derive greater positive performance outcomes. Yami & Nemeh (2014) found that dyadic coopetition is better suited to incremental innovation while network coopetition is more appropriate for radical innovation, while Ritala, et al.'s (2014) case study on Amazon was one of the few studies to consider coopetition in the context of networks mediated by technology platforms. In the context of this study, coopetition as a strategic capability for a firm embarking on strategies of interdependence will be considered both in the context of dyadic relationships and network/ecosystem relationships (including networks/ecosystems mediated by technological platforms). This means that an additional component of firms' coopetition-specific managerial capabilities is their ability to differentiate between the characteristics of dyadic coopetition and network coopetition. Moreover, by doing so, this study will humbly contribute to advancing academic knowledge on network coopetition.

3.3.3.5 – Integrating Key Considerations from the Ecosystems Literature into the RBV

The considerations drawn from the ecosystems managerial perspective can inform the adaptation of the RBV to the forces of interdependence. An adapted RBV that takes into account the resources and capabilities owned or controlled by external firms can extract valuable insight from the ecosystem literature's emphasis on the alignment structures and collaborative arrangements that firms use to co-

create value with multiple partners. The first consideration derived from the ecosystem literature is the ability for firms to co-create value with an ecosystem of other firms, particularly complementors. The managerial capability of firms to manage partnerships and alliances has been recognized as a strategically important capability, especially owing to the idiosyncratic and path dependent processes behind these partnerships and alliances (Gulati, 1999; Gulati, et al., 2000; Gulati & Gargiulo, 1999; Kale, et al., 2000; Shankar & Bayus, 2003). However, the ability of firms to manage their ecosystems is different in that it takes into account a broader set of stakeholders from a firm's institutional milieu including regulators, universities and research institutes, complementors, suppliers, and customers. These relationships are valuable, idiosyncratic and their development is often based on causally ambiguous, path dependent, and socially complex processes. Therefore, an ecosystem is a strategic resource for firms while firms' managerial ability to assess, originate, participate in, and manage ecosystemic relationships that lead to value being co-created is a strategically important capability.

A component of this strategic capability is firm's managerial abilities to strategically orchestrate the selection, attraction, retention, and control of heterogenous complementors (Gawer, 2014), especially as complementors are key to the generation of direct and indirect network externalities as emphasized by the networks literature. This capability resonates with and builds on what Dyer & Singh (1998) describe as firms' abilities to manage "*synergy-sensitive resources*". Attracting complementors is predicated – among other things – on the structural aspects of an ecosystem, such as the structural considerations derived from the networks literature, especially density overlap, lock-in (Venkatraman & Lee, 2004), and size or installed-base (Casadesus-Masanell & Yoffie, 2007). Firms failing to attract complementors to their ecosystem face a higher risk of substitutability and the erosion of their ecosystem's value as a strategic resource (Adner & Kapoor, 2010), this will also prevent them from establishing a dominant technological standard on the technological platform that mediates their ecosystem's value creation process (Schilling, 2002) (this is elaborated on in the following section on platforms). Firms will have to consider complementor heterogeneity and the importance of certain influential complementors. This relates to firms' managerial abilities to assess the relative strength of network externalities that was emphasized in the networks literature (Afuah, 2013), in fact assessing the heterogeneities and nuances of complementors is a mechanism by which management can assess the relative strength of network externalities. Therefore, the ability of firms to manage ecosystems for the purpose of value cocreation, the ability to manage a portfolio of complementors, the ability to manage interdependence and integration risks (Adner, 2006),

and the ability to assess the relative strength of network effects through the differentiation between complementors' nuances and heterogeneities are important strategic capabilities for the maximizing of direct and indirect network externalities and by extension sustained (and temporary) competitive advantage. Moreover, in context of hypercompetition, this strategic capability will have to cater for managing complementors over time, including possibly catering for complementor management strategies for temporary advantage given rapid technological changes (McIntyre & Srinivasan, 2017). While complementor management is an important component of the overall strategically important managerial capability of ecosystem management, other important components include the management of other ecosystem stakeholders such as regulators, and the ability of firms to internalize and distribute the value that is cocreated.

The second consideration from the ecosystem literature that can inform an RBV that is adapted to interdependence is the ability of a firm to assume the role of a focal firm from which it can lead an existing ecosystem or originate a new one. A firm's position as focal firm in an ecosystem relates to the notion of network centrality from the networks literature; a focal firm, that by definition is central to a network, is able to benefit more from the network externalities that are generated, which in the context of the RBV contribute to the firm's competitive advantage. A focal firm is able to set the industry standard once an ecosystem achieves critical mass (Bonardi & Durand, 2003) and is able to adapt the ecosystem to align with its own strengths (Gawer & Cusumano, 2002; Iansiti & Levien, 2004; Adner, 2006), as such a focal firm is better positioned to internalize more of the generated network externalities and exert greater control on how residual network externalities are distributed among ecosystem participants. Moreover, by controlling the standards setting process and influencing the ecosystem development process to be more in line with its own strengths, a focal firm is able to erect barriers to imitability and substitutability while reducing the mobility of external resources and capabilities, the combination of which contributes to limiting competition and sustaining competitive advantage. Therefore, a firm's position as focal firm in an ecosystem is a strategically important resource.

A firm that seeks to assume the position of focal firm in an ecosystem needs to have or develop the requisite managerial capabilities. These managerial capabilities include managing the health of an ecosystem, aligning ecosystem partners including unconnected ones from unrelated industries, setting ecosystem standards, establishing ecosystem governance structures, managing mechanisms for the

distribution of generated network externalities, managing the risks associated with technological components and complements, coordination mechanisms that generate value from the interaction of the resources and capabilities of diverse firms, and, avoiding imposing too onerous control mechanisms that may lead to the risk of substitutability (Iansiti & Levien, 2004; Adner, 2017; Adner & Kapoor, 2010; Bonardi & Durand, 2003; Ozcan & Eisenhardt, 2009; Dougherty & Dunne, 2011). The ability of firm management to effectively carry out the role of focal firm is valuable since it leads to the generation of network externalities. This ability is also based on the combination of heterogenous individual skills, team skills, and firm culture that arise through causally ambiguous and socially complex processes that are made all the more potent by any underlying asset-mass efficiencies and time-compression diseconomies, and which contribute to making the capability all the more imperfectly imitable. Thus, the ability to assume the position of focal firm in an ecosystem is a strategically important capability. This builds on the governance and alliance management themes emphasized in Dyer & Singh's (1998) Relational View as well as the bargaining power theme raised by Lavie (2006).

Beyond the capabilities required to be ecosystem focal firms, the capabilities required to originate *de novo* ecosystems requires a set of different, unique capabilities that are also strategically important. A firm that wants to originate *de novo* ecosystems needs to have managerial abilities that can deal with the related causality dilemma of convincing stakeholders to participate in an ecosystem whose value depends on their participation. These managerial capabilities include the ability of having a holistic view of a firm's ecosystem, the ability to influence others, orchestrate processes of collective discovery, and become cognitive referents that shape meaning and reduce ambiguity (Santos & Eisenhardt, 2009; Dattée, et al., 2018; Dougherty & Dunne, 2011). A firm's ability to originate *de novo* ecosystem is valuable, heterogenous, imitable, and consequently strategically important in itself; however, the components of this capability – such as the ability to be a cognitive referent and orchestrate processes of collective discovery – are themselves dependent on a firm's existing highly valuable, inimitable, and heterogenous resources and capabilities such as firms' institutional legitimacy, reputation, brand, and culture.

While the ecosystem literature emphasizes the collaborative arrangements through which firms align to cocreate value, another alignment mechanism that can at times be a valuable path to value cocreation is coopetition. However, coopetition requires a set of unique managerial capabilities, not least the ability to manage the tensions arising from coopetition's conflicting underlying forces of competition and

collaboration. These managerial capabilities include the ability to judge the environmental contingencies affecting coopetition (Gnyawali & Park, 2011; Cozzolino & Rothaermel, 2018) and the ability to judge inter-organizational and intra-organizational contingencies (Ritala, et al., 2017; Wilhelm & Sydow, 2018; Czakon, et al., 2020; Chiambaretto, et al., 2019). These managerial capabilities also include highly coopetition-specific abilities such as understanding the opportunities and challenges that are unique to coopetition, assessing the value generation potential for coopetative relationships, managing those relationships, managing the underlying tensions (e.g., situations that call for separating cooperative activities from competitive ones, situations that call for combining them, situations that call for a hybrid approach, situations that call for co-management), arbitration, knowing when to terminate coopetative relationships, and, differentiating between dyadic coopetition and network coopetition (Czakon, et al., 2020; Le Roy & Czakon, 2016; Chiambaretto, et al., 2016; Fernandez, et al., 2014; Gnyawali & Park, 2011; Pellegrin-Boucher, et al., 2018; Le Roy & Fernandez, 2015; Czakon & Czernek, 2016). Given that coopetition can lead to value cocreation, it is a valuable capability that contributes to the generation of sustained competitive advantage; it is also a useful coordinating mechanism in hypercompetitive environments and during times of technological discontinuities for value cocreation and therefore the generation of temporary competitive advantage (Cozzolino & Rothaermel, 2018). The underlying managerial components of a firm's coopetition capabilities are heterogenous, socially complex, and by extension imperfectly imitable. Thus, in certain contexts, coopetition can be a strategically important capability for firms, especially as an alignment mechanism through which they can orchestrate externally owned or controlled resources and capabilities to generate value.

3.3.3.6 – Addressing RBV Critiques Through Integrating Considerations from the Ecosystems Literature

Integrating considerations from the ecosystem literature into an adapted RBV also contributes to addressing certain critiques of the RBV. Integrating the first consideration from the ecosystems literature (ability of firms to cocreate value with other firms especially complementors) into an expanded RBV directly addresses the call by Kraaijenbrink, et al. (2010) to take into account the institutional context of firms in shaping resource value. It also addresses Kraaijenbrink, et al.'s (2010) critique/suggestion that resources should be better defined; for example, by considering, the resources and capabilities of external complementors the distinction between rivalrous and non-rivalrous resources is more clearly demarcated. The managerial capability of ecosystem management (and the related capability of complementor

management) helps advance knowledge on managerial capabilities of resource orchestration, configuration, and integration as called by Newbert (2007) and Grant (1996a) as determinants of sustained competitive advantage. In the same vein, the entrepreneurial abilities of management to create value through the orchestration, integration, and configuration of the external resources and capabilities of the stakeholders in their ecosystems tackles the call by Witt (2007), Baker & Nelson (2005), Foss (2011), Kor, et al. (2007) and Kraaijenbrink, et al. (2010) for a more firm-specific notion of resource value as well as the suggestion by Kraaijenbrink, et al. (2010) that a more viable theory of sustained competitive advantage should be developed that takes into account management's innovative capabilities to generate new sources of sustained competitive advantage.

Integrating the second consideration (ability of a firm to assume the position of focal firm to lead or originate ecosystems) into an RBV adapted for interdependence also contributes to addressing certain critiques of the RBV. The ability of firm management to orchestrate and configure diverse external resources and capabilities in innovative ways to generate value through their position as focal firms in ecosystems or in originating new ecosystems advances Newbert (2007) and Grant's (1996a) call for more emphasis to be given to management's resource orchestration, configuration, and integration capabilities as well as advancing Witt (2007), Baker & Nelson (2005), Foss (2011), Kor, et al. (2007) and Kraaijenbrink, et al.'s (2010) call for more specific-notions of resource value to be considered especially the value created through management's idiosyncratic, innovative abilities to deploy and combine resources in novel ways. Moreover, a firm's ability to create *de novo* ecosystems, especially the notion of envisioning potential value that has yet to be cocreated, echoes the call by Kraaijenbrink, et al. (2010) for a more viable theory of sustained competitive advantage, specifically in terms of a firm's subjective, entrepreneurial capabilities of transforming resources into services that have a higher value in future markets.

The incorporation of coopetition capabilities into an RBV adapted for interdependence helps to address the call by Kraaijenbrink, et al. (2010) for a more subjective, firm-specific notion of resource value and a more nuanced understanding of how sustained competitive advantage is generated. Specifically, it helps advance knowledge on how the idiosyncratic, entrepreneurial abilities of management to combine resources in innovative ways can generate value and sustained competitive advantage. It also touches on Kraaijenbrink, et al.'s (2010) call to better demarcate and define resources and to differentiate between

different managerial processes required to deploy them, in that part of a firm's coopetition capabilities is to delineate between non-rivalrous resources that can be exposed to collaborative forces, rivalrous ones that should be protected, and those that can be exposed to coopetative forces (simultaneously collaborative and competitive).

3.3.4 – Platforms

The academic literatures on ecosystems and platforms often overlap since at a fundamental level both perspectives deal with the phenomenon of interdependence. However, the platform terminology is more often used when describing the products, services, and technological interfaces that mediate transactions between several sides (McIntyre & Srinivasan, 2017; Cennamo & Santalo, 2013), that have been established and championed by one or more focal firms (Gawer & Cusumano, 2002; Iansiti & Levien, 2004), which form the foundational units that complementors can use to build ancillary products and services (Gawer & Cusumano, 2002; Gawer & Henderson, 2007), and which have architectures that facilitate innovation (Gawer & Cusumano, 2014; Jacobides, et al., 2018).

The platform concept has evolved over the years, Gawer & Cusumano (2002; 2014) identify three key phases: internal platforms, supply chain platforms, and industry platforms. The concept of internal platforms, which became increasingly popular in the 1990s, centred on a firm's ability to reuse technological components in incremental innovation and new product development (Gawer & Cusumano, 2002; 2014) through the simple and efficient alterations of features of core elements to generate derivative products (Meyer & Lehnerd, 1997). Modularity is a key condition for the success of internal platforms (Meyer & Lehnerd, 1997), for example, during the 1980s Sony took advantage of the modular design of its Sony Walkman to efficiently and successfully introduce over 250 versions in the US (Sanderson & Uzumeri, 1995) while Hewlett Packard benefited from the modular design of its inkjet and LaserJet printers to reuse manufacturing and assembly processes (Feitzinger & Lee, 1997). Supply chain platforms extended this logic beyond the resources and capabilities of a firm to external, often more cost-effective, sources of innovation in their supply chain (Gawer & Cusumano, 2014). As well as modularity, a unifying system of architecture, standards and/or protocols is key for supply chain platforms (Sako, 2003). Although supply chain platforms extends the notion of platforms beyond the boundaries of a firm to those producing components in its supply chain, ultimate power remains with the focal firm that assembles those

components (Gawer & Cusumano, 2014). The latest evolution is what Gawer & Cusumano (2002; 2014) describe as industry platforms, whereby the logic is extended further still beyond the firm and its supply chain to outside complementors who do not necessarily trade with one another, are not part of the same supply chain, and usually are not cross-owned by the focal firm. Again, modularity and a unified set of standards, architectures, and/or protocols are key enablers of industry platforms (Gawer & Cusumano, 2002; 2014; Cusumano, 2010). In this study, the term platform is used as per the definition of industry platforms.

The three considerations derived from the ecosystems academic literature are also relevant for the platform concept albeit that the platform literature considers these assumptions from a more technological angle which enriches and deepens them. Value creation through the participation of a wide array of stakeholders is important for the success of a platform-mediated value proposition, as are the complementors which play an important role in its wider adoption (Gawer & Cusumano, 2002; 2014; Gawer & Henderson, 2007; Cusumano, 2010; Iansiti & Levien, 2004; Boudreau, 2012). The prominence of the focal firm is also highlighted in platform literature especially in designing a platform's technological architecture and setting its standards and protocols; the focal firm also has the ability to originate *de novo* platforms (Gawer & Cusumano, 2002; Iansiti & Levien, 2004; Gawer & Cusumano, 2014; McIntyre & Srinivasan, 2017). Coopetition is also relevant in the platform literature as participants also need at times to cooperate to create value while simultaneously competing to capture it, for example a focal firm may need to collaborate with a complementor on the platform it has originated while that complementor simultaneously participates in a competing platform (Cennamo & Santalo, 2013; Gawer & Henderson, 2007; Gawer & Cusumano, 2014). The platforms literature also overlaps with the networks literature, in that a fundamental motivation for firms to adopt platform strategies are the direct and indirect network externalities that can potentially be generated; how a platform addresses multisidedness and considerations about network structure, characteristics, and behaviour will determine the level of network externalities that are generated and how participants distribute and internalize that value (McIntyre & Srinivasan, 2017; Zhu & Iansiti, 2012; Eisenmann, et al., 2011).

However, given that the platform literature goes deeper into the technological manifestation of interdependence within an ecosystem or network, two further considerations can be derived. In adapting the RBV to the forces of interdependence and expanding it to include externally owned or controlled

resources and capabilities, these two additional considerations should also be incorporated. The first relates to whether a platform option is relevant: having identified the need to originate a new ecosystem or lead an existing one, should the focal firm then go a step further and create a technological platform that facilitates the interactions between ecosystem participants or does it suffice to simply have formal alliances and agreements with them? The second is that, if a platform is the best option, how should the focal firm design its technological architecture and enforce standards and protocols in a way that maximizes participation and value creation, while protecting the focal firm's intellectual property. These two considerations will be elaborated on the following two sections.

3.3.4.1 – The Strategic Capability of Knowing When to "Platformize" and When Not To

Recalling the second consideration derived from the ecosystem literature which emphasized the importance of the focal firm as well as its role in the *de novo* creation of an ecosystem, it would be logical to assume that a focal firm considering the *de novo* origination of an ecosystem would require an interface – platform – through which ecosystem members can co-innovate and transact. However, a focal firm's pursuit of a platform strategy means that it risks ceding at least some control and exposing some of its intellectual property to the wider market. Should the focal firm be pursuing a platform strategy in the first place rather than a product strategy that reduces dependence on others, and which keeps control and intellectual property in-house? What conditions therefore are necessary for the platform option to be relevant and beneficial? Gawer & Cusumano (2008) provides a compelling answer to this question. A focal firm should consider a platform strategy when the proposed platform's products, services, and technologies can perform a function that is core to a wider ecosystem while solving business problems to many firms and users in an industry. A platform can be considered core when the overall system it serves cannot operate without it. Focal firms can actively identify and/or design a platform in a way that makes it core to a technological system or market (Gawer & Cusumano, 2008). By ensuring that they pay attention to this assumption, focal firms can evaluate whether a platform strategy is preferable to a standard product strategy and thus avoid committing costly strategic errors. The managerial abilities of firms to navigate these questions will depend on a unique set of skills, knowledge, and relationships at the individual management level, top management team level, and the contingent/related capabilities level (e.g., firm intellectual property rights protection capabilities, organization culture). This combination of skills, knowledge, and relationships at different levels and their interplay with other contingent/related

capabilities is highly path dependent, socially complex, and prone to the influence of unique historical conditions (e.g., the addition of platform skills and knowledge through mergers and acquisitions) and time-compression diseconomies (e.g., in relation to a firm's capabilities to protect its intellectual property). Thus, the managerial ability of knowing when to "platformize" and when not to is a valuable, heterogenous, and imperfectly imitable capability that should be incorporated into an adapted RBV that accounts for the forces of interdependence.

The question of when a firm should platformize and when it should avoid doing so has parallels with the question of "strategic openness", whereby firms voluntarily cede control of certain resources to gain competitive advantage, a concept that has become all the more prominent given the rise of the platform economy, open innovation (Chesbrough, 2003), and the proliferation of open source technologies (West & O'Mahony, 2008) in the last 10-15 years (Alexy, et al., 2018). Alexy, et al. (2018) found that "*for a monopolist, strategic openness is a rational decision when it reduces the costs to produce the bundle of resources, or increases the value captured from the still proprietary complement. In oligopoly competition, the decision to strategically open a resource is further determined by the substitutability of the open resource in the firm bundle as well as by the number of rivals in the market.*" Alexy, et al. (2018) also found that firms can derive competitive advantage from a newly opened resource if the firm has superior, idiosyncratic capabilities and proprietary (and potentially more profitable) complementarities allowing it to better leverage the newly opened resource; moreover if the newly opened resource becomes common across a market or industry it can lead to rivals adopting it and substituting it for their own resources thus the newly opened resource ends up acting as a "Trojan Horse". Moreover, openness may be disproportionately advantageous to larger firms who benefit from greater fixed-cost reductions, cross-subsidization, and the driving out of competition especially in environments of uncertainty and resource scarcity (Alexy, et al., 2018).

3.3.4.2 – Architectural Modularity and Unified Standards and Protocols as Strategic Resources and Capabilities

The second consideration derived from the platform literature emphasizes that a platform's technological architecture should be modular to allow different actors such as complementors to efficiently participate and innovate (Jacobides, et al., 2016), while having a set of unified standards and protocols to facilitate the focal firm's governance of overall platform strategy. At a fundamental level, modularity is an approach

to making sense of the complex whole by decomposing it into near-independent, interacting parts; modularity describes "*the degree to which a system's components can be separated and recombined, and it refers both to the tightness of coupling between components and the degree to which the "rules" of the system architecture enable (or prohibit) the mixing and matching of components*" (Schilling, 2000). Herbert Simon suggested that most entities can be viewed as hierarchical systems that can be decomposed into increasingly finer subsystems of components or modules to the point of reaching the elementary particles (Simon, 1962). Simon also stresses the concept of "near-decomposability" as a property of hierarchical, complex systems that is useful in analysing how complex systems develop and reproduce (Simon & Ando, 1961; Simon, 1965), and which emphasizes that despite modularization, some residual interdependence between modules will always be present and the resultant complexity that is created needs to be managed. The level of analysis is important, for example an industry may be a module of a system (e.g., the economy) or a system composed of modules (e.g., individual firms) (Schilling, 2000). Yoo (2016) identifies two further features of modular systems (apart from near-decomposability and interdependence), abstractions leading to information asymmetries that stimulates innovation and the law of requisite variety that allows the platform to respond to exogenous challenges such as those that would result from changes in regulatory or customer behaviour.

The modular approach has multiple benefits both on the supply and demand side. On the demand side, rapidly evolving consumer behaviours and needs can be catered for by the platform and specifically complementors providing one or more modules (Langlois & Robertson, 1992). On the supply side, a modular system stimulates swift innovation as well as facilitating the simultaneous and autonomous testing of several disparate approaches and the ability to learn through trial-and-error in ways that are not possible in traditional, closed, and heavily integrated systems. A modular system "*enlists the division of labor in the service of innovation*" (Langlois & Robertson, 1992) by allowing specialists participating in a platform to focus their innovation capabilities on a specific module without the need to coordinate with other actors (Langlois & Robertson, 1992; Baldwin & Clark, 2000; Langlois & Garzarelli, 2008; Sanchez & Mahoney, 1996). This type of innovation that modularity enables is important during cycles of fast technological change, uncertain markets, and hypercompetition (Nelson & Winter, 1977); platforms that seek to thrive in such environments need to adopt modular technological architectures which facilitates strategic agility (Weber & Tarba, 2014). Moreover, from the focal firm's point of view, modularity

increases the platform's chance of survival and its adaptability by ensuring that any destructive exogenous forces are localized and absorbed at the module level (Orton & Weick, 1990).

From a technological point of view, application programming interfaces (APIs) and "mashups" are key enablers of platform modularity (Weiss & Gangadharan, 2010). APIs are bits of code that "*act as digital control points that set the terms for which data and services can be efficiently shared*" (Evans & Basole, 2016) over the internet; they can be restricted to specific users (Closed APIs) or open to public consumption (Open APIs). Firms can open their APIs to other firms who subsequently create new digital applications and services through mashups that build upon the original API (Google Maps is an example of an Open API that can be the basis of a mashup application created by a bank for its customers to identify their nearest branch or ATM) (Evans & Basole, 2016). Between 2006 and 2016, the number of APIs increased thirtyfold to 12,000 while the number of mashups has grown to 6,000 (Evans & Basole, 2016). APIs are not the only technological enablers of modularity; micro-services, blockchain technologies (e.g., Hyperledger Fabric, Ethereum, R3 Corda), containerization technologies (e.g., Docker), and container-orchestration tools (e.g., Kubernetes) are also examples of technological enablers of modularity. From an industry point of view, modular systems are prevalent across multiple industries, most intuitively in technology and manufacturing, but also across retail as well as banking and financial services; in banking and financial services, modularity can be observed in the growth of ATMs, payment systems, and the more recent use of APIs to integrate banking services with third parties such as utilities providers (Liebenau, et al., 2014).

Modularity, by itself leads to the formation of markets, not ecosystems of actors interacting through a platform (Baldwin, 2008); for an ecosystem to form, a focal firm with a certain level of institutional legitimacy and authority needs to coordinate activities (Jacobides, et al., 2016) and the coordination of activities at a platform level can be achieved through the enforcement of unifying standards and protocols, such as the software development kit or SDK. In environments of divided technical leadership and rapidly evolving technologies, platform leadership and platform control can shift quickly; for example, what used to be called the IBM PC was initially controlled by the original designer, IBM, but over time, control shifted to two of its suppliers, Intel, which manufactured the microprocessors and especially Microsoft which supplied the operating systems (Bresnahan & Greenstein, 1999). In such environments, it is important for the focal firm to determine scope, in other words to decide what functions and intellectual

property to keep control of – by keeping in house and restricting access – and which functions to open up to other firms (e.g., complementors, suppliers); for the functions that the focal firm decides to open up to outside firms, the focal firm can maintain a level of control by creating and enforcing standards and protocols that govern the compatibility of complementary modules on the platform (Jacobides, et al., 2016; Gawer & Cusumano, 2002; West, 2003; Bonardi & Durand, 2003). Scope and product architecture are two of the four levers of platform leadership that Gawer & Cusumano (2002) identify, the other two being how the focal firm manages its coopetative relationships with complementors and how the focal firm can organize itself internally in a way that gives assurances that there are no conflicts of interest between the focal firm's platform and non-platform related activities (usually by creating a segregated unit in the focal firm's organization that is focused on platform related activities) (Gawer & Cusumano, 2002). The ecosystems literature highlighted the importance of the ability of firms to strategically influence the generation, internalization, and distribution of network externalities through originating *de novo* ecosystems, leading existing ones or influencing their evolution to the focal firm's advantage; architectural modularity, setting unified standards and protocols is a way for this to be achieved technologically.

3.3.4.3 – Integrating Key Considerations from the Platforms Literature into the RBV

In proposing an RBV that is adapted for interdependence, which takes into account resources and capabilities owned or controlled by external stakeholders, the platforms literature emphasizes the technological interface that mediates the relationships between these stakeholders. From the point of view of the focal firm applying this adapted RBV, the resources and capabilities-related considerations derived from the networks literature informs them on the economic benefits of interdependence and how managing network characteristics and multisidedness can maximize these benefits, while the resources and capabilities-related considerations derived from the ecosystems literature informs them on the alignment mechanisms and collaborative arrangements that they can apply in response to interdependence including taking into account value co-creation, complementors, becoming focal firms, leading and originating ecosystems and coopetition. However, what of the resources and capabilities required to translate these strategies and considerations into a technological interface that mediates the relationships and interactions of the diverse stakeholders that own or control these external resources and capabilities. The platforms literature provides insight into these requisite resources and capabilities.

A key consideration derived from the platforms literature is the importance of architectural modularity and control of standards and protocols, especially for focal firms looking to benefit from strategies of interdependence. The success of a focal firm's approach to the co-creation of value propositions with external stakeholders such as complementors will be determined by its ability to adopt and enforce a modular technological architecture on a platform that mediates this co-creation. Modularity enables the simultaneous but autonomous innovation required for value to be co-created among an ecosystem of diverse stakeholders, as such technological modularity is a valuable strategic resource. At a platform level, modularity reduces substitutability especially in rapidly changing environments, since complementors are likely to migrate to a more flexible, modular platform that emerges to substitute a highly rigid and non-modular one (Langlois & Robertson, 1992); thus by enforcing modular technological architectures, focal firms can better protect their platform from being substituted. Modularity also helps prevent asset erosion by ensuring that legacy assets are modernized making them more flexible and adaptable to integrate with newer technologies, thus reducing their imitability and/or substitutability. Moreover, the managerial ability to modularize is predicated on knowledge, skills, and a culture that are based on a combination of unique historical conditions and socially complex factors, making a firm's ability to successfully modularize a valuable, heterogenous, and inimitable strategic capability. As well as contributing to the generation of network externalities and competitive advantage, modularity is also a strategically important resource and capability as it helps sustain this competitive advantage by facilitating the absorption and localization of destructive exogenous forces at the module level (Orton & Weick, 1990). Concurrently, modularity in a platform also contributes to a focal firm's strategy for temporary competitive advantage by allowing the platform participants to rapidly innovate in response to hypercompetitive forces and rapidly evolving changes in demand (Langlois & Robertson, 1992). Thus, technological modularity acts as a valuable resource and capability through which firms' combined strategies for temporary and sustained competitive advantage can be practically deployed as suggested by D'Aveni, et al. (2010). Modularity also facilitates for the focal firm, the distribution and internalization of network externalities that are generated.

While modularity is a valuable resource and capability that facilitates the generation, distribution, and internalization of network externalities, it is not sufficient by itself to coordinate activities in an ecosystem for value co-creation (Baldwin, 2008; Jacobides, et al., 2016). Control over platform technological standards and protocols is therefore a strategically important resource for focal firms as it allows them to

coordinate value generation activities on the platform. A firm's managerial abilities to create, enforce, and develop technological standards and protocols as well as demarcating their scope, is by extension a strategically important capability; moreover, these capabilities are often the result of a combination of unique, heterogenous, socially complex, and imitable factors at the individual, firm management, and firm culture level. This capability allows the focal firm to control and govern the value cocreation process as well as the resultant generation, distribution, and internalization of network externalities (Jacobides, et al., 2016; Gawer & Cusumano, 2002). A focal firm's control of technological standards and protocols also reduces the imitability of the platform, however, if a firm's control is too rigid it could lead to increased threat of substitutability (Dattée, et al., 2018); therefore, a firm's managerial ability to manage this balance is a strategically important capability. A firm's control over a platform's technological standards and protocols also allows it to effectuate the governance mechanisms suggested by Dyer & Singh (1998) to maximize the generation of relational rents, as well as creating safeguards limiting the amount of outbound spillover rent the focal firm loses to other participants in the network.

A firm's resources and capabilities related to architectural modularity and technological standards and protocols are closely related to the resources and capabilities considerations derived from the ecosystems and networks literatures. For example, the architectural modularity and technological standards and protocols of a firm's resources and capabilities can act as the vector through which the firm can translate technologically considerations related to ecosystem leadership or formation, value cocreation, coopetition, managing network characteristics, and enforcing the six key characteristics of multisided markets.

Firms also need to have the managerial abilities required to manage conflicts of interest that may arise through technological platforms; this relates to firms' capabilities related to reducing opportunistic network behaviour and managing the risks associated with coopetition. One approach to this need for managing conflicts of interest is an organizational response, in that the focal firm can segregate internally its platform activities from its day-to-day activities (Gawer & Cusumano, 2002). This ties in to Lavie (2006) and Dyer & Singh's (1998) emphasis on effective governance to maximize relational rents and the creation of safeguards against opportunistic behaviour which from the point of view of the focal firm increases the risk of it losing outbound spillover rents to other participants.

Beyond managing conflicts of interest, firms should also have the managerial abilities to assess when a platform strategy is beneficial and when it poses unnecessary risks of exposing firms' valuable intellectual property. According to Gawer & Cusumano (2008), firms should only adopt platform strategies when the platform fulfils a value proposition for an ecosystem that that ecosystem cannot function without while solving problems for firms and users across industry-wide contexts. Both the question of "platformization" and Strategic Openness are compatible with the RBV but require "*the need to adopt a less ownership-centric definition of control than often applied*" (Alexy, et al., 2018), which resonates with Lavie (2006) and Dyer & Singh's (1998) expansion of the RBV. Both "platformization" and Strategic Openness risk reducing scarcity and inimitability of resources as well as increasing the risk of the focal firm losing outbound spillover rents to other stakeholders, therefore for this to be a plausible strategic option, firms need to assess whether the value created (and captured) from the newly opened resource (e.g., through the creation of relational rents that otherwise would not be feasible if the resource was closed, or through lowering production costs while increasing adoption through collaboration with other stakeholders, or reducing the risk of substitutability through wide adoption) is greater than the value lost through imitation and reduced resource scarcity (Alexy, et al., 2018). Strategic Openness and "platformization" in fact challenge the notion in the RBV that firms needs to own or control strategic resources and capabilities even more than Lavie (2006) and Dyer & Singh (1998) in that beyond the RBV being extended to consider that a focal firm can obtain competitive advantage through resources and capabilities owned and controlled by others, there are also situations where firms can obtain competitive advantage by ceding ownership and control of their own resources and capabilities. Thus, firms' managerial abilities to manage conflicts of interest as well as their ability to determine when to proceed with and when to avoid "platformization" are also strategically important platform-related capabilities that should be incorporated into an RBV expanded to cater for interdependence.

3.3.4.4 – Addressing RBV Critiques Through Integrating Considerations from the Platforms Literature

The integration of the two considerations derived from the platform literature into an RBV that is adapted for interdependence also contributes to addressing suggestions and critiques for the overall refinement of the RBV. Kraaijenbrink, et al. (2010) call for better defining resources (e.g., between rivalrous and non-rivalrous resources) this distinction between resources is facilitated technologically through modularity and technological standards and protocols; this distinction is also a key component of the managerial

decision-making process that determines under what conditions it is advantageous for firms to "platformize" and under what conditions "platformization" is a threat. The consideration of capabilities relating to modularity, technological standards and protocols (e.g., in the way focal firms drive the cocreation of value by the configuration of external resources and capabilities through APIs or blockchain technology) also directly addresses the call by Newbert (2007) and Grant (1996a) to consider the configuration and integration capabilities of firms as key determinants of sustained competitive advantage. Architectural modularity and technological standards and protocols as strategic resources and capabilities also advance the suggestion made by Kraaijenbrink, et al. (2010), Witt (2007), Baker & Nelson (2005), Foss (2011) and Kor, et al. (2007) for the value of resources and capabilities to be assessed more subjectively, especially in terms of management's entrepreneurial capabilities of value creation through innovation. Architectural modularity and technological standards and protocols are key technological enablers of that managerial ability of innovative value creation, and in the context of platforms extends the scope of consideration to the managerial ability of innovative value cocreation. This consequently advances the call by Kraaijenbrink, et al. (2010) to consider the institutional contexts of firms in the (co)creation of resource value. Furthermore, the incorporation of architectural modularity and technological standards and protocols into an adapted RBV tackles the call by Kraaijenbrink, et al. (2010) for a more viable theory of sustained competitive advantage. More specifically, as well as facilitating the consideration of both temporary and sustained competitive advantage (separately and simultaneously) especially in hypercompetitive contexts, architectural modularity and technological standards and protocols also provide the foundations for addressing when value is created, when rents/externalities are internalized and distributed, and how innovation generates new sources of competitive advantage.

3.4 – The Modalities of Banks' Strategic Response

Section 2 highlighted the forces that have been driving greater interdependence in the banking industry since the 2007-08 Global Financial Crisis, including emerging technologies, regulatory changes, and public policy enablers, the increased penetration of bigtech into banking and financial services, and the rise of fintechs and the support they receive from other stakeholders such as venture capital firms, innovation labs, incubators, and accelerators. Section 2 concluded with a high-level consideration of banks' potential strategic response to these new forces of interdependence. Section 3 presented the theoretical lens through which banks' strategic response will be examined, the RBV. However, Section 3

also proposed the adaptation of the RBV to better take into account the forces of interdependence, specifically suggesting that a) temporary competitive advantage should be considered, especially in hypercompetitive environments, as a component of a broader strategy for sustained competitive advantage, b) the scope of the RBV should be extended to consider resources and capabilities owned or controlled by external firms. This expanded RBV that caters for the forces of interdependence builds on Dyer & Singh's (1998) Relational View and on the work of Lavie (2006), but given the recent rise of the platform economy also takes into account considerations drawn from the networks, ecosystems, and platforms literatures. Diagram 4 provides a visual representation of the ramifications on relational rents and competitive advantage of this study's proposed reformulation of the RBV. Having discussed the challenges that banks face and the theoretical lens I use to analyse their strategic response, it is important to touch on the study's ontological stance and demarcate the scope before posing the research question (although this will be discussed in more detail in Section 4).

The forces of interdependence impact banks differently depending on their profile. The regulatory and technological forces that promote greater interdependence are likely to have different effects on international banks versus those whose operations are limited to local or regional contexts, or on universal banks versus banks whose operations are limited to specific activities such as private wealth management or investment banking. Furthermore, these regulatory and technological forces also promote the rise of fintech and the incursion of bigtech into financial services, which stimulates and then reinforces the presence of supporting stakeholders such as venture capital firms, incubators, accelerators, and innovation labs, which in turn all come together to amplify the forces of interdependence in the banking industry. Therefore, in demarcating the universe of banks that this study will consider, it is important to select a context where the presence of these forces is maximized, thus developed markets will be selected over developing markets. Within developed markets, regulation promoting the forces of interdependence in banking were pioneered in Europe through PSD2 and the Open Banking Standard – both of which came into effect in January 2018 – while the rest of the developed markets subsequently began exploring the concept of open banking inspired by the European model[107], as such banks in Europe will be the focus of this study. Within European banks, large, international, and integrated/universal banks will be considered as opposed to small, local, regional, and specialized ones, since the forces of interdependence are more likely to be exerted on these larger, international, integrated banks and in a more potent and varied way,

[107] https://www2.deloitte.com/global/en/pages/financial-services/articles/open-banking-around-the-world.html

thus the top 20 European banks by assets will be considered (see Appendix 4). The time boundary that will be considered will be from the start of 2008 until the end of 2019. This time boundary coincides with, the advancement in the development of relevant technologies, the passing of relevant regulatory changes and public policies, the increased penetration of bigtech in financial services, the proliferation of fintechs backed by significant venture capital funding and supported by innovation labs, incubators, and accelerators (see Appendix 3 for a time line of relevant developments that supports the selected period). The question of time boundary and universe will be expounded on in the research design and methodology in Section 4, however it is important to define them at this stage as they will impact both the modalities of banks' strategic response (e.g., leading an ecosystem or originating a *de novo* platform-mediated network is a less relevant modality for a small, local, specialized bank; instead for such a bank the modality of assessing the benefits of participating in such ecosystems is more salient) and the research question which will be posed in Section 3.5.

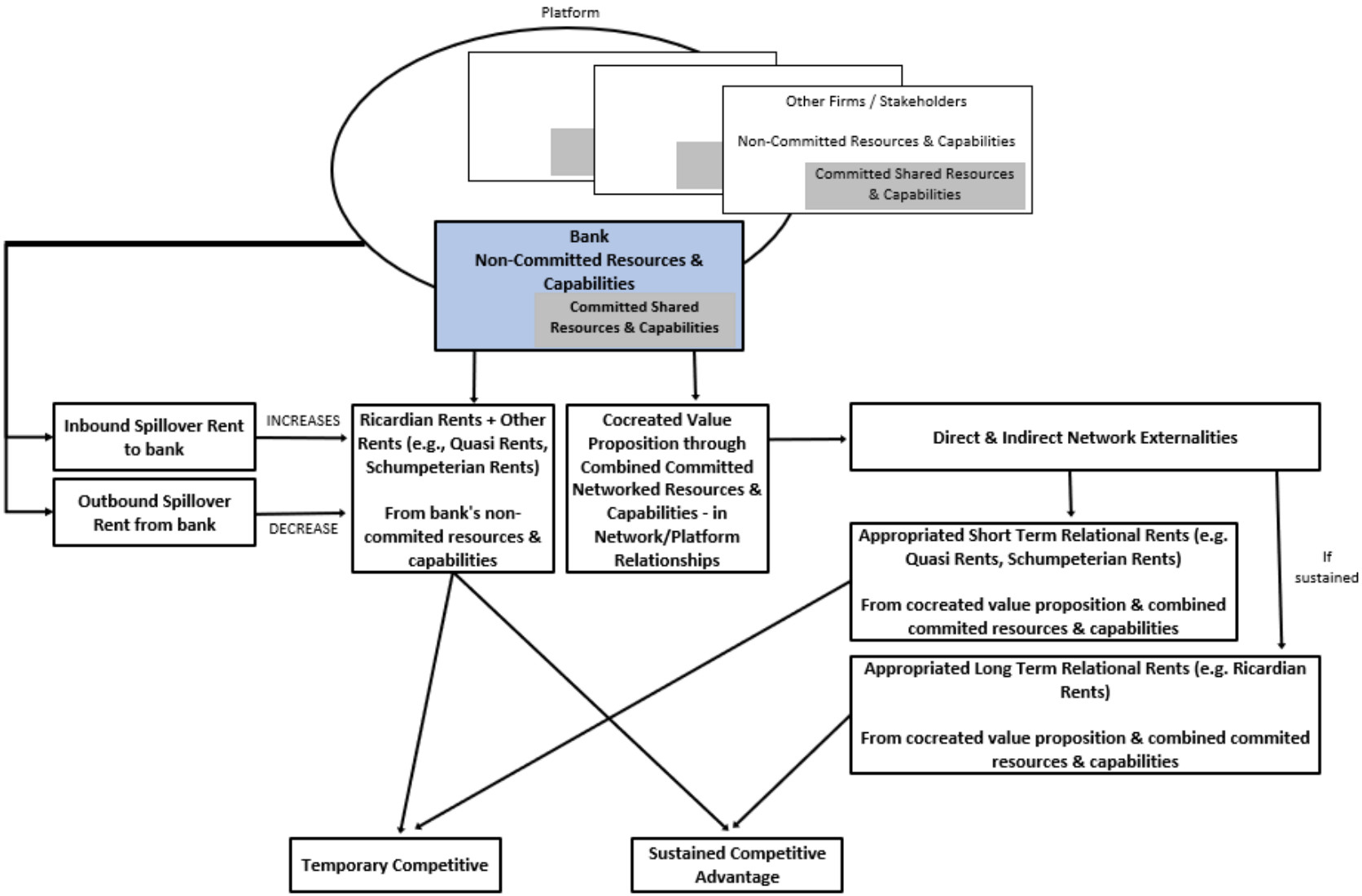

Diagram 4: Theoretical Framework – Reformulated RBV for Strategies of Interdependence in the Platform Economy Age – Rethinking Relational Rents

This study adopts an internal realist ontology, thus while I deem that banks' strategies of interdependence are objective realities, I consider that these strategies of interdependence are best captured by the modalities of banks' strategies of interdependence. With the refined universe in mind, four modalities and several submodalities (summarized below in Table 1) of banks' strategies of interdependence have been identified through preliminary research, reviews of academic and practitioner literatures, and my practical experience. These modalities are discussed in more detail in the Research Design and Methodology in Section 4 and specifically in the Strategy of Inquiry in Section 4.1.

Modalities →	**Acquisitions and investments**	**Partnerships**	**Open innovation ecosystems**	**Open IT infrastructure**
Submodalities	Acquisition of fintech or fintech related firms	Partnerships or non-lead investments in fintechs	Establishment of banks' own external innovation labs, incubators, and/or accelerators	Establishment of open-API portals, developer kits, and sandboxes
	Divestments	Partnerships with bigtech	Participation in others' external innovation labs, incubators, and/or accelerators	Open innovation technological interfaces for staff, external developers, & customers
	Significant investments or lead investments in fintechs	Partnerships with other financial institutions		
	Establishment of corporate venture capital subsidiary and fintech funds	Consortium initiatives, especially blockchain consortia		
	Establishment of fintech subsidiaries	Partnership cessations		
	Establishment of internal innovation labs, incubators, and/or accelerators			

Table 1: Modalities and Submodalities of Banks' Strategies of Interdependence

The modalities and submodalities relate to many aspects of the underlying theory – the RBV – as well as to key themes from the adaptations made to that theory by Dyer & Singh (1998) and Lavie (2006) and to the considerations suggested by this study that are derived from the literatures on ecosystems, platforms, networks, coopetition, and hypercompetition. The four categories of modalities that have been identified relate directly to how banks can react to the forces of interdependence by strategizing for sustained and temporary competitive advantage through the resources and capabilities owned or controlled by external firms. The acquisition and investment modality deals with a number of points raised by Dyer & Singh (1998) and Lavie (2006) that relate to the amount of relational rents a firm cogenerates and internalizes such as absorptive capacity, complementarity, and governance as well as key themes from the RBV literature such as resource orchestration, management's entrepreneurial capabilities, and resource vulnerability. This modality also touches, at least indirectly, on all of the considerations derived from the network, ecosystem, and platform literatures, in that acquisition and/or investment in internal resources and capabilities and/or lead investments in external resources and capabilities are mechanism for the realization of these considerations (e.g., network structure, multi-sidedness, platformization, ecosystem formation).

The partnership modality also deals with several points raised by Dyer & Singh (1998) and Lavie (2006), particularly in the context of relational and spillover rents, especially in terms of network tie strength, network centrality, network behaviour, knowledge-sharing routines, alliance management, safeguards, complementarity and bargaining power. This modality, particularly the "consortium initiatives" submodality, also caters for additional considerations derived from the networks, ecosystem, and platform literatures relating to "platformization", *de novo* platform/ecosystem origination, platform/ecosystem leadership, coopetition, technological modularity and technological standards, multi-sidedness, network structure, ecosystem formation, and managing direct and indirect network externalities.

The open innovation ecosystem modality aligns with the notion of relational rents advanced by Dyer & Singh (1998) and the notion of spillover rents presented by Lavie (2006) as well as the points relating to network behaviour, bargaining power, and governance they both raise; it also aligns with themes from the RBV literature relating to resource orchestration, knowledge capabilities, management's entrepreneurial capabilities, and resource vulnerability. Moreover, this modality also touches on several of the considerations that were derived from the network, ecosystem, and platform literatures like direct and

indirect network effects, ecosystem formation, complementors, coopetition, "platformization", and technological standards. The open IT infrastructure modality resonates with Dyer & Singh (1998) and Lavie's (2006) points about knowledge-sharing routines, safeguards against outbound spillover rent, complementarity, network behaviour, and governance, as well as the themes from the RBV literature around resource orchestration, strategic openness, and rent capture mechanisms. This modality also aligns with many considerations derived from the network, ecosystem, and platform literatures such as multi-sidedness, direct and indirect network externalities, network structure, ecosystem formation, the role of complementors, coopetition, "platformization", technological modularity, and technological standards. All four modalities can also be used to understand banks' strategies for temporary competitive advantage (if any) as a response to the forces of interdependence in hypercompetitive environments.

3.5 – Research Question

Section 2 highlighted the forces of interdependence that have become more prevalent in the banking and financial services industry since the 2007-08 Global Financial Crisis. Given these new forces of interdependence, section 2 concluded by posing the managerial question: how have large European banks been strategically responding to the rising forces of interdependence? Section 3 presented the theoretical framework that guides this study. This study's understanding of strategy is shaped by the RBV, however given the nature of the forces of interdependence and the hypercompetitive environments that amplify them, this study proposed an adaptation to the RBV that builds on Dyer & Singh's (1998) Relational View and Lavie's (2006) integration of the Relational View into the RBV, but that also takes into account considerations drawn from the networks, ecosystem, and platforms literatures to better cater for interdependence in the platform economy age. Section 3.4 demarcated this study's universe (top 20 banks in Europe) and time boundary (January 2008 to December 2019) before setting out the modalities of banks' strategic responses. With this in mind, and considering the top 20 European banks in the time boundary 1 Jan 2008 to 31 Dec 2019, this study's research question can be posed:

> **Through the lens of a Resource Based View that has been adapted for platform-related interdependence by accounting for a) external resources and capabilities and b) temporary competitive advantage, what strategies have firms adopted in response to interdependence in the platform economy age?**

Section 4 details the research design and methodology this study adopts to address the research question.

4 – Research Design and Methodology

This section sets out the internal realist, soft positivist, qualitative research design that aims to address the research question. Section 4.1 begins by laying out the strategy of inquiry, including overarching ontological and epistemological considerations, the relationship between theory and data, the conceptual framework, the research methodology, the unit of analysis and the units of observation, generalizability, and validity. Section 4.2. details the data collection activities that this study has conducted, including considerations about data sources and time boundaries, as well as the safeguards that the study adopts to ensure the reliability of research outcomes. Section 4.3 discusses the data interpretation activities that were conducted to yield a taxonomy of banks' strategic responses to interdependence. Section 4.3 also details the process of theorization that is used in this study to abstract the knowledge derived from the research outcomes to a theoretical level that feeds back into the theory development that this study proposes.

4.1 – Strategy of Inquiry

In seeking to answer the research question, a qualitative strategy of inquiry has been adopted that uses both non-reactive archival data (e.g., financial databases) and documentary evidence. Section 4.1.1 deals with the overarching considerations of the strategy of inquiry including its ontological and epistemological stances, the relationship between theory and data, the level and type of contributions the inquiry makes, the overall methodology, the unit of analysis, and the unit of observation. Section 4.1.2 addresses how the research design seeks to maximize the generalizability and validity of outcomes. Section 4.1.3 discusses the different modalities that this study considers with respect to banks' strategies of interdependence.

4.1.1 – Overarching Considerations of the Strategy of Inquiry

This inquiry adopts an internal realist ontology, an epistemology that is soft-positivist (on the border of the positivist/constructivist split), and considers the research question through an abductive conceptual framework. In terms of ontology, this inquiry's internal realist position considers that objective reality is causally independent from the human mind but cannot be observed directly as it requires human understanding to interpret it (Easterby-Smith, et al., 2018). As such the banks' strategies of interdependence are an objective reality, but they can best be understood indirectly through the

examination of the modalities of banks' strategic responses to interdependence. From an epistemological point of view, this inquiry's soft-positivist/soft-constructivist stance implies that I, as the researcher, will adopt a detached, value-free position, and consider well-defined concepts. However, the study will not be overly reductionist seeking instead to increase overall understanding, nor will it rely on statistical generalization but will instead apply analytic generalization and theoretical abstraction (Yin, 2018; Easterby-Smith, et al., 2018). In terms of conceptual framework, abductive reasoning provides good methodological fit as it seeks to propose provisional theories based on the development of existing theories to better explain emerging phenomena; it does so, by exploring the impact of new contexts and concepts on existing contexts and concepts (Edmonson & McManus, 2007; Fann, 1970). This aligns to the theme and objectives of this research.

The research question poses a "what" question, as such the study is a descriptive one. This inquiry builds on existing theory (the RBV), existing extensions to that theory (Lavie, (2006), and Dyer & Singh (1998)), and proposes a further adaptation based on a number of managerial perspectives and economic perspectives (networks, ecosystems, and, platforms literatures) and concepts (e.g., hypercompetition, coopetition, modularity, complementors), thus it is not a purely confirmatory inquiry since it seeks the refinement and expansion of existing theory and concepts as well as being open to the potential of theory generation (or at least the discovery of new concepts, variables, and relationships). The inquiry seeks to develop knowledge on the strategies that banks are adopting in response to increased interdependence in their milieu by taking a broad view on the phenomenon of interdependence, however it does so in an idiographic way in that it is focused on the context of large European banks, thus while it is expected that some of the theory development outcomes will be applicable in diverse contexts, other outcomes will be specific to large European banks (or large incumbents, or banks) and will not be universal. An abductive approach was used to arrive at the identification of the forces of interdependence currently impacting banks (regulation, fintechs, entry of bigtech into financial services, technology, venture capital, and the proliferation of incubators, accelerators, and innovation labs). Moreover, the inquiry recognizes the unique structure and role of banks in the origination of new money, which may necessitate modification of existing concepts when considering banks' strategies of interdependence (e.g., as focal-firms creating new ecosystems and platform-mediated networks). This inquiry also calls for the expansion of the RBV to a) incorporate resources and capabilities not owned or controlled by the firm and which are instead owned or controlled by external firms, and b) consider temporary competitive advantage in addition to sustained

competitive advantage especially in hypercompetitive markets. Thus, in terms of generalizability, this inquiry aims to develop new perspectives that are more localized to specific contexts (banking and financial services) while contributing to existing universal theory (the expansion/adaptation of the RBV). The generalizability of this inquiry is expanded upon in section 4.1.2.

The inquiry adopts a Straussian view of the relationship between theory and data, in that preconceptions are inevitable and that the researcher should have a sound understanding of existing theory and concepts before setting out to collect the data that confronts theory with the empirical world, while concurrently guarding against imposing theory on data and being open to the discovery of unanticipated phenomena from the data (Strauss & Corbin, 1990). These preconceptions stem from existing literature as well as my position of somewhat of an insider. Consequently, the relationship between theory and data should be a constant iterative approach "*between asking questions, generating hypotheses, and making comparisons*" (Strauss & Corbin, 1990) triangulating continuously between the analysis and interpretation of sources of evidence (Dubois & Gadde, 2002). The sources of evidence are qualitative data, primarily documents, and archival records; section 4.2.1 elaborates on data collection activities and section 4.1.2 discusses the universe. The research follows a circular, iterative process especially between the data collection process (section 4.2.1) and the data interpretation process (section 4.3.1). As the documents and archival records are interpreted, the insights that are obtained are used to feedback into the data collection process (and possibly even the methodology or research question) to refine it, the process then repeats until I become satisfied that the iterative process has sufficiently contextualized the data to the point of saturation where the fullness of meaning has been uncovered and coherent concepts and explanations emerge. To ameliorate the generalizability and validity of the outcomes of this process, it has been conducted longitudinally over a suitable time frame (which is elaborated on in section 4.2.1).

In terms of methodology, a case study methodology is adopted since this aligns with the aim and many of the characteristics of this study. Yin (2018) provides a good definition of case study research "*A case study is an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident. … A case study copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result benefits from the prior development of theoretical propositions to guide design, data collection, and analysis, and as another result relies on*

multiple sources of evidence, with data needing to converge in a triangulating fashion". The case study methodology is particularly well suited to addressing descriptive studies that pose descriptive research questions, in a contemporary real-world setting, using multiple sources of evidence, and with a detached researcher who has little control of the phenomena and events being studied (Yin, 2018). The unit of analysis is the strategy of interdependence adopted by a given bank as captured by each of the 20 cases in this case study; however, the unit of observation is the individual modalities and submodalities of a given bank's strategy of interdependence as set out in Sections 4.1.3 and 4.2.1.

This study adopts a circular research process, the processes of data collection and data interpretation are not linear. In fact, the research process in its entirety follows a circular, iterative progression whereby important new insights that are obtained through the interpretation of initial data feeds back into the data collection process allowing refinements to be made, this continues until saturation. For example, insights from data interpretation activities may feedback into the original data collection activities resulting in refinement to the data collection process, which in turn may trigger new insights in a subsequent data interpretation step. This circular process also aligns closely with the triangulation method that this study also uses, and just as with triangulation, circularity also enhances the validity, reliability, and generalizability of research outcomes by improving the rigour with which data is collected, organized, and interpreted (Easterby-Smith, et al., 2018). While the circular approach is particularly prevalent during the data collection and data interpretation parts of this this study, it is important to note that the circular research approach is more holistic and extends to the process of theorization (iterating between empirical findings and their interpretation, theoretical framing, and, extant literature), as well as to the possibility of iteratively refining the research design and research question based on the processes of data collection, data interpretation, and theorization.

4.1.2 – Ensuring the Generalizability and Validity of Outcomes

Selecting the cases that are studied in a way that maximizes the potential for the generalizability of outcomes is important. Section 3.4 discussed the demarcation of the universe that is considered – the top 20 banks in Europe – since the regulatory environment in Europe as well as the top 20 banks' size, diverse operations, and international presence means that the forces of interdependence that these top 20 banks have to contend with are all the more potent and observable. This means that the logic behind the selection

of the 20 cases facilitates literal replication – the prediction of similar results – (e.g., in that the study does not mix large, integrated global banks with small, specialized, local ones across different regulatory regimes, and that it excludes central banks, development banks, and other non-banking financial institutions), while theoretical replication – predicting contrasting results for anticipated reasons – is catered for through the different modalities and sub-modalities of banks' strategies of interdependence (Yin, 2018).

Moreover, since this is a longitudinal study, selecting a time boundary that maximizes the generalizability of outcomes is also key (this was also touched upon in Section 3.4). The time boundary used in this analysis is 1 Jan 2008 to 31 Dec 2019. The time line corresponds to: a) the proliferation of financial technology and of fintech firms, b) the rapid advancement of relevant enabling technologies (e.g., smart phones, internet speed, blockchain, big data, artificial intelligence, cloud computing), c) regulatory changes that have both increased the net-regulatory burden on banks (e.g., Basel III, Dodd-Frank Wall Street Reform & Consumer Protection Act) and facilitated the activities of fintechs (e.g., PSD2, Open Banking Standard), d) the increasing penetration of bigtech in banking and financial services; e) the vast venture capital investment in fintech, f) the increase of innovation hubs, incubators, and accelerators, and, g) public policy enablers that have facilitated financial technology innovation. These factors are elaborated on in Section, in the literature review, and in a time-line of the major financial technology related events over the past 20 years is presented in Appendix 3 in which it can be observed that the majority of important events are clustered in the period 2008-2019. Moreover, the chosen time boundary is sufficiently long (12 years) to gather enough relevant data and for observations and analysis to be indicative of more significant phenomena rather than temporary noise. Finally, the chosen time boundary excludes the Covid-19 period (2020 onward) that thrusted much of the world into a new recessionary period. Thus, given the 20 cases considered and the time boundary selected, the observations made are more likely to: a) closely align with the purpose of this descriptive study and the research question posed, and, b) provide a full and realistic range of topics that constitute a close to complete description of what is studied (Yin, 2018).

With this in mind, the generalizability of the study is improved as patterns observed in the cases (and across the cases) can be compared to findings from other studies where relevant, and the study covers a sufficiently diverse context and time boundary for inferences to be made to other contexts (Easterby-Smith, et al., 2018). It is important to note that the case study approach facilitates analytic generalization

– not statistical generalization – in other words, case study research outcomes allow the generalization of theoretical propositions, including the potential of expanding existing theories, as opposed to the extrapolation of probabilities about certain populations or universes (Yin, 2018). The analytic generalization that case study research enables is directly relevant to this study's research question, its overall aims, and intended contributions. The analytic generalizations are generated from the overall case study (not individual cases) through a) the corroboration, rejection, or advancement of the underlying theoretical concepts that were discussed in the theoretical framework, b) the emergence of new concepts from the case study (Yin, 2018) in keeping with this study's Straussian view of the relationship between theory and data, or, c) a combination of both.

The logic behind selecting the 20 cases and the time boundary considered not only enhances the generalizability of this study but also improves the study's construct validity by ensuring the identification of the correct operational measures for the concepts this study examines (e.g., the modalities of banks' strategies of interdependence). Moreover, the fact that evidence will be sought from multiple cases is regarded as more robust than relying on a single case (Herriott & Firestone, 1983). Construct validity is also maximized by relying on multiple sources of evidence and triangulating between them to develop converging lines of inquiry (Yin, 2018). This study triangulates between different data sources (e.g., press releases, financial databases, annual financial statements, specialist databases, specialist reports), between types of data (e.g., documents, archival databases), and between different methods, providing multiple measures of the same phenomenon and enabling the convergence toward a single representation of that phenomenon with a greater degree of confidence (Patton, 2015; Miles, et al., 2019; Romelaer, 2005; Yin, 2018). Construct validity is also maximized by maintaining a chain of evidence in a diligent way so that the reader can follow how raw data was collected, organized, and summarized, how evidence from this data was derived and interpreted, and how this evidence was synthesized into research findings that address the research question (Yin, 2018). Maintaining a strong chain of evidence required maintaining a case study database, which is discussed in Section 4.2.2 since this relates to data collection and the question of validity. Since this study is descriptive, internal validity is less relevant than it would be for causal or explanatory studies, nevertheless the diversity of cases selected as well as the time boundary facilitate a more robust treatment of patterns, relationships, and concepts, for example in the differentiation between any anomalies and short-lived patterns on one hand, and any strong incidence of relationships or

concepts and sustained patterns on the other. Alternative interpretations of phenomena were nevertheless sought where relevant to bolster the generalizability and validity of the research (Miles, et al., 2019).

While this study adopts an internal-realist, soft-positivist stance, to maximize the generalizability and validity of the study's outcomes, I am nevertheless cognizant of my dual positions as practitioner and researcher. I have worked at the intersection of banking and technology for over 11 years (currently at Gartner, and previously at IBM, Thomson Reuters, and Bloomberg), in which time I have interacted with key decision makers at banks, fintechs, incubators and accelerators, technology companies, technology consortia, and regulators. As such, I can be considered as somewhat of an insider as well as an academic researcher and would have likely developed certain biases, preconceptions, and unchallenged assumptions. While this study's ontological and epistemological position, its theoretical framework, its longitudinal multi-case study design, its Straussian view of the relationship between theory and data, and the triangulation between different data sources and methods go a long way in guarding against potential biases, I nevertheless need to be critically sensitive and reflexive in the way I select the modalities and sub-modalities of banks' strategies of interdependence, in the way I collect and manipulate data ensuring that all relevant data is considered including those that may present alternative descriptions and explanations, and in the way I interpret the data to make theoretical contributions (Alvesson & Deetz, 2000; Silverman, 2013).

4.1.3 – The Modalities of Banks' Strategies of Interdependence

This section details the modalities of banks' strategies of interdependence that were presented in Section 3.4. The modalities of banks' strategic responses to the forces of interdependence have been identified through preliminary data collection and analysis, a review of the academic and practitioner literature, and my own experience. The modalities can be refined based on any knowledge that subsequently emerges from the detailed data collection and analysis process. The modalities and submodalities are categorized as acquisitions and investments, partnerships, open innovation ecosystems, and open IT infrastructure; these are elaborated on below.

4.1.3.1 – Acquisition and Investments Modality

There are several submodalities that are associated with the acquisitions and investments modality:

- Acquisition of fintech or fintech related firms
- Divestments
- Significant investments or lead investments in fintechs
- Establishment of corporate venture capital subsidiary and fintech funds
- Establishment of fintech subsidiaries
- Establishment of internal innovation labs, incubators, and/or accelerators

Acquisition is a particularly nuanced modality. Sears (2017) found that large, incumbent firms sometimes acquire small technology firms to overcome time-compression diseconomies and the uncertainties related to internal innovation and development. Sears (2017) found that the following factors are key to determining the value creation potential of the acquisition: the purpose of acquisition (resource deepening where the acquisition complements and enhances the acquirer's existing resources, or, resource extension where the acquisition brings the acquirer into new markets), the position of the acquirer (technological leader, or, technological laggard), and the acquirer's absorptive capacity (its ability to "*value, assimilate, and exploit the resources and capabilities of the target*"). Technological leaders usually possess the necessary absorptive capacity to successfully integrate target resources and capabilities to create value, while technological laggards do not, and any attempt to integrate target resources and capabilities often lead to value destruction. However, even technological leaders will need to consider whether the firms they are considering acquiring possess resources and capabilities that lead to discontinuous changes and negative complementarities with their existing resource base, which may increase substitutability and lead to value destruction (Sears, 2017; Schmidt & Keil, 2013). Technological laggards are more successful when the acquisition is part of a "strategic renewal" – especially in resource extension acquisitions – whereby the acquirer recognizes its existing technology strategy is failing and substitutes it with the target's technological resources and capabilities (Sears, 2017). Furthermore, when entering new geographic markets, firms possessing knowledge-based resources are better served through adopting a greenfield establishment mode rather than seeking to acquire a local entity as an entry point (Klier, et al., 2017).

In terms of interdependence, the purpose, timing and nature of the acquisition are very important considerations. For instance, is the focal firm acquiring a target for the purpose of benefiting from the target's resources and capabilities to better enable the focal firm to engage in strategies of

interdependence? Or is the focal firm acquiring the target as a rejection of strategies of interdependence and a rejection of the notion of value cocreation with resources and capabilities that it does not own or control? Does the focal firm prefer to counter the forces of interdependence by owning rather than collaborating with the resources and capabilities it does not currently have?

Weber & Tarba (2014) and Brueller, et al. (2014) also note that when properly managed, acquisitions can "*facilitate the gradual accumulation of the capabilities underlying strategic agility*" which allow firms to make sense quickly, make decisions nimbly, and redeploy resources swiftly, which improve firms' abilities to react to hypercompetitive environments and which are important considerations in any strategy for temporary competitive advantage.

Moreover, the modality of acquisition needs to be considered in conjunction with other modalities longitudinally since this can reveal the purpose of acquisitions and the evolution of a firm's strategy of interdependence (e.g., a technological laggard may embark on acquisitions initially as a rejection of interdependence, subsequently establish innovation labs and a corporate venture capital arm, transform into a technological leader and subsequently only embark on acquisitions that enable it to promote rather than suppress strategies of interdependence). In a similar vein, it is important to analyse firms' divestments and the reason behind them. Have firms divested from businesses that have been impacted by interdependence with the aim of insulating themselves from the forces of interdependence, or have they divested from investments as their strategy of interdependence has evolved?

A related set of modalities are banks' internal investments that allow it to develop the resources and capabilities required to better execute its strategies of interdependence. This includes creating corporate venture capital arms and allocating fintech funds in order to identify, assess, and influence fintechs with whom the banks seeks to collaborate with, invest in, or acquire. This also includes internal innovation labs, incubators, and/or accelerators to benefit from the entrepreneurial capabilities of banks' existing employees to develop value creating innovations in response to the forces of interdependence. In some cases banks may invest in the creation of an internal fintech subsidiary, or this may evolve as a result of innovations in a bank's internal innovation lab, incubator, and/or accelerator. The fintech subsidiary is frequently ringfenced from the rest of the bank and allowed to operate semi-independently; this is often due to the cultural, technological, and operational differences between the fintech subsidiary and the rest

of the bank, but this can also be to facilitate the fintech subsidiary's own strategies of interdependence with other stakeholders who would otherwise be less likely to collaborate with it if it was simply another fully integrated department of the bank. Banks may also look to invest externally as lead-investors in fintechs; the status of lead-investor is particularly important as through this position banks exert greater influence on the development of the fintech and the path it takes compared to other non-lead investors, for instance lead-investors are more likely to become board members of the fintech than non-lead investors (Amornsiripanitch, et al., 2019). Thus, a bank acting as a lead-investor can influence the evolution of a fintech to align it more closely with the bank's strategy and for the purpose of value cocreation through the exploitation of the fintech's resources and capabilities, while only having a partial ownership stake.

4.1.3.2 – Partnerships Modality

There are several submodalities associated with the partnerships modality:

- Partnerships or non-lead investments in fintechs
- Partnerships with bigtech
- Partnerships with other financial institutions
- Consortium initiatives, especially blockchain consortia
- Partnership cessations

The second modality focuses more on the inter-organizational relationships that a bank can make use of to co-explore and co-exploit value generating opportunities (Parmigiani & Rivera-Santos, 2011) as part of its strategy of interdependence. This could be in the form of dyadic or multi-firm alliances as elaborated on by Lavie (2006) or value co-creation opportunities through platform-mediated networks. Of particular interest are a bank's partnerships with bigtechs, which have increasingly sought to penetrate the financial services industry, as well as its partnerships with other banks and financial institutions to co-create value propositions predicated on the comingling of their resources and capabilities. Furthermore, it is important to consider whether banks have also established partnerships with specific fintechs without acquiring them, or if they have taken a non-lead investment position, in some cases these partnerships do not involve investment while in others banks take a small equity stake in the fintech to influence its evolution or to demonstrate to the fintech that the bank will not behave opportunistically.

Banks have also recently initiated or participated in consortium initiatives, especially since the rise of the platform economy and particularly enabled through the development of blockchain technology. Through these blockchain consortia initiatives, banks along with other stakeholders are able to create beneficial value propositions that can only come to fruition through the combination of resources and capabilities of the collaborating stakeholders through the blockchain platform. The partnership modality provides banks with quicker and less costly access to resources and capabilities than the acquisition and internal development/investment modality (Parmigiani & Rivera-Santos, 2011) allowing the bank to more rapidly co-create value with its partners without owning or controlling their resources and capabilities; this is particularly useful in hypercompetitive environments where banks may need to strategize for temporary competitive advantage. In fact, it may be argued that the very existence of fintechs may be a strategically important resource and capability, since through partnerships and minority stakes, banks can indirectly participate in, and derive rents from, activities that have become more onerous for them (e.g., due to regulatory changes). However, with the partnership modality, banks will need to consider the risks of platformization and the potential for losing outbound spillover rents, which is not something they would need to consider with the acquisition and internal development/investment modality.

4.1.3.3 – Open Innovation Ecosystems Modality and Open IT Infrastructure Modality

There are several submodalities associated with the open innovation ecosystems modality:

- Establishment of banks' own external innovation labs, incubators, and/or accelerators
- Participation in others' external innovation labs, incubators, and/or accelerators

There are also several submodalities associated with the open IT infrastructure modality:

- Establishment of open-API portals, developer kits, and sandboxes
- Open innovation technological interfaces for staff, external developers, and customers to co-innovate

The third (open innovation ecosystems) and fourth (open IT infrastructure) modalities relate to the notion of open innovation that was popularised by Chesbrough (2003). Open innovation can be defined as "*the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the*

markets for external use of innovation" as such firms "*can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their innovations. Open innovation processes combine internal and external ideas together into platforms, architectures, and systems*" (Chesbrough, 2012). Chesbrough (2012) elaborates that there are two types of open innovation, the first is outside-in whereby firms open up their innovation processes to many external contributions and influences, the second is inside-out open innovation whereby firms "*allow unused and underutilized ideas to go outside the organization for others to use in their businesses and business models*", as such inside-out open innovation has parallels with the idea of strategic openness (Alexy, et al., 2018). While particularly relevant in high-technology, open innovation is increasingly used in other industries as well (Chesbrough & Crowther, 2006) and is a particularly efficient approach in hypercompetitive environments since firms can develop their knowledge and explore opportunities related to emerging technologies and contexts more rapidly and cost-effectively than they would otherwise through internal research and development or acquisition **(**Hung & Chou, 2013; Chesbrough & Garman, 2009).

The open innovation ecosystems modality is concerned primarily with whether banks have established external innovation labs, incubators, and/or accelerators that are open to other firms, particularly fintechs, through which the bank seeks to co-innovate and co-create value propositions that have the potential of generating Schumpeterian and/or relational rents that can contribute to the bank's competitive advantage. Through this form of outside-in open innovation, the bank also stands to benefit from inbound spillover rents through the knowledge it can absorb from the fintechs and other firms it hosts at its innovation lab, incubator, and/or accelerator, as well as having preferential access to and the ability to influence these firms and their innovations to be more in line with its strategy. Bank's external innovation labs, incubators, and/or accelerators are also mechanisms through which banks can form ecosystems to facilitate the origination of value propositions that are predicated on platform-mediated networks. In a similar vein, banks may choose to participate in external innovation labs, incubators and/or accelerators that have been established by others. There are numerous reasons for banks doing this, for example if a bank wishes to participate in a niche that that innovation lab, incubator or accelerator specializes in, or this may be part of an inside-out open innovation strategy whereby the bank may wish to expose underutilized resources and capacities to the innovation of others.

The open IT infrastructure modality is more focused on the technological aspects of open innovation, such as the establishment of any technological platforms by banks to facilitate co-innovate among their staff, customers, and external developers. Moreover, this modality considers how European banks have responded to PSD2 and the Open Banking Standard to facilitate access to their APIs to external parties. Have European banks done the minimum required by these new regulations or have they embraced the concept of open banking, for example by providing more advanced access to their APIs, by creating sandboxes and developer portals, by pioneering open banking in other geographic markets that have less advanced open banking regulations, or by integrating open banking into their business model to platformize and become a marketplace for other firms to collaborate and co-create value?

4.1.3.4 – A Fifth "Status Quo" Modality?

Aside from these four modalities, there is also the possibility, that faced with the forces of interdependence, banks may simply choose to double-down on their existing technologies and business models, a possibility explored by Adner & Snow (2010). In effect, while this may be a fifth modality to consider for smaller, local or specialized banks, it is not a realistic consideration for the top 20 European banks given their size, scope, and reach as well as the preliminary research that has been conducted.

4.2 – Data Collection

This section expands on a number of data collection considerations. Section 4.2.1 looks more specifically at what data was collected for the 20 cases and details 3 key data collection activities, the first two using archival data from financial and specialist databases, and the third using a combination of archival data from databases and documentary evidence. Section 4.2.2 discusses the importance of reliability and lays out the safeguards that are adopted to maximize the reliability of this study's outcomes.

4.2.1 – Data Collection Activities

The theoretical framework and the strategy of inquiry has identified the top 20 European banks by assets (see Appendix 4) as the relevant 20 cases to be considered in order to answer this study's research question. This section describes three data collection activities that have been conducted in a circular research process alongside the data interpretation activities detailed in section 4.3.

4.2.1.1 – Data Collection Activity 1: Tabulate Banks' Historical Financial Indicators

This section details the first data collection activity: Data Collection Activity 1: Tabulate Banks' Historical Financial Indicators. Financial databases (Thomson Reuters/Refinitiv, Bloomberg, and Bureau Van Dijk) were used to tabulate the historical evolution of the key financial indicators of the 20 banks over the time period set out in 3.4 and 4.1.2. This data collection activity feeds into Data Interpretation Activity 1, which aims to better understand the segmentation and financial performance of the 20 banks (see Section 4.3.1). 17 major financial indicators were considered, these are listed in Appendix 5 along with a definition for each indicator.

4.2.1.2 – Data Collection Activity 2: Segment Banks' Historical Financial Indicators

This section details the second data collection activity: Data Collection Activity 2: Segment Banks' Historical Financial Indicators. Financial databases (S&P Capital IQ) were used to segment the total income of the 20 banks a) geographically, and, b) by business, longitudinally for the time period considered. Income segmentation data in these financial databases is dependent on the available segmentation data from the banks' annual financial statements, as different banks segment their data in different ways. This data collection activity feeds into Data Interpretation Activity 1, which aims to better understand the segmentation and financial performance of the 20 banks (see Section 4.3.1).

4.2.1.3 – Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases

This section details the third data collection activity: Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases. Data relating to the modalities of banks' strategies of interdependence, which were elaborated on in Section 4.1.3, were collected longitudinally for each of the 20 cases and presented in 20 separate single-case matrices. Data was obtained from archival databases (financial databases such as Bloomberg and Thomson Reuters/Refinitiv as well as specialist databases like Crunchbase and La French Tech) and documentary evidence (e.g., Factiva, press releases, annual financial statements, financial press, specialist press/periodicals, industry reports). The study of banks' strategies of interdependence are based on the four modalities discussed in Section 4.3 and which are summarized below:

1. Acquisitions and investments
    - Acquisition of fintech or fintech related firms
    - Divestments
    - Significant investments or lead investments in fintechs
    - Establishment of corporate venture capital subsidiary and fintech funds
    - Establishment of fintech subsidiaries
    - Establishment of internal innovation labs, incubators, and/or accelerators
2. Partnerships
    - Partnerships or non-lead investments in fintechs
    - Partnerships with bigtech
    - Partnerships with other financial institutions
    - Consortium initiatives, especially blockchain consortia
    - Partnership cessations
3. Open innovation ecosystems
    - Establishment of banks' own external innovation labs, incubators, and/or accelerators
    - Participation in others' external innovation labs, incubators, and/or accelerators
4. Open IT infrastructure
    - Establishment of open-API portals, developer kits, and sandboxes
    - Open innovation technological interfaces for staff, external developers, and customers to co-innovate

Each single-case matrix has a short overview of the bank detailing its organizational structure (e.g., major businesses), international presence, and other relevant information (e.g., any unique historical conditions in the time period considered). It will also include a list of key relevant subsidiaries and information about them. Each single-case matrix then compiles the data for the modalities and submodalities. For each data entry in the single-case matrices, the name and URL (where applicable) of the data source is presented in two adjacent columns; the consolidated list of data sources, along with a short description of each source, is presented in Appendix 9.

For the "acquisitions and investments" modality and specifically the following submodalities "acquisition of fintech or fintech related firms", "divestments", and "significant investments or lead investments in

fintechs", specialist databases like Crunchbase and La French Tech were consulted. Searches were conducted both at the parent company level and subsidiary level. Acquisition/divestment/investment dates, amounts paid, percentages transacted, target company funding stage, and any other important information were noted. The subsector of target companies were also noted, the subsector is often noted on Crunchbase, La French Tech, and other databases, however, this often needs to be validated as categorizations of subsector can be subjective (e.g., a target company may specialize in multiple areas, or one categorization may be based on the target's business, for example robo-advisory, while another may be based on its technology, for example artificial intelligence). I visited each target company's website to understand what they do and assigned my own subsector categorization, which not always aligned to those given in the databases.

For the "partnerships" modality and specifically the "partnerships or non-lead investments in fintechs" submodality, specialist databases like Crunchbase and La French Tech were consulted in much the same way as with the "Acquisitions and investments" modality, except in this case, only non-lead investments were considered.

For the "open innovation ecosystems" modality and its two submodalities "establishment of banks' own external innovation labs, incubators, and/or accelerators" and "participation in others' external innovation labs, incubators, and/or accelerators", the same process was adopted as with the submodality "establishment of internal innovation labs, incubators, and/or accelerators" under the "acquisitions and investments" modality. The sources again were Factiva, annual financial statements, and any websites, however the distinction was made between incubators, accelerators, and innovation labs that were set up exclusively for the banks' own staff, which are deemed "internal", and those that are open to external parties, which are deemed "external". Within the "external" category, a further distinction was made between those incubators, accelerators, and innovation labs established by the focal bank, which are deemed "own external" and those that have been established by others but which the bank is participating in, which are deemed "participation in external".

For the "open IT infrastructure" modality and its submodalities "establishment of open-API portals, developer kits, and sandboxes", and "open innovation technological interfaces for staff, external

developers and customers to co-innovate", annual financial statements and specialist databases were consulted in much the same way as the other modalities.

Appendix 6 details the Boolean searches that were used in Factiva and the keyword searches that were used in annual financial statements for each modality and submodality as well as noting any relevant nuances that were considered.

This data collection was conducted on a best effort basis. Given the triangulation between methods, types of data, and data sources, the risk of missing significant data is minimized. However, it is reasonable to expect that a small amount of less-significant data may inadvertently be omitted or miscategorized; nevertheless, this is unlikely to significantly affect the interpretation of findings, conclusions, or theorization. Conducting this process diligently and ensuring that data is collected and managed systematically in a case study database is important for increasing the validity of research outcomes, this will be elaborated on in the following section.

This data collection activity feeds into Data Interpretation Activity 2, which aims to create a taxonomy of banks' strategies of interdependence (see Section 4.3).

4.2.2 – Ensuring the Reliability of Outcomes

In Section 4.1.2, the importance of generalizability and validity to safeguard the quality and usefulness of this inquiry's outcomes were discussed; a third important factor that contributes to this is reliability, which this section will expand on. Reliability refers to the ways in which data is collected, observations are made, and interpretations are derived, ensuring that an external party can understand how the data was collected and follow the logical process through which interpretations were derived (and potentially repeat the study to obtain the same results) (Yin, 2018; Easterby-Smith, et al., 2018). In order to facilitate this, it is important to adopt transparent and rigorous data organization and observation techniques (Easterby-Smith, et al., 2018). Section 4.1.2 discussed how construct validity is maximized by meticulously maintaining the chain of evidence through which case study data contributes to answering the research question and contributes to theory, and how this chain of evidence is dependent on maintaining a reliable case study database. Additionally, in terms of reliability, an assiduously maintained chain of evidence also

maximizes the reliability of this study's outcomes in the context of the data interpretation and theorization processes, just as an assiduously maintained case study database maximizes the reliability of this study's outcomes in the context of data collection. Thus, between the chain of evidence and the case study database, an external reader of this study can follow the process of data collection, data manipulation, and data interpretation all the way to the addressing of the research question and to theorization. A diligently maintained case study database thus directly contributes to improving the reliability of this study's outcomes as well as indirectly contributing to the outcomes' validity. A case study database involves organizing and documenting the data collected for the case study (Yin, 2018). For Data Collection Activities 1, 2, and 3 as well as Data Interpretation Activities 1 and 2 (Section 4.3.1), this will involve the systematic and transparent presentation of the screening criteria and data sources used, the clear presentation and tabulation of results, transparent and detailed accounts of how the taxonomy of banks' strategies was created, and a clear explanation of how interpretations were made.

More specifically, for Data Collection Activities 1 and 2, diligently maintaining a case study database involves tabulating the data extracted from the financial databases and ensuring to highlight the database source, the periodicities, any missing data, manipulations conducted through the database (e.g., currency conversion), any subsequent data manipulation or computations, and any assumptions made in extracting the data. This also involves ensuring that data extraction is conducted at the parent company level and not at the subsidiary level (which means ensuring the correct identifier or ticker is used in financial databases like Bloomberg) as well as ensuring that all financial numbers are converted to a single currency to facilitate comparison (in this case the Euro will be chosen as the majority of the top 20 European banks report in Euros). For Data Collection Activity 3, diligently maintaining a case study database involves accurately noting the source (and where relevant the URL) of each data source that make up each of the 20 single-case matrices, accurately noting relevant dates and other important facts (e.g., percentage of shares acquired, geographic location or scope of innovation lab, other parties involved in a consortium), and indicating any keywords and Boolean searches that were used within individual annual financial statements or in Factiva database searches (these have been laid out in detail in Appendix 6). It is also important to ensure that each single-case matrix contains an overview of the corporate structure of each bank to ensure that relevant subsidiaries are taken into account, including those subsidiaries that the parent company may have disposed of, consolidated or merged with others, though this will be confined to subsidiaries in which the parent has a controlling interest in (usually greater than 50% of voting rights).

Moreover, many subsidiaries have different names than the parent company thus all searches conducted using the parent company name have also been conducted using the names of the subsidiaries, and if subsidiaries file separate annual financial statements to the parent company those too were analysed (e.g., Royal Bank of Scotland owns several subsidiaries with unrelated names such as NatWest and Ulster Bank, while Crédit Mutuel files consolidated annual financial statements as well as separate annual financial statements for its subsidiaries like Crédit Mutuel Arkéa and CIC). Furthermore, when conducting database searches and other Boolean searches, attention was given to nuances that may have an effect on the results such as conducting searches that include and exclude accents (Crédit Mutuel and Credit Mutuel) and those that include the full name as well as acronyms (Royal Bank of Scotland and RBS). The content-analytic meta-tables based on the single-case matrices for Data Collection Activities 3 are presented in Appendix 10; appendix 9 presents a consolidated list (with short descriptions) of the sources used for Data Collection Activity 3. Appendix 7 presents the historical financial data for the 20 banks and Appendix 8 presents their historical business and geographic segmentation.

While this study adopts an internal realist ontology and soft-positivist epistemology, there are nevertheless some level of subjective reasoning involved which requires a level of reflexivity on my part to ensure that biases are not introduced in the data collection and data interpretation stages, especially as cases are considered holistically and generalization is made at the case level as opposed to the variable level. This is particularly relevant when it comes to categorization, meaning-making, pattern detection, clustering, and theorization relating to emergent relationships, themes, concepts, and assertions. The theoretical framework along with triangulation create strong safeguards against this, however as an additional safeguard, I have kept memos to document, reflect and justify key choices and decisions in the research process, and although these memos are not included in the research output, they help foster greater transparency and diligence in the research process leading to more reliable outcomes (Saldaña, 2016; Miles, et al., 2019).

4.3 – Data Analysis

Having discussed the overall strategy of inquiry in section 4.1 and the approach to data collection in section 4.2, this section focuses on how the data was analysed and interpreted. The process of data analysis sought to address the research question by examining the literature review, archival data, and documentary

evidence, and as such took into consideration well researched, accepted wisdom from literature while being open to knowledge that emerges from the data; the case study methodology accommodates this duality between accepted and emergent knowledge. Section 4.3.1 goes into more detail on two key data interpretation activities; however, it is important to emphasize that the research process is circular meaning that these data interpretation activities intertwine with the data collection activities from section 4.2.1 in an iterative sequence of feedback loops.

The data analysis and interpretation processes facilitate theorization and the answering of the research question. It assists in the observation of banks' strategies in relation to interdependence, resulting in the creation of a taxonomy of banks' strategies of interdependence. In seeking to answer the research question, data analysis and interpretation and the resultant taxonomy, were also used to theorize and support the proposed adaptation of the RBV to cater for the forces of interdependence by taking into account resources and capabilities not owned or controlled by the focal firm as well as considering temporary competitive advantage alongside sustained competitive advantage, based on Lavie (2006) and Dyer & Singh (1998) and incorporating additional considerations from the networks, ecosystem, and platforms literatures.

4.3.1 – Data Interpretation Activities

This section details the two data interpretation activities that this study adopts. The first data interpretation activity is aimed at providing the reader with a contextual understanding of the 20 banks considered, especially regarding the evolution of their financial performance over the period considered as measured by several financial indicators and by the geographic and business product segmentation of their revenues. This contextual presentation is covered in Section 5 and does not constitute the formal findings that will be used to answer the research question. The second data interpretation activity ultimately results in the creation of a taxonomy of banks' strategies of interdependence. The findings of this second data interpretation activity constitute this study's formal findings which answers the research question and is presented in Section 6.

4.3.1.1 – Data Interpretation Activity 1: Ranking and Segmentation Exercise

The first data interpretation activity "Data Interpretation Activity 1: Ranking and Segmentation Exercise" relates to "Data Collection Activity 1: Tabulate Banks' Historical Financial Indicators" and to "Data

Collection Activity 2: Segment Banks' Historical Financial Indicators". The purpose of this data interpretation activity is to obtain a deeper understanding of the financial and segmentation characteristics of the 20 banks across the time boundary considered. While the two data collection activities underlying this data interpretation activity are financial indicators obtained from archival databases and derived from banks' annual financial statements, the purpose of the data interpretation activity is not to conduct statistical studies but rather to categorize the 20 banks in ways that deepens the reader's contextual understanding.

The financial indicators that were tabulated for the 20 banks for the time period 1 Jan 2008 to 31 Dec 2019 as part of "Data Collection Activity 1: Tabulate Banks' Historical Financial Indicators" were analysed to identify any trends or patterns that evolve over time. The top and bottom performing quartiles were identified (e.g., highlighted in green and red respectively) for all indicators across all years. A ranking exercise was also conducted, ranking the banks from 1 (highest) to 20 (lowest) for all indicators for each year, so that the evolution of banks' ranks over time can be observed for each indicator. Patterns and trends were then identified. For example, do all banks see an increase or decrease in their net interest income of a similar magnitude during specific periods, which could indicate a reaction to a significant macro-economic or exogenous force? Do banks in one country perform consistently differently to ones in other countries, which may indicate some regional forces? Are some banks more reliant on non-interest income and how has this evolved over time? Have some banks fared consistently well or consistently badly in many of the financial indicators across most of the 12 calendar years considered (do they feature consistently in the top or bottom quartile), or have some banks seen a reversal of fortunes beginning at a given point in time (e.g., going from a consistently low ranking to a consistently high ranking, and *vice versa*)? This helps create a segmentation of banks based on performance characteristics, for example, banks that are overall financially robust, banks that are overall financially weak, banks with declining non-interest income, banks with healthy total income growth, banks who are overly dependent on interest income.

The segmentation of banks' revenues by geography and business over time from "Data Collection Activity 2: Segment Banks' Historical Financial Indicators" was also interpreted. Geographic segmentation is important to identify banks that are more international (who derive their total income from diverse geographies), those that are more regional (who derive the majority of their total income from specific

regions such as Europe or Asia Pacific) and those that are more local (who derive the majority of their total income from a specific country such as France or the UK). Business segmentation also identifies banks that are more diversified (who derive their total income from diverse businesses such as retail banking, corporate banking, and investment banking) and those that are less diversified (who derive the majority of their total income from one business such as retail banking). Any trend reversals were also noted, for example any banks that go from being international to being regional, or those that go from being more diversified to being more specialized.

Inter-segmentation links, relationships, and trends were also noted and interpreted. For example, are less diversified banks, that are more regional seeing falling net income? Are banks that are more dependent on retail banking and thus less diversified seeing declining interest income? Are global and diversified banks seeing healthy, growing total income? Segmenting the 20 banks by performance, geographic revenue, and business revenue facilitates their categorization.

4.3.1.2 – Data Interpretation Activity 2: Interpretation of Modalities of Banks' Strategic Response to Interdependence and Creation of a Taxonomy of Banks' Strategic Responses

The second data interpretation activity "Data Interpretation Activity 2: Interpretation of Modalities of Banks' Strategic Response to Interdependence and Creation of a Taxonomy of Banks' Strategic Responses" relates primarily to "Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases". There are two main aims of this data interpretation activity, the first is to analyse and interpret the single-case matrices for each of the 20 banks, which capture the modalities and submodalities of their strategic response to interdependence over the time period considered, this was conducted both individually and holistically across the 20 cases. The second aim is to create a taxonomy of banks' strategic response to interdependence.

In terms of analysing and interpreting the 20 single-case matrices, the following approach was adopted. Once all single-case matrices were completed, a content-analytic summary table brought together the data from all 20 banks into one meta-matrix to facilitate analysis (Miles, et al., 2019). In keeping with this study's abductive approach and its Straussian view of the relationship between data and theory, the content-analytic meta-matrices rely both on theory driven propositions that were derived from the

literature review and propositions that emerge from the data "*from the ground up*" (Yin, 2018). The theory driven approach is inherent in the case-study design since the modalities and submodalities that are being collected and analysed derive from the literature review and the theoretical framework. The modalities and submodalities of banks' strategies of interdependence are based on the RBV as the underpinning strategic management theory along with the RBV's adaptation as suggested by Lavie (2006) and Dyer & Singh (1998) and the further adaptation this study proposes inspired by the network, ecosystem, and platforms literatures. The inductive data-driven portion of the overall abductive approach may suggest additional modalities or considerations which can be incorporated into the analysis. This interplay between theory driven analysis and data driven analysis facilitates the categorization of the 20 cases; this categorization plays an important role in the process of creating the taxonomy of banks' strategies of interdependence, since categories can be clustered to create higher order descriptors. This interplay is also useful in highlighting any plausible rival descriptors that can challenge or help refine theory driven propositions, thus ameliorating the construct validity and generalizability of research outcomes (e.g., while the theoretical framework may indicate that a bank's lead investment in a fintech is aimed at deriving relational and spillover rents through the collaborative arrangements between the bank and the fintech and through the bank benefiting from the valuable resources and capabilities owned/controlled by the fintech, the data-driven approach may reveal that that particular fintech provides the technological foundations of a platform-mediated ecosystem that the banks seeks to dominate and its investment in the fintech is aimed at imposing technological standards and protocols on this platform-mediated ecosystem that are beneficial to the bank and which allow the bank to assume the position of ecosystem leader).

It is also important to note that the use of modalities and submodalities may suggest the adoption of a variable-based approach, however this will be actively avoided in favour of a holistic case-based approach (Byrne, 2009). With a case-based approach, "*the goal is to retain the integrity of the entire case and then to compare or synthesize any within-case patterns across the cases*" (Yin, 2018). Tallying occurrences at the variable level (e.g., modalities and submodalities) may be a useful heuristic and can be a starting point for making sense of the data, but it is not sufficient and may be misleading, which is why a holistic approach is preferable, for example, a bank may have a significant number of innovation labs, incubators, and accelerators indicating that the bank adopts strategies of open innovation and collaboration, however upon closer inspection one finds that these innovation labs, incubators, and accelerators have all been short-lived, small-scale, and highly localized. By adopting a case-based approach, research outcomes and

conclusions were obtained at the case level (as opposed to the variable level), which is this study's unit of analysis (banks' strategies of interdependence) and thus directly linked to the research question posed.

4.3.1.3 – Creating a Taxonomy of Banks' Strategies of Interdependence

With this overall strategy of data analysis and interpretation in mind, several analytic methods were used in order to create the taxonomy of banks' strategies of interdependence. Taxonomies, as Nickerson, et al. (2013) observe, "*play an important role in research and management because the classification of objects helps researchers and practitioners understand and analyze complex domains*" and can be used for theory development. This study's understanding of a taxonomy aligns with that of Bailey (1994) who defines taxonomies as classification systems derived empirically (as opposed to typologies which are classification systems derived conceptually). The empirical approach classifies data using cluster analysis or other statistical methods with the objective of classifying similar objects into the same category or taxon to form an overall taxonomy (Bailey, 1994; Nickerson, et al., 2013).

This study's taxonomy development is influenced by Nickerson, et al. (2013) since this provides a systematic way of taxonomy development that reduces the possibility of classification being conducted in an arbitrary or *ad hoc* way. However, this study also recognizes that Nickerson, et al. (2013) were focused on the information systems discipline. As such this study adapts Nickerson, et al.'s (2013) approach to a qualitative, case-study research that is focused on the case-level and not the variable-level, that deals with a relatively large number of modalities and submodalities, and a relatively large number of cases. With this in mind, this study's approach to taxonomy creation followed the following logic: pattern matching, cross-case synthesis, time series analysis, and logic models were applied to the content-analytic meta matrix to cluster bank's characteristics (modalities and submodalities) into dimensions, 3 further rounds of clustering were conducted at the dimension level (with the possibility of adding, removing, splitting, or merging dimensions, except in the final round) resulting in 8 taxa. This study considers that a taxonomy is composed of several taxa; a taxon is composed of dimensions; and, a dimension is composed of characteristics (modalities and submodalities).

Pattern matching compared descriptive features predicted through the literature review with the findings from the 20 cases (Yin, 2018), noting recurring characteristics, trends, and relationships. Cross-case

synthesis was also based on pattern matching, since it begins with the within-case pattern matching method previously described and any tentative conclusions drawn, after which it examined any replicative (literal or theoretical) relationships across case studies (Yin, 2018). This facilitated further abstraction of observations, relationships, and characteristics into higher-order findings, and the categorization and clustering of cases into dimensions and taxa. Cross-case patterns and any resultant clustering relied especially on a holistic case-based approach and sought to strongly avoid pattern matching and clustering at a variable level as this compromises the validity of outcomes. Once pattern-matching and cross-case synthesis were conducted, the outcomes were clustered to form dimensions and taxa. The clustering was based on identifying patterns around categories or themes, relationships, and concepts or theoretical constructs (Miles, et al., 2019). Where relevant, time-series analysis was conducted to account for the longitudinal dimension of the study. Key findings from pattern matching and cross-case synthesis such as relationships, concepts, and descriptive characteristics were chronologically sequenced (Yin, 2018) to identify similarities from a temporal perspective. Logic models were also, where relevant, used as a form of longitudinal analysis. Logic model analysis is akin to conducting pattern-matching longitudinally whereby "*an outcome (event) at an earlier stage can become the stimulus (causal event) for the next stage … in turn producing another outcome that becomes yet another stimulus*" and is particularly good for understanding theories of change (Yin, 2018). It is important to note that while both longitudinal methods – chronological sequencing, and logic models – involve dealing with causality (e.g., why a certain event occurs before another and whether one event triggers another), these longitudinal methods were not used to convert this study from a descriptive one to an explanatory one; instead these methods were used to better understand the dimensions from a temporal perspective thus making the taxa of the taxonomy deeper, more nuanced, and better descriptors.

Four rounds of clustering were conducted at the characteristic (modalities and submodalities) and the dimension (clusters of modalities and submodalities) level, before the final taxonomy was produced. The taxonomy was deemed final based on the following conditions:

- Robust but concise: the final taxonomy should have enough taxa to clearly differentiate the 20 cases while being parsimonious.
- Complete and collectively exhaustive:
    - All 20 cases (banks) should be accounted for in the taxa

    - All characteristics (modalities and submodalities) should be accounted for in each taxon (through the dimensions contained in each taxon)
- Extendible:
    - It should be possible to incorporate new characteristics into the taxonomy if additional cases are considered
- Facilitates theorization:
    - A useful taxonomy facilitates theorization and can form the basis of further explanatory studies to be conducted
- At least one case is classified under each taxon
- No new taxon or dimension were added in the final iteration
- No taxa or dimensions were merged or split in the last iteration
- Mutually exclusivity:
    - Each case (bank) must figure in only one taxon
    - Every taxon is unique (no two taxa are the same)
    - Every dimension is unique within a taxon (a taxon cannot contain duplications of any given dimension)
    - A taxon may contain several dimensions each containing multiple characteristics (modalities and submodalities). In keeping with this study's case-level approach (as opposed to a variable-level approach), characteristics should not be taken into account individually, but rather holistically at the dimension level (although it is possible to have a dimension composed of one characteristic), thus mutual exclusivity should be applied at the dimension level and not at the level of the individual characteristics that make up a dimension.

The final taxonomy of banks' strategies of interdependence that emerges from this process is a more robust description of the different strategies the 20 banks have adopted over the 12-year period under consideration. The taxonomy's robustness is underscored by triangulation at the data level (e.g., press releases, financial databases, annual financial statements), the types of data used (archival databases, documents), and the method level (pattern matching, cross-case synthesis, chronological sequence analysis, and logic models). It is also underscored by an approach that intertwines theory-driven propositions with insights that emerge from the data, while considering cases holistically and

longitudinally; as well as a taxonomy generation process that is systematic. The generalizable, valid, and reliable outcomes of the study as encapsulated by the final taxonomy can thus be used to theorize and link this study's outcomes to the underlying theory and proposed adaptations discussed in the theoretical framing in Section 3. The process of theorization will be discussed in more depth in the next section.

4.3.2 – Theorization

The objective of this study is to answer the research question about how the top 20 European banks are responding strategically to the rising forces of interdependence. The research design is crafted around answering this research question and does so through the data collection and data interpretation activities described in Section 4, culminating in a taxonomy of banks' strategies of interdependence. However, in seeking to answer this research question, this study proposed the adaptation of an existing theory, thus an additional (but related) objective of this study is to validate the proposed adaptation of the existing theory, this necessitates the additional theorization step that this section will address. Answering the research question and validating the proposed adaptation to the theory which informs how the research question is answered, are two tightly interwoven processes, further underscoring the importance of the circular research design elaborated on in Section 4.1.1, with continuous iteration between data collection, data interpretation, theorization, the theoretical framing, and the research question.

The theorization process is aimed at validating the proposed adaptation of existing theory. This study does not propose a new grand theory – the study is based on the RBV. This study also does not propose a completely new spin-off from an existing theory, or a completely new adaptation of existing theory, this has already been done by Dyer & Singh (1998) and Lavie (2006) whose work this study builds upon. Instead, this study seeks to further adapt the RBV to better account for the forces of interdependence, building on Dyer & Singh (1998) and Lavie (2006), but also taking into account other constructs, themes, and phenomena that have become much more prominent in recent years; the emergence of these new constructs, themes, and phenomena have not sufficiently or adequately been addressed by extant literature and existing theory (as elaborated on in Section 3.4), which is why a theory development approach as opposed to a theory testing approach is required for this study. Thus, the process of theorization is orientated to this end. It is also important to note that the proposed adaptation to the RBV is also in the context of the 20 banks in Europe, and while the proposed RBV adapted for interdependence can be

generalized to other contexts such as other large, incumbent organizations from different contexts, geographies, and industries that are facing increasing forces of interdependence in their milieu, for it to be generalizable in a broader sense, further research would need to be conducted to explore further considerations that would be relevant for significantly different contexts such as small firms or firms trying to disrupt incumbents. Having said that, this study reinterprets the findings towards a higher level of abstraction leading to a meta-taxonomy that is applicable more broadly beyond banking.

Case study research design has often been used to develop theories (Glaser & Strauss, 1967; Eisenhardt, 1989; Yin, 2018; Eisenhardt & Graebner, 2007; Mintzberg & Waters, 1982; Gersick, 1988). Theorization through case study research relies on developing theory inductively and building theory from case studies through replication logic in a rich, real-world context (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Yin, 2018). The process of developing theories from case study research is addressed in a very compelling way by Eisenhardt (1989). While Eisenhardt's (1989) approach deals particularly with the development of new theories from case study research, it is also very relevant to the development and expansion of existing theory, which is the focus of this study. Moreover, there are many parallels between many of the foundations of Eisenhardt's (1989) approach and with the way this study was conducted. For example, Eisenhardt's (1989) process of theorization from case study research builds on Robert Yin's case study research design and the qualitative methods of Matthew Miles and A. Michael Huberman (Eisenhardt (1989) references earlier editions of their work, while this study uses the latest editions of the same publications e.g., Miles, et al. (2019) and Yin (2018)), as well as Glaser & Strauss' (1967) grounded theory building. Moreover, Eisenhardt's (1989) process adopts a positivist epistemology and an iterative approach, which is broadly in line with this study's soft-positivist epistemology and circular research design. Inspired by Eisenhardt (1989) this adopts the following three-step process of theorization:

- Step 1: Shaping Hypotheses

The within-case data analysis and cross-case data analysis that is conducted as part of Data Interpretation Activity 2: Interpretation of Modalities of Banks' Strategic Response to Interdependence and Creation of a Taxonomy of Banks' Strategic Responses gave rise to themes, concepts, and relationships (Eisenhardt, 1989; Miles, et al., 2019). These themes, concepts, and relationships were compared to the proposed theoretical framing from Section 3 in a highly iterative way to understand how well the empirical data fits with the theoretical framing, adapting it where necessary based on empirical evidence. This is in line with

this study's abductive conceptual framework and its Straussian view of the relationship between theory and data, especially given that iterating towards a close fit between empirical data and proposed theoretical framing "*is important to building good theory because it takes advantage of the new insights possible from the data and yields an empirically valid theory*" Eisenhardt (1989). Eisenhardt (1989) elaborates that this process involves two-steps, 1) refining the definition of the constructs proposed in the theoretical framing using empirical data, and, 2) building evidence that measures constructs in each case. This is predicated on a replication logic at the case level (Yin, 2018) whereby cases that confirm emergent themes, concepts, and relationships enhance confidence in their validity, while cases that disconfirm themes, concepts, and relationships provide the chance to refine or extend theory (Eisenhardt, 1989). By clustering the identified themes, concepts, and relationships, these can then be abstracted into higher-order, more generalized phenomena that lead to assertions, propositions, hypotheses, and/or tentative theories (Miles, et al., 2019).

- Step 2: Enfolding Literature

These assertions, propositions, hypotheses, and/or tentative theories identified in the previous step are then compared to the extant literature, which "*enhances the internal validity, generalizability, and theoretical level of theory building from case study research*" (Eisenhardt, 1989). Eisenhardt (1989) emphasizes that an important part of this process is to take into account a broad range of literatures including those that may conflict with the proposed theory adaptation as well as those that may have considered it in a completely different context; this helps improve the validity and generalizability of findings. With this in mind, in proposing to adapt the RBV to better deal with interdependence, this study's theoretical framing draws from diverse literatures including from economic perspectives (networks, multisidedness), managerial perspectives (ecosystems, platforms), technology literature (platforms), literature on coopetition, literature on hypercompetition, while also accounting for institutional and regulatory contexts. Thus, having taken into account these diverse literatures in proposing the adaptation of the RBV that this study adopts, the assertions, propositions, hypotheses, and/or tentative theories that emerge from the empirical data are used to confront this adapted RBV in order to support or refine it.

- Step 3: Reaching Closure

The third step relates to reaching closure in the theorization process; Eisenhardt (1989) highlights two main points: knowing when to stop adding cases, and knowing when to stop iterating between data and

theory. Although I remained open to adding cases if theoretical saturation (Glaser & Strauss, 1967) was not reached, this was not necessary given the number of cases selected and the process of theoretical sampling that went into selecting them. In terms of knowing when to stop iterating between data and theory, this was when conducting further iteration began to produce minimal incremental improvements to the proposed theory adaptation.

This process of theorization yields an RBV adapted to interdependence that is testable, logically coherent (Pfeffer, 1982), and empirically valid given the close coupling of theory development and empirical evidence (Eisenhardt, 1989). Given that the process of theorization aims to develop and expand existing theory and not to create new theory, the resultant expanded theory is not as parsimonious as grand theories (Pfeffer, 1982), however by adopting a longitudinal multiple-case study design (as opposed to a single case study), only themes, concepts, and/or relationships replicated across multiple case studies were retained leading to a more parsimonious, generalizable, and robust theory expansion (Eisenhardt, 1989).

Having presented the research design that this study uses to answer the research question and to theorize (summarized in Diagram 5), the following section presents the contextual discussion related to the first two data collection activities and the first data interpretation activity. Section 6 then presents the findings that address this study's research question and which relate to the third data collection activity, and the second data interpretation activity. Section 6 also presents second order findings to produce a meta-taxonomy of strategies of interdependence that provides a more holistic level of analysis.

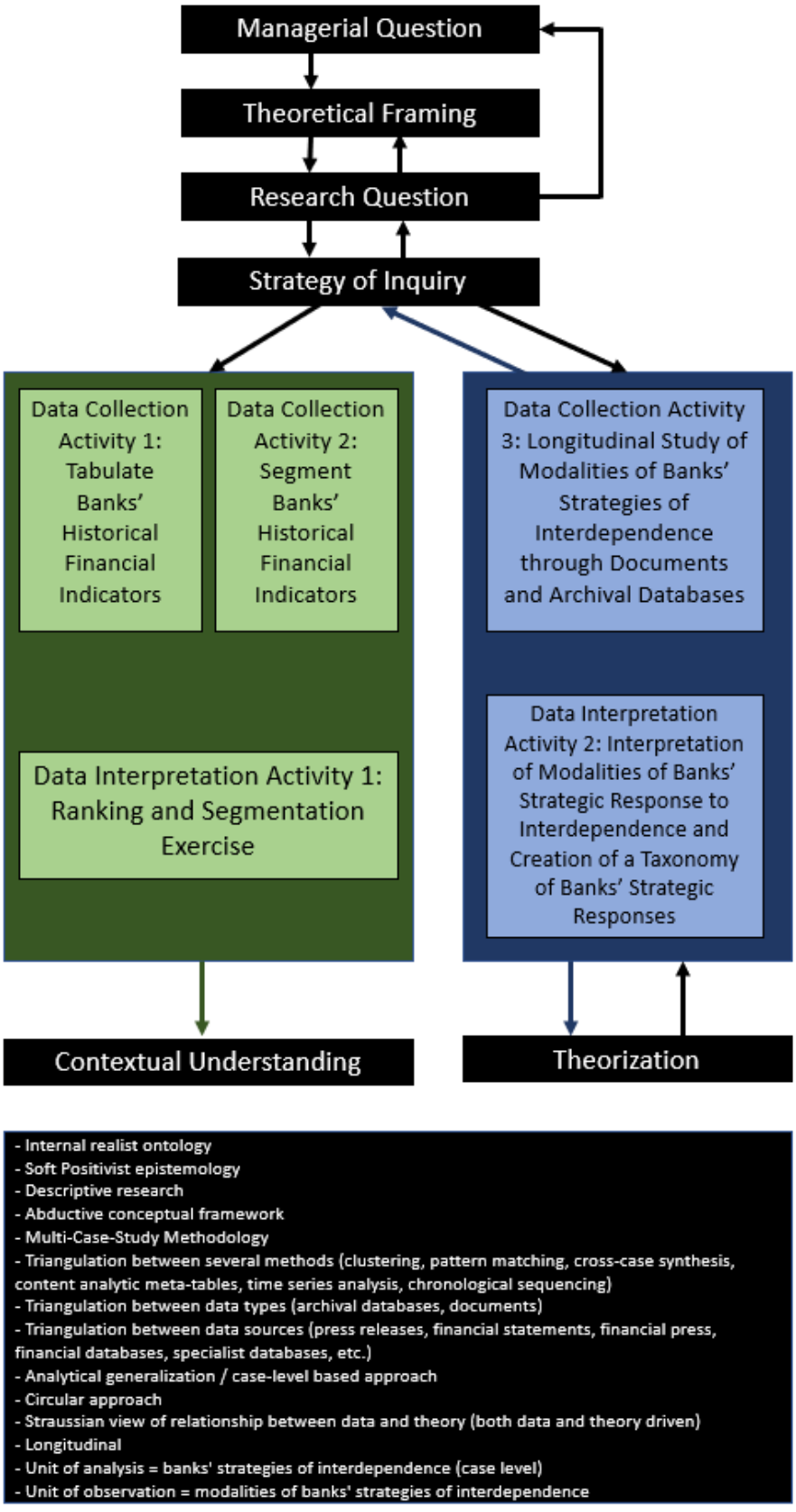

Diagram 5: Research Process

5 – Contextual Presentation

This section provides the reader with a contextual presentation of the 20 banks considered based on the outcomes of "Data Interpretation Activity 1: Ranking and Segmentation Exercise" and the results from "Data Collection Activity 1: Tabulate Banks' Historical Financial Indicators" and "Data Collection Activity 2: Segment Banks' Historical Financial Indicators" (tabular data for data collection activity 1 is presented in Appendix 7 and tabular data for data collection activity 2 is presented in Appendix 8). This contextual presentation is not intended to influence "Data Interpretation Activity 2: Interpretation of Modalities of Banks' Strategic Response to Interdependence and Creation of a Taxonomy of Banks' Strategic Responses", the process of theorization, or answering the research question. This section is intended to provide the reader with contextual richness for the 20 banks considered and to stimulate a reinterpretation of the findings into second order findings (Section 6.5). The outcome of this contextual presentation is a categorization of the 20 banks based on the evolution of their financial performance from the GFC in 2008 until the end of 2019, as well as a study of their geographic and business segmentation. Six broad categories were identified: troubled banks, specialized banks, cooperative banks, global giants, Spanish banks, and, regional banks (these are represented in Diagram 6, and are elaborated on in Sections 5.1-5.6). This contextual presentation is however not intended to be an exhaustive study of the 20 banks over the period considered.

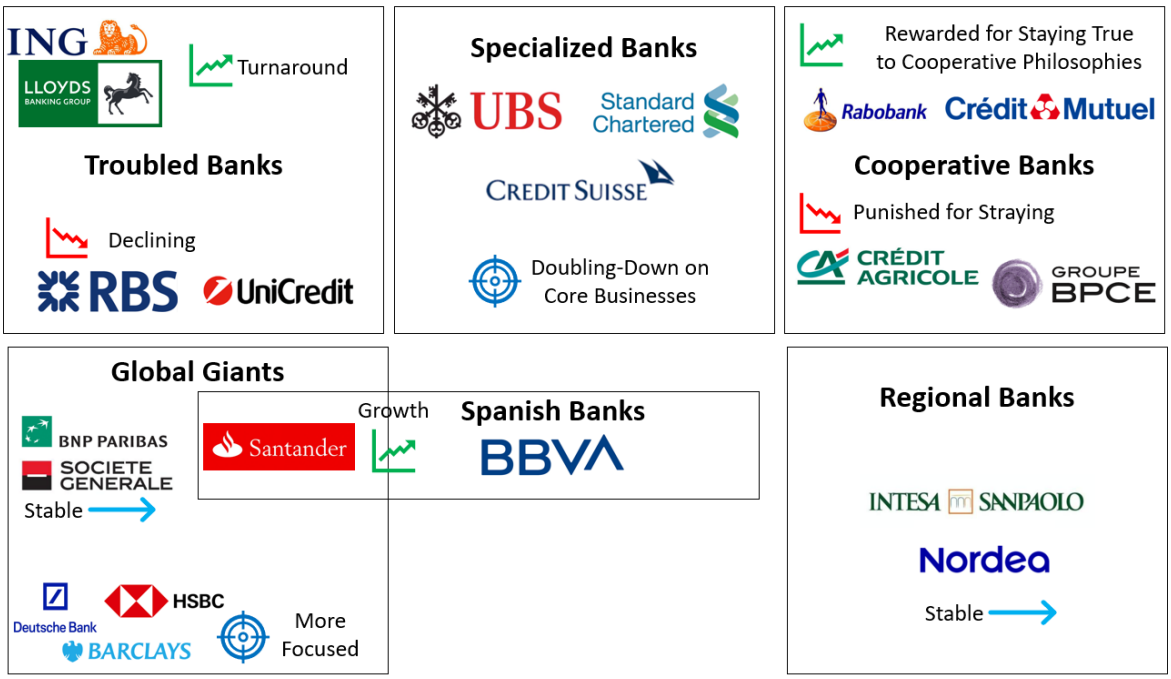

Diagram 6: Categorization Based on Financial Performance, Geographic & Business Segmentation

5.1 – The Troubled Banks: Deepening Crisis for Some, Redemption for Others

Banks that were especially negatively impacted by the GFC saw their total revenues decline dramatically, and generally struggled across most financial indicators in the period under consideration. For example, Royal Bank of Scotland (RBS) and Lloyds Banking Group, both of which required large tax-payer funded bailouts from the UK government[108] saw their total revenues decline for 9 consecutive years in the case of RBS (from 69 billion EUR in 2008 to 18 billion EUR in 2018), and for 6 years in the case of Lloyds. Some of the banks like RBS and UniCredit have continued to contend with financial troubles throughout the period considered, while others like Lloyds and ING were able to recover.

RBS was arguably the worst performing bank out of the 20 banks for the period considered. In 2007 RBS led a consortium to acquire ABN Amro for 49 billion GBP in what was the largest ever banking takeover in Europe at the time[109], by 2009 RBS had to be bailed out by the UK government which owned 84% of the bank by the end of 2009[110] and announced the largest annual loss in British corporate history (24.1 billion GBP in 2008)[111]. RBS was in the bottom quartile for total income growth for 9 out of the 11 years considered, with 7 out of 10 annual declines in net interest income (figuring 5 times out of 10 in the bottom quartile, its interest income having declined from 62 billion in 2008 to 12 billion in 2019), and 7 out of 10 annual declines in non-income interest income (figuring 7 times out of 10 in the bottom quartile), which translated into 8 out of 11 years of operating losses (5 out of 10 years of declining operating income, and 5 times in the bottom quartile for operating income/loss) and poor overall net income growth (4 out of 11 years in the bottom quartile). As such, RBS's return on assets (ROA) was negative for 9 out of 11 years (10/11 years in the bottom quartile), its pretax margin was negative for 8 out of 11 years (9/11 years in the bottom quartile), its return on common equity (ROE) was negative 9 out of 11 years (11/11 years in the bottom quartile), its return on total equity (ROTE) was also negative 9 out of 11 years (10/11 years in the bottom quartile).

In the aftermath of the GFC, RBS became a significantly more British, and less global, bank. While it derived around a third of its revenue from the US, Europe, and the rest of the world until around 2012, from 2016 onward RBS relied on the UK for over 90% of its revenue. In terms of product segmentation,

[108] https://fr.reuters.com/article/us-britain-banks/lloyds-rbs-agree-to-massive-shake-up-idUSTRE5A206F20091103
[109] http://news.bbc.co.uk/1/hi/business/7033176.stm
[110] https://www.rbs.com/rbs/about/the_bank_we_are_becoming.html#Shelf%202
[111] https://www.reuters.com/article/rbs-idUKL5E7N936H20111212

RBS's international banking operations dwindled from around 15-20% of total revenue between 2008 and 2011 to less than 5% from 2012 onward, reflecting RBS's divestiture from many of its international operations including selling its stake in Bank of China in 2009, its US based commodities trading arm Sempra Commodities in 2010, its stake in WorldPay in 2013, its international private banking and wealth management operations in 2015[112], and divesting from its US operations through its IPO of Citizens Financial in 2013[113] (the largest IPO of a commercial bank at the time). RBS derived 33% of its revenue from its insurance operations in 2008, however after selling its insurance arm in 2013-14 (which later became Direct Line)[114], revenue from insurance declined to almost zero. RBS also shrunk its investment banking operations in the aftermath of the GFC[115], dwindling from 54% of revenue in 2009 to less than 12% from 2016 onward. RBS entered the GFC as an international, diversified bank, a brief period of time in 2009 was the world's largest bank[116]; by the end of the GFC it was transformed into a British bank that was focused on retail and commercial banking.

Although Lloyds Banking Group, also required a UK government bailout linked to its acquisition of troubled lender HBOS in 2008, it performed comparatively better than RBS and by 2017 the bank went back to full private ownership[117]. While it was in the bottom quartile for total income growth for 6 years and in the bottom quartile for loans-to-assets ratio for 10 out of 11 years, it managed to steadily grow its net interest income with 7 out of 10 years of net interest income growth (5 times in the top quartile) which translated in 8 years of operating income growth (4 times in the top quartile). Lloyds had negative ROE, ROTE, and ROA from 2010 to 2013, and was in the bottom quartile for pre-tax margin from 2010-2014, however, it managed to turn around its performance after 2014, with steady rises in ROE, ROTE, ROA and pre-tax margin. Lloyds Banking Group has always been a UK-focused bank with over 90% of revenues consistently being derived from the UK. It has also continuously maintained its focus on retail banking, corporate banking, and wealth management having never significantly ventured into full-fledged investment banking activities.

[112] https://www.rbs.com/rbs/about/the_bank_we_are_becoming.html#Shelf%202
[113] https://www.ft.com/content/7be28b06-7f18-11e5-93c6-bba4b4b36134
[114] https://www.directlinegroup.co.uk/en/who-we-are/our-story.html
[115] https://www.fnlondon.com/articles/rbss-investment-bank-revenues-crash-by-almost-three-quarters-20191024
[116] https://www.ft.com/content/ed89437e-9db7-33c2-b4dd-bbea6bb1157c
[117] https://www.bbc.co.uk/news/business-39932871

UniCredit, which also sought government bailouts[118] and struggled with some of the highest levels of bad loans in Europe[119] saw 8 fiscal years of total income decline (from 65 billion EUR in 2008 to 25 billion EUR in 2018), and like RBS was one of the worst performing banks of the 20 banks for the period considered. UniCredit saw 7 years of negative net revenue growth (bottom quartile for net revenue for 6 years), its net interest income having declined for 8 years (bottom quartile for net interest income for 6 years), leading to 7 years of declining operating income including 4 years of operating losses (bottom quartile for operating income for 7 years), and 4 years of negative pretax margins (bottom quartile for pretax margin for 7 years). UniCredit has also had a consistently bad loans-to-assets ratio (9 out of 11 years in the bottom quartile), and a consistently bad Tier 1 capital adequacy ratio (10 out of 11 years in the bottom quartile). Throughout the period considered, UniCredit remained a regional bank, focused on Italy (with a gradually increasing contribution to total revenue from 37% in 2010 to 47% in 2019), Germany (maintained at 18-21% of total revenue), Austria (maintained at around 10% of total revenue), and Central and Eastern Europe (with a gradual decrease from 26% in 2010 to 21% in 2019 of total revenue), while reducing its exposure to the remainder of Western Europe significantly from 7% in 2010 to 1% in 2019. During this time UniCredit exited a number of businesses, including its stake in Polish lender Bank Pekao in 2016[120], and its card processing services in Italy, Germany, and Austria in 2016[121]. UniCredit did not greatly change the composition or weighting of its business segmentation throughout the period considered.

ING received a 10 billion EUR bailout from the Dutch government and as a result had to divest from many of its operations including its insurance business – which at the time ranked 6th in the world – and many of its international businesses including its US direct banking arm ING Direct in 2013[122], its Canadian direct banking arm in 2012[123], and its UK direct banking operations in 2013[124]. ING saw dramatic declines in its total revenue with 10 consecutive years of total revenue decline (from 152 billion EUR in 2008 to 33 billion EUR in 2018), however it has managed to steadily improve its financial performance albeit as a smaller financial institutions. It has managed to gradually grow its net income, while having to contend

[118] https://www.nytimes.com/2009/03/19/business/global/19iht-banks.html
[119] https://www.wsj.com/articles/unicredit-ceo-likely-to-resign-possibly-next-week-1463770372
[120] https://www.spglobal.com/marketintelligence/en/news-insights/trending/1rgolj0ltnhrxiv4bznu6q2
[121] https://www.unicreditgroup.eu/en/press-media/press-releases-price-sensitive/2016/unicredit-completa-la-cessione-a-sia-delle-attivita-di-elaborazi.html?intcid=INT-IG_CTA0019
[122] https://www.nytimes.com/2009/10/27/business/global/27iht-ing.html
[123] https://www.ing.com/Newsroom/News/Press-releases/PROld/ING-to-sell-ING-Direct-Canada-to-Scotiabank.htm#:~:text=ING%20announced%20today%20that%20it,leading%20Canadian%20financial%20services%20company.
[124] https://www.ing.com/Newsroom/News/Press-releases/PROld/ING-completes-sale-of-ING-Direct-UK.htm

with massive drops in non-interest income from 55 billion EUR in 2008 to the 4 to 9 billion EUR range thereafter, and in interest income from 97 billion EUR in 2008 declining every year until 2017 when it was only 25 billion EUR (though it managed to slowly grow its net interest income) due to the divestiture of ING's insurance related business. Despite this, ING has managed to gradually improve its efficiency ratio (from being in the bottom quartile in 2008-10 to being in the top quartile in 2015-18), its pretax margin (from being the bottom quartile in 2008-2009 to being in the top quartile for 8 of the 9 following years), and its ROE (from being negative in 2008 and 2009 to being in the top quartile for 6 out of the following 9 years). ING also steadily increased its annualized net interest margin and its ROA (top quartile for ROA for 5 years).

ING derives around half of its revenue from the Netherlands and Belgium, which did not greatly change during the period under consideration. ING reduced its exposure to the Americas given the divestitures of its direct banking operations in the US and Canada and its Latin American insurance operations, while growing its presence in Germany (from 10% of total revenue in 2013 to 15% in 2019) and its "challenger" geographies – Australia, Austria, Czech Republic, France, Italy, and Spain – (from 6% in 2013 to 11% in 2019). In terms of business segmentation, after divesting from its insurance businesses, ING managed to maintain the split between retail banking, and corporate banking at around of two-thirds and one-third of total revenue respectively. Thus, like RBS, ING entered the GFC as an international, diversified bank and ended up a less diversified and less international bank by the end of 2019 (thought it remained significantly more international than RBS).

5.2 – The Specialized Banks: Doubling-Down on Core Businesses

Banks like Standard Chartered, Credit Suisse and UBS that derive major parts of their revenues from non-retail banking operations such as corporate banking, investment banking, trade finance, and wealth management that are less affected by long-term near-zero interest rates, performed better in terms of total income. UBS and Credit Suisse kept their total revenue comparatively steady in the period 2008-2018, while Standard Chartered was one of the few banks out of the 20 considered to consistently grow its revenue with 6 out of 11 years of total income growth. Credit Suisse and Standard Chartered weathered the GFC comparatively well, while UBS, which was initially badly exposed, managed to recover relatively

quickly. During the period considered, all three banks increased their focus on their core businesses, and modestly expanded their international footprint.

UBS avoided collapse after being particularly badly hit in the early days of the GFC (incurring a 50 billion CHF write-off of its toxic subprime mortgage securities between 2007-09) and was able to turnaround its financial performance from 2010 onwards[125]. In the period considered UBS had 6 years of net revenue growth (top quartile for net revenue 4 times), steadily growing its non-interest income while maintaining relatively stable net interest income despite declining interest income and the worst annualized net interest margins (bottom quartile for annualized net interest margin for 11 out of 11 years). While it has struggled with its efficiency ratio (bottom quartile for 10 out of 11 years), UBS has consistently had some of the best Tier 1 capital adequacy ratio (top quartile for 11 out of 11 years), and loans-to-assets ratio (top quartile for 11 out of 11 years).

Over the period considered, UBS has become somewhat more international, gradually reducing the proportion of the total revenue it generates from Switzerland and Europe, the Middle East, and Africa, EMEA (e.g., from 52% in 2012 to 43% in 2019) while increasing its exposure to the US and Asia Pacific (e.g., from 48% in 2012 to 54% in 2019). In the period considered, UBS has also doubled-down on its specialism – private banking and wealth management – which it has grown from contributing 51% to total revenue in 2012 to 57% in 2019, while reducing some of its investment banking operations (e.g., fixed income)[126] whose contribution to total revenue declined from 28% in 2012 to 25% in 2019. Thus, in the course of the period considered, UBS became a less diversified, but slightly more international bank.

Credit Suisse managed to navigate the GFC comparatively well[127]. Credit Suisse increased its net interest income for 7 years out of 10 – including consecutive increases from 2010-15 – figuring 5 times in the top quartile for net interest income00, however like UBS, Credit Suisse had one of the worst annualized net interest margins out of the 20 banks considered (7 years in the bottom quartile), although this has consistently and gradually improved over time. On the other hand, Credit Suisse's non-interest income has steadily declined over time (7 years of decline and in the bottom quartile for 5 years) and the bank has struggled with its efficiency ratio (bottom quartile for 11 years out of 11). Overall, the bank's net income

125 https://www.ft.com/content/fbbba5ba-d7ca-11df-b478-00144feabdc0
126 https://www.reuters.com/article/us-ubs-idUSBRE89S1BU20121029
127 https://www.reuters.com/article/us-creditsuisse-trading-insight-idUSBRE99D03520131014

has declined over time (5 years of declines and in the bottom quartile for 3 years), it had a negative pretax margin for 3 years (bottom quartile for 5 years), and had a negative ROA for 4 years (bottom quartile for 5 years). However, Credit Suisse has continuously maintained a healthy Tier 1 capital adequacy ratio (top quartile for 10 out of 11 years) and loans-to-assets ratio (top quartile for 8 out of 11 years).

Credit Suisse maintained the proportion of the total revenue that it derives from Switzerland and from the Americas relatively constant over the time period considered, however, like UBS, Credit Suisse grew the proportion of total revenues derived from Asia Pacific (from 7% in 2009 to 13% in 2019) while reducing the proportion of total revenue derived from EMEA (from 20% in 2009 to 9% in 2019). Moreover, like UBS, Credit Suisse also scaled back its investment banking operations[128] – which went from contributing to 62% of total revenue in 2009 to contributing to 36% of total revenue in 2019 – while increasing its focus on its core business of private banking and wealth management which increased from 35% of total revenue in 2009 to 53% in 2019, while also growing its corporate and institutional banking business (from 5% of total revenue in 2009 to 12% in 2019). Thus, like UBS, Credit Suisse became a less diversified, and slightly more international bank in the course of the period considered.

Standard Chartered was comparatively insulated from the impact of the GFC[129]. It gradually grew its total income in the period considered (figuring in the top quartile for total income growth for 5 years while never figuring in the bottom quartile). Standard Chartered consistently grew its interest income (6 years of growth and in the top quartile fort 7 years), and its net interest income (8 years of growth and in the top quartile for 4 years), it has also performed well in terms of its annualized net interest margin (in the top quartile for 8 years) though this has been steadily declining over the years. While it has not grown its non-interest income significantly, it has nevertheless managed to keep them steady for the period considered. Standard Chartered was in the top quartile for ROA from 2008-2013, efficiency ratio from 2008-2014, pre-tax margin from 2008-2014, ROE and ROTE in 2008 and 2010-13, and ROA from 2008-13; however from 2013/14 onward Standard Chartered began seeing a reversal of fortunes with significant declines across each of these indicators, including falling into the bottom quartile for pre-tax margin for 3 years after 2014, and for ROE and ROTE from 2015-18. As such Standard Chartered experienced a steady decline in net income which became more pronounced from 2013 onward.

[128] https://www.reuters.com/article/uk-credt-suisse-grp-results-idUKKCN0IC0BY20141023
[129] https://www.wsj.com/articles/SB10001424052748704094304575029031815795848

Standard Chartered has long been an Asia Pacific focused bank, consistently deriving around 70% of its revenues from this region, though the proportion derived from Greater China, Hong Kong and North Asia has steadily increased (32% in 2009 to 42% in 2019), while the proportion derived from ASEAN and South Asia has steadily decreased (37% in 2009 to 25% in 2019). As for the rest of Standard Chartered's revenue, around 16-19% has consistently come from the Middle East and Africa, with the remaining 10-15% from Europe and the Americas. Standard Chartered has traditionally focused on corporate, commercial, and institutional banking, maintaining this business segment's contribution to total revenue at around 55-65%. On the other hand, Standard Chartered's retail banking operations contributed a steadily declining proportion of total revenue (from 41% in 2009 to 33% in 2019). Thus, although a British bank, Standard Chartered can be more accurately categorized as an Asia-Pacific focused regional bank, that has become – like UBS and Credit Suisse – less diversified and more focused on its core operations.

5.3 – Global Giants: Mixed Performances but Stable Overall

Large, diversified, international banks experienced mixed performances, although none saw any drastic declines. HSBC, Europe's largest bank, remained a global giant, albeit a smaller and more focused one than before the GFC, and one that was increasingly focused on Asia Pacific. Barclays and Deutsche Bank went through a similar evolution after the GFC; Barclays became less global, exiting most of its African markets while focusing more on North America, and, Deutsche Bank increased its focused on private banking and wealth management while reducing its exposure to corporate and investment banking. BNP Paribas and Société Générale maintained relatively stable performances over the period considered, while Santander was one of the best performing banks and expanded its geographic footprint in the aftermath of the GFC.

While its North American business took a hit during the 2008 GFC, overall HSBC was better positioned compared to most of its peers[130]. HSBC managed to keep its total revenue, net interest income, non-interest income, and net income comparatively steady over the 11-year period considered. HSBC was in the top quartile for its efficiency ratio (5 years between 2008 to 2013) though its efficiency ratio began to slowly worsen after 2013. HSBC's steadily improved its pretax margin (8 years in the top quartile for the period considered), it also maintained one of the best annualized net interest margins (9 years in the top quartile,

[130] https://www.ft.com/content/bbbce032-805f-11de-bf04-00144feabdc0

though steadily declining in the period considered), and one of the best ROAs of the 20 banks considered (7 years in the top quartile). HSBC can be considered a global bank given the breadth of its international activities, however the bank has relied more and more on Asia for its revenue (from 31% of total revenue in 2009 to 56% in 2019) and less and less on Europe (from 47% of total revenue in 2009 to 32% in 2019). HSBC's total revenue from Latin America also declined significantly (from 14% in 2009 to 5% in 2019) reflecting its exit from several Latin American operations like the sale of its Brazilian operations to Banco Bradesco in 2016[131]. The bank also exited a number of other markets including Turkey and South Korea, and while it maintained a well-diversified operation from a business segmentation perspective it nevertheless wound-down many of its international retail banking operations. Thus, while HSBC remained a global, integrated bank with an ever growing presence in Asia (especially in China) by 2015 the bank had moved away from its famous brand of the "world's local bank" becoming a "simpler and smaller" international player[132].

BNP Paribas, with its risk-averse approach and focus on retail banking, also came out of the GFC relatively unscathed[133]. BNP Paribas' decline in total revenue was comparatively modest, and it maintained relatively flat net interest income, non-interest income, and net income. It maintained one of the best ROEs (6 years in the top quartile) although it has struggled with its Tier 1 capital adequacy ratio (7 years in the bottom quartile). While BNP Paribas has a global presence[134], Europe has consistently contributed to around 75% of its total revenues in the period considered. BNP Paribas has long had a presence in the US with North America contributing 10-15% of total revenue in the period considered. Like many of its peers such as HSBC, Credit Suisse, and Standard Chartered, BNP Paribas has sought to expand its modest presence in Asia Pacific[135] with the region's contribution to total revenue growing from 4% in 2009 to 7% in 2019. BNP Paribas has long had strong retail banking operations through its extensive international retail banking network[136]; retail banking's contribution to total revenue has continuously grown from 47% in 2009 to 70% in 2019, while the contribution of corporate and institutional banking has continuously declined from 51% in 2009 to 28% in 2019.

[131] https://www.hsbc.com/news-and-media/media-releases/2016/completion-of-sale-of-brazil-business
[132] https://www.ft.com/content/85642fcc-e50d-11e4-bb4b-00144feab7de
[133] https://archive.fortune.com/2008/08/27/news/companies/demos_bnp.fortune/index.htm?postversion=2008082712
[134] https://group.bnpparibas/en/group/bnp-paribas-worldwide
[135] https://www.reuters.com/article/us-bnp-asia-idUSBRE92619620130307
[136] https://www.bbc.co.uk/news/business-10834809

Like HSBC, Barclays managed to navigate the GFC without recourse to UK government bailouts preferring to raise capital privately, however unlike HSBC which pivoted away from the US towards Asia Pacific, Barclays delved deeper into investment banking and into the US by acquiring part of Lehman Brothers[137]. However, over the period considered, Barclays struggled with its financial performance. Barclays' total revenue continuously declined (bottom quartile for 5 years), as did its net income (bottom quartile for 5 years), interest income (8 years of declines), net interest income (bottom quartile for 6 years), non-interest income, ROA (bottom quartile for 5 years and negative for 3 years), ROE (bottom quartile for 6 years and negative for 4 years), and, ROTE (bottom quartile for 6 years and negative for 3 years). On the other hand, Barclays maintained one of the healthiest loans-to-assets ratios (top quartile for 9 years), and a steadily improving annualized net interest margin. Barclays' UK operations are the largest contributor to total revenue consistently accounting for around 50-55% of total revenue for most of the period considered. However, with the acquisition of part of Lehman Brothers in 2008[138], Barclays' North American operations grew from accounting less than 1% of total revenue in 2008 to 33% by 2019. On the other hand, Barclays decreased its presence in Europe, for example selling most of its Spanish business to CaixaBank in 2014[139], which meant that the contribution of its European operations to total revenue declined from 19% in 2008 to 8% in 2019. The bank also exited its African operations in 2016[140], Barclays' Middle East and Africa segment accounted for 15-18% until 2013, thereafter it only accounted for less than 3%. In terms of product segmentation, this remained stabled during the period considered, with a third of total revenue attributed to retail banking, while the remaining two thirds of total revenue derived from corporate banking, investment banking, asset and wealth management, and payments. Thus, in the period considered, Barclays remained a diversified bank but became less international.

Deutsche Bank, which was intimately involved in subprime US mortgages, on the other hand was negatively affected by the GFC[141] and several other high-profile scandals in the period considered[142]. While maintaining a good loans-to-assets ratio (11 years in the top quartile), Deutsche Bank saw steady declines in total revenue and net revenue, relatively flat net interest income and non-interest income, and was one of the worst performers in terms of efficiency ratio (10 years in the bottom quartile). Deutsche Bank's ROA was negative for 4 years and figured in the bottom quartile for 8 years, its pretax margin was

[137] https://www.ft.com/content/bbbce032-805f-11de-bf04-00144feabdc0
[138] https://www.nytimes.com/2008/09/18/business/worldbusiness/18barclays.html
[139] https://www.bbc.co.uk/news/business-29007147#:~:text=Barclays%20Bank%20has%20agreed%20to,and%20approximately%20555%2C000%20new%20clients.
[140] https://www.bbc.co.uk/news/business-35695601
[141] https://www.nytimes.com/2008/04/29/business/worldbusiness/29iht-bank.4.12440904.html
[142] https://www.dw.com/en/deutsche-banks-biggest-scandals/a-54979535

negative for 3 years and figured in the bottom quartile for 7 years, its ROE was negative for 5 years and figured in the bottom quartile for 6 years, and its ROTE was negative for 4 years and figured in the bottom quartile for 6 years. In the period considered, the proportion of total revenue Deutsche Bank derived from Germany gradually increased (from 25% in 2009 to 41% in 2019) while the total revenue derived from the rest of EMEA gradually declined (from 39% in 2009 to 26% in 2019). The total revenue the bank derived from the Americas and Asia Pacific remained relatively constant. The total revenue the bank derived from corporate and investment banking declined from 67% in 2009 to 53% in 2019, while private banking and wealth management grew from 29% of total revenue in 2009 to 45% in total revenue in 2019 reflecting Deutsche Bank's increased focus on private banking[143]. Thus, while Deutsche Bank remained an international, diversified bank throughout the period considered, it became a little less international, depending more on its local market, while inverting its focus from corporate and investment banking to private banking and wealth management.

Despite large, toxic derivatives exposure to American International Group in 2008 and a 4.9 billion EUR loss inflicted upon it by rogue trader Jérôme Kerviel, Société Générale managed to navigate the GFC (and subsequently the 2011 European sovereign debt crisis) without incurring severe ramifications[144]. Société Générale maintained a relatively flat total revenue, net interest income, and non-interest income over the period considered. The bank also saw steady declines in its interest income and struggled with its annualized net interest income margin (bottom quartile for 5 years). In terms of geographic segmentation, Société Générale has maintained roughly the same split across the time period considered with around 45-50% of total revenue deriving from France, a third from Europe, and the remaining 15-20% from the rest of the world. The same is true from a business product segmentation, with Société Générale's total revenues consistently split between retail banking (around two thirds of total revenue) and corporate and investment banking (around a third of total revenue).

Santander largely avoided any negative ramifications from the GFC and was one of the few banks considered to grow its total revenue[145]. Santander managed to gradually grow its net interest income, its operating income (8 years of operating income growth), maintained one of the best efficiency ratios across the 20 banks considered (top quartile for 9 years), and maintained one of the best annualized net interest

[143] https://www.reuters.com/article/us-deutsche-bank-strategy-wealth-idUSKCN1U51BP
[144] https://www.nytimes.com/2011/08/13/business/global/global-worries-about-the-french-bank-societe-generale.html
[145] https://www.ft.com/content/4c320568-ed88-11dd-bd60-0000779fd2ac

margins (top quartile for 10 years). This translated into a comparatively healthy ROA (top quartile for 8 years), ROE (top quartile for 5 years), and ROTE (top quartile for 6 years). Although Santander struggled with its Tier 1 capital adequacy ratio (bottom quartile for 7 years) and with its loans to assets ratio (bottom quartile for 11 years). Having first entered the UK market through the acquisition of Abbey National in 2004, Santander expanded its presence in the UK in the aftermath of the GFC by acquiring Alliance & Leicester and Bradford & Bingley in 2008[146] leading to the UK constituting between 11-17% of the bank's total revenue in the period considered. Santander's European (excluding the UK) business consistently contributed around a third of total revenue, while the bank expanded its presence in the US from 7% of total revenue in 2010 to 12% in 2019, especially through its acquisition of Sovereign Bancorp in 2008[147], and HSBC's US car loans business in 2020[148]. Most of Santander's total revenue is derived from Latin America; this declined from 50% in 2010 to 40% in 2016, however after it announced a concerted push into Latin America in 2018[149], the bank's total revenues from Latin America rose again to around 45% by 2019. From a business product perspective, Santander's main focus is on retail banking which has consistently provided the bank with around 80-87% of its total revenue, while the proportion of total revenue Santander derives from corporate and investment banking has declined slightly from 16% in 2010 to 13% in 2019. On the other hand, Santander's private banking, insurance, and wealth management business has grown from 3% in 2010 to 6% in 2019 especially in Latin America.

5.4 – Spanish Banks: A Story of Growth

The two Spanish banks – Santander and BBVA – performed comparatively well across most financial metrics. Both banks have diversified business operations and a presence in several geographies (especially the Americas), as well as being leaders in digital transformation[150][151]. BBVA adopted technology transformation as early as 2007, with their Executive Chairman proclaiming in 2015 that "*BBVA will be a software company in the future*"[152], and was comparatively unaffected by the GFC[153]. BBVA gradually grew its total revenue, its net interest income, and its interest income (top quartile for 6 years) over the period considered. BBVA maintained one of the best annualized net interest income (top quartile for 11

[146] https://www.ft.com/content/c9c5df8d-1e11-4e76-8114-15e01473ffab
[147] https://www.reuters.com/article/us-santander-sovereign-idUSTRE49C15R20081013
[148] https://www.ft.com/content/cb91571c-b4cb-11df-b0a6-00144feabdc0
[149] https://www.ft.com/content/8e6e3fc6-f626-11e8-8b7c-6fa24bd5409c
[150] https://www.computerweekly.com/news/252467261/Santander-brings-global-digital-services-under-one-roof
[151] https://www.forbes.com/sites/bernardmarr/2019/01/25/the-astonishing-ways-bbva-spains-second-largest-bank-uses-ai-to-transform-itself/#4cae75af5253
[152] https://www.forbes.com/sites/bernardmarr/2019/01/25/the-astonishing-ways-bbva-spains-second-largest-bank-uses-ai-to-transform-itself/?sh=22f2f0df5253
[153] https://www.wsj.com/articles/SB125054311778138089

out 11 years considered), ROAs (top quartile for 9 years), efficiency ratios (top quartile for 10 years), ROEs (top quartile for 5 years), and ROTEs (top quartile for 5 years). However, like Santander, BBVA also struggled with its Tier 1 capital ratio (bottom quartile for 9 years) and its loans to assets ratio (bottom quartile for 6 years). At the start of the GFC, BBVA derived 55% of its total revenue from Spain and 45% from the rest of the world (excluding Europe) especially in Latin America and the USA. These two geographies' contributions to BBVA's total revenue progressed consistently in opposite trajectories in the period considered so that by 2019, only 18% of BBVA's total revenue derived from Spain, while the rest of the world (excluding Europe) accounted for 81%, meaning that BBVA had transformed into a more global (especial in the Americas) and less Spanish bank by the end of the period considered[154].

5.5 – Cooperative Banks: Some Rewarded for Staying True to Cooperative Philosophies, Some Punished for Straying

The four cooperative banks – Crédit Agricole, Crédit Mutuel, Groupe BPCE, and Rabobank – had mixed performances in the period considered, those that maintained a conservative risk appetite and did not stray from the cooperative philosophies performed better than those that took on greater risk in a bid to compete with non-cooperative banks. Caisse d'Epargne and Banque Populaire (which merged to form Groupe BPCE in 2009) and Crédit Agricole, overextended themselves and took on too much risk through their investment banking arms (Natixis and Calyon respectively) during the GFC in a bid to compete with non-mutualist rivals like BNP Paribas and Société Générale[155]. On the other hand, Crédit Mutuel and Rabobank, who did not expand into non-traditional cooperative activities, were relatively immune from the impact of the GFC and performed comparatively well thereafter.

Crédit Agricole was badly affected by the GFC incurring severe write-downs linked to the collapse of subprime mortgages in the US[156] and thereafter as a result of the European Debt Crisis[157]. Crédit Agricole maintained a relatively flat total income over the period considered. The bank managed to gradually grow its non-interest income (top quartile for 5 years) and maintained a healthy loans to assets ratio (top quartile for 11 out 11 years). However, Crédit Agricole consistently had one of the worst annualized net interest income ratios (bottom quartile for 9 years) and Tier 1 capital adequacy ratios (bottom quartile for 6 years).

[154] https://www.bbva.com/en/the-internationalization-of-bbva-from-a-local-bank-to-a-multinational-operating-in-more-than-30-countries/
[155] https://www.ft.com/content/f30f33e4-6fdb-11de-b835-00144feabdc0
[156] https://www.france24.com/en/20090304-credit-agricole-2008-net-profit-down-75-%E2%82%AC1-billion-
[157] https://www.reuters.com/article/us-creditagricole-results/credit-agricole-struggles-to-turn-page-with-huge-writedown-idUSBRE8A800B20121109

Crédit Agricole maintained low or negative ROA (bottom quartile for 4 years), ROE (bottom quartile for 4 years), and ROTE (bottom quartile for 4 years) ratios, however after 2013 these began recovering significantly. The geographic breakdown of Crédit Agricole's total revenue remained steady during the period considered, with 48-53% deriving from France, 39-46% from Europe (excluding France), and around 7-10% from the rest of the world. In terms of business product segmentation, the proportion of Crédit Agricole's total revenues from corporate banking declined over the period considered (from 18% in 2008 to 12% in 2019), as did the proportion derived from retail banking (from 44% in 2008 to 30% in 2019), while wholesale banking's contribution grew (from 4.6% in 2008 and 18% in 2009 to 29% in 2019) and asset management and insurance's contribution remained flat at around a third of total revenue. This reflects the bank's 2014 medium term plan to focus on organic European growth[158]; overall the bank remained a well-diversified European bank throughout the period considered.

Groupe BPCE was formed in 2009 by the merger of Caisse d'Epargne and Banque Populaire in response to the severe losses incurred by Natixis (the investment bank created and co-owned by Caisse d'Epargne and Banque Populaire) which led to Banque Populaire's first loss since World War II, and Caisse d'Epargne first loss in its 200-year history[159]. From 2009 onward, Groupe BPCE maintained relatively flat total revenue and net revenue, however its interest income steadily declined (8 out of 9 years of decline), as did its net interest income (6 out of 9 years of decline including figuring in the bottom quartile for 4 years). Groupe BPCE struggled with its Tier 1 capital adequacy ratio (bottom quartile for 4 years) although this improved noticeably form 2016 onward. On the positive side, Groupe BPCE managed to steadily grow its non-interest income (8 out of 9 years of growth) growing by 71% between 2009 and 2018. Groupe BPCE has always derived the overwhelming majority of its total revenue from France, although France's contribution to Groupe BPCE's total revenue has been gradually declining (from 85% in 2010 to 76% in 2019) reflecting an increased internationalization of the bank's activities such as Natixis' expansion in the US[160] (from 6% of total revenue in 2010 to 11% in 2019), Groupe BPCE's acquisition of leading German fintech Fidor in 2016[161] (growth of the contribution of Europe, excluding France, to total revenue from 5% in 2010 to 8% in 2019), and Natixis' expansion in Latin America[162] and Asia Pacific[163] (growth of the

[158] https://www.globenewswire.com/news-release/2014/03/20/1771577/0/en/CREDIT-AGRICOLE-SA-Cr%C3%A9dit-Agricole-Group-presents-its-Medium-Term-Plan-for-2014-2016.html
[159] https://www.ft.com/content/f30f33e4-6fdb-11de-b835-00144feabdc0
[160] https://www.businesswire.com/news/home/20170905006320/en/New-US-Headquarters-Marks-Growth-Milestone-for-Natixis-Global-Asset-Management
[161] https://newsroom-en.groupebpce.fr/news/acquisition-of-fidor-bank-by-groupe-bpce-6a10-53927.html
[162] https://www.businesswire.com/news/home/20150422005800/en/Natixis-Global-Asset-Management-Opens-First-Office-in-South-America
[163] https://www.reuters.com/article/us-investment-summit-natixis/natixis-plans-to-double-asia-pacific-assets-to-100-billion-in-three-years-idINKBN1DF11C

contribution of the rest of the world to total revenue from 3% in 2010 to 5% in 2019). In terms of business product segmentation, most of Groupe BPCE's total revenue have historically derived from retail banking and insurance, although this has consistently declined (from 79% in 2009 to 67% in 2019), while corporate and investment banking's contribution has grown (from 8% in 2009 to 13% in 2019) as has asset and wealth management's contribution (from 9% in 2009 to 16% in 2019). Thus, over the period considered, Group BPCE has become more international (though still predominantly French) and more diversified (though still predominantly retail banking and insurance focused).

Unlike Crédit Agricole and Groupe BPCE, Crédit Mutuel was comparatively insulated from the effects of the GFC, and in fact expanded its operations through the acquisition of Citigroup's retail operations in Germany (renaming it Targobank)[164] in 2008, Citigroup's retail operations in Belgium in 2011[165], a wide ranging joint venture with Banco Popular in 2010[166], and General Electric's equipment finance and receivables finance operations in France and Germany in 2016[167]. Crédit Mutuel was in the top quartile for total income growth for 6 years (though it experienced a large decline in 2018). The bank grew its net revenue for 8 out of 11 years, maintained a relatively flat net interest income, steadily grew its non-interest income for 9 out of 11 years including a 180% increase in 2011 (although it incurred a 60% decline in 2018), a steadily growing operational income, and a comparatively strong Tier 1 capital adequacy ratio (top quartile for 6 years). Crédit Mutuel derived the majority of its total revenues from France, though the proportion has been steadily declining (from 89% in 2009 to 81% in 2019) given the banks' expansion in Germany, Belgium, and Spain, as such the contribution of its European operations to total revenue has risen (from 11% in 2009 to 17% in 2019). In terms of business product segmentation, the contribution of retail banking to total revenue has declined slightly (from 77% in 2009 to 73% in 2019), while the contribution of insurance grew slightly (from 12% in 2009 to 14% in 2019), and the contribution of corporate banking declined (from 12% in 2009 to 5% in 2019). Thus, during the period considered, Crédit Mutuel became more European (though still predominantly French) and remained focused on retail banking and insurance.

[164] https://www.dw.com/en/french-bank-credit-mutuel-to-buy-german-citibank/a-3476236
[165] https://www.bloomberg.com/news/articles/2011-12-28/credit-mutuel-nord-europe-to-buy-citibank-belgium-s-retail-unit
[166] https://www.ft.com/content/f403c186-82e3-11df-8b15-00144feabdc0
[167] https://www.ge.com/news/press-releases/ge-completes-sale-equipment-finance-and-receivable-finance-businesses-germany-and

Rabobank, a conservatively run cooperative bank that focuses on the food and agricultural sector was the only major Dutch bank not to require a state bailout[168]. Rabobank maintained a relatively flat total revenue, net revenue, and net interest income, and a steadily growing non-interest income, and operating income. The bank maintained one of the best Tier 1 capital adequacy ratios (top quartile for 10 years) although it struggled with its loans-to-assets ratio (bottom quartile for 11 years). Rabobank has traditionally relied on the Netherlands for around two thirds of its total revenue, while the contribution of its US and Asia Pacific businesses to total revenue have both grown in the period considered (from 8% in 2008 to 15% in 2019, and from 5% in 2008 to 8% in 2019 respectively). On the other hand, the contribution of the European (excluding the Netherlands) segment total revenue has declined (from 15% in 2008 to 10% in 2019) with Rabobank exiting some European countries like Poland[169]. In terms of business product segmentation, Rabobank derives most of its total revenue from domestic retail banking, which has grown somewhat in the period considered (from 57% of total revenue in 2008 to 62% of total revenue in 2019), while its wholesale and rural banking segment grew significantly (from 12% of total revenue in 2008 to 29% in 2019) reflecting Rabobank's rural and agricultural business especially in the US[170]. Rabobank exited its asset management operations through its sale of its asset management arms Robeco in 2013[171] and Bouwfonds Investment Management in 2018[172] reducing the contribution of asset management to total revenue from 15% in 2008 to zero from 2013 onward. Thus, in the period considered, Rabobank became a more international bank (though it still derives most of its revenues from the Netherlands), while become less diversified and more focused on its core business operations.

5.6 – Steady Regional Banks

Several regional European banks (which are not cooperatives, and which did not attempt risky expansion plans requiring large government bailouts), like Intesa Sanpaolo and Nordea maintained steady performances in the period considered. Both banks also became more focused during this period, Intesa Sanpaolo grew its focus on asset management, insurance, and private banking operations, while Nordea exited markets it deemed risky, while increasing its focus on its core Nordic markets.

[168] https://www.theglobeandmail.com/report-on-business/international-business/european-business/dull-dutch-rabobank-blooms-as-rivals-struggle-through-debt-crisis/article4364089/
[169] https://www.wsj.com/articles/SB10001424052702304096104579239473767161300
[170] https://www.businesswire.com/news/home/20190315005429/en/Rabobank-Announces-Plan-to-Strengthen-U.S.-Rural-Banking-Business
[171] https://www.reuters.com/article/orix-robeco-idUST9N0A202Z20130215
[172] https://realassets.ipe.com/rabobank-sells-majority-of-bouwfonds-investment-management/10022906.article

Intesa Sanpaolo, which was formed by the 2007 merger of Banca Intesa and Sanpaolo IMI[173], performed comparatively better than its Italian competitor UniCredit[174]. Intesa Sanpaolo maintained a relatively steady total income over the period considered, grew its net income (despite large losses in 2011 and 2013 which coincide with the European sovereign debt crisis), steadily improved its loans-to-assets ratio, consistently improved its efficiency ratio (eventually figuring in the top quartile for 6 years between 2012 and 2018), and consistently grew its non-interest income (top quartile for 3 years). On the other hand, Intesa Sanpaolo saw gradual declines in its net interest income (bottom quartile for 4 years), net interest (bottom quartile for 4 years), and annualized net interest margin (from being in the top quartile between 2008 and 2014 to being in the bottom quartile in 2017 and 2018). Intesa Sanpaolo has maintained the geographic segmentation of its total revenues relatively steady in the period considered with around 77-82% of total revenues deriving from Italy, 16-19% from Europe (excluding Italy), and 2-6% from the rest of the world. While retail and commercial banking remained the largest contributor to the bank's total revenues, its proportion has steadily declined over time (from 67% in 2008 to 47% in 2019), on the other hand Intesa Sanpaolo has grown its asset management, insurance, and private banking operations whose combined contribution to total revenue grew from 6% in 2008 to 22% in 2019 reflecting the bank's ambitions to grow these business segments[175] [176].

Nordea, with most of its activities centred on the Nordic region was relatively unaffected by the GFC[177]. Nordea maintained a stable net income, operating income, non-interest income, and net interest income (despite declining interest income and figuring in the bottom quartile for annualized net interest margin for 9 years). Nordea consistently maintained one of the best efficiency ratios (top quartile for 11 out of 11 years) and pretax margins (top quartile for 11 out of 11 years), maintained a healthy Tier 1 capital adequacy ratio (top quartile for 5 years), as well as posting strong ROA (top quartile for 8 years), ROE (top quartile for 9 years), and ROTE (top quartile for 9 years) numbers. Nordea has predominantly relied on the Nordics (Sweden, Finland, Norway, Denmark) segment for the majority of its total revenue with this segment's contribution to total revenue consistently above 90%. Since 2014, Nordea began scaling

[173] https://group.intesasanpaolo.com/en/newsroom/press-releases/2020/07/brief-overview-of-history-of-the-intesa-sanpaolo-group
[174] https://www.ft.com/content/86347cc8-b0f2-11dd-8915-0000779fd18c
[175] https://www.ft.com/content/b2dfb484-3588-11e8-8b98-2f31af407cc8
[176] https://www.wsj.com/articles/intesa-and-unicredit-banking-on-asset-management-1447336274#:~:text=Intesa%20and%20UniCredit%3A%20Banking%20on%20Asset%20Management%20The,assets%20a%20big%20plank%20of%20its%20new%20strategy.
[177] https://www.ft.com/content/90de7642-4a3a-11e8-8ee8-cae73aab7ccb

back its presence in Russia and the Baltic region as part of a de-risking strategy[178] [179] meaning that Nordea became an even more Nordic-focused bank during the period considered (by 2019, the Nordics accounted for 94% of the bank's total revenue). Nordea grew its personal and business banking segment in the period considered (from 51% of total revenue in 2014 to 67% in 2019), while its corporate and institutional banking operations declined (from 24% of total revenue in 2014 to 16% in 2019), the bank has also been reducing its exposure to shipping, oil, and offshore services since 2010 as part of a de-risking strategy[71]. Thus, in the period considered, Nordea became a less international and less diversified bank, preferring to focus on its core geographic market and grow its retail and business banking segment.

Having provider richer contextual information on the 20 banks in this study based on the evolution of their financial performance, geographic segmentation, and business segmentation in the period considered, the following section presents this study's findings which will be used to answer the research question. The contextual information from this section have not influenced or overlapped with any of the data collection, data interpretation, or theorization activities that have led to the findings and insights presented in the following section. However, this section's contextual information will be taken into account in this study's second order findings (Section 6.5).

[178] https://www.nordea.com/Images/35-363903/Q120%20Debt%20Investor%20Presentation%20for%20web%20updated%20ratings.pdf
[179] https://www.bloomberg.com/news/articles/2020-12-18/nordea-plans-full-russia-exit-after-years-of-cuts-targeting-risk#:~:text=Nordea%20Bank%20Abp%20is%20winding,services%20open%20for%20corporate%20clients.

6 – Findings

Section 4 set-out the research design that guides the collection and analysis of empirical data that was used to answer the research question posed in Section 3 (and the managerial question posed in Section 2) in line with the theoretical framework elaborated on in Section 3. The previous section provided a deeper contextual account of the evolution of the 20 banks' financial and segmentation performance in the period considered. This section presents the findings of the third data collection activity discussed in the research design in Section 4 (the first two data collection activities are aimed at the contextual discussion in Section 5).

Section 6.1 starts by reflecting on some of the amendments that were made to the submodalities of banks' strategies of interdependence in response to insights that emerged from the data collection (and data interpretation) process. Section 6.2 presents the findings from "Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases" at the individual case level (i.e., each individual bank). Section 6.2 concludes with a tabular summary of the findings for the 20 banks. Section 6.3 presents the findings from "Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases" at the modality level. Section 6.3 also presents links and relationships between modalities and submodalities that have been observed. Section 6.4 configures the findings into a taxonomy of banks' strategies of interdependence based on "Data Interpretation Activity 2: Interpretation of Modalities of Banks' Strategic Response to Interdependence and Creation of a Taxonomy of Banks' Strategic Responses". Section 6.5 reinterprets the findings and abstracts them at a more holistic level to present a meta-taxonomy of strategies of interdependence that can be applicable beyond the context of the 20 banks considered in this study.

The content-analytic meta-tables relating to "Data Interpretation Activity 2" – based on the single case matrices for the 20 banks – are included in Appendix 10. A list of data sources used for the single case matrices are detailed in Appendix 9. Appendix 11 presents the process through which the taxonomy of banks' strategies of interdependence was produced including the different iterations that were made to reach the final taxonomy.

6.1 – Reflections on Data Collection Activity 3 and Amendments to Submodalities

In the process of conducting "Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases" a number of amendments and refinements to the theoretical framework emerged, which is in keeping with this study's abductive conceptual framework, circular research design, and its Straussian view of the relationship between data and theory. These amendments and refinements were predominantly in relation to the modalities of banks' strategies of interdependence and specifically relate to submodalities. This section highlights the amendments and refinements that emerged, and will conclude by restating an amended/refined list of modalities of banks' strategies of interdependence. However, it is worth noting that this data collection activity, which lasted 18 months, was highly iterative and was composed of a number of sub-activities, such as collecting the raw data, categorizing and tabulating data, making sense of any unexpected emergent insights/trends/patterns, and recategorizing and retabulating prior data in the light of these emergent insights/trends/patterns. It was through this iterative approach that the amendments and refinements to the theoretical framework emerged.

The first five refinements relate to the "Acquisitions and Investments" modality. Two of these refinements relate to the refinement of the submodality "Establishment of fintech subsidiaries" which had already been identified. The preliminary research identified the submodality "Establishment of fintech subsidiaries", whereby banks establish fintech related subsidiaries, which although majority owned by the bank, are nevertheless branded and operated as distinct businesses; this could be because in order for the resources and capabilities of the fintech subsidiary to function successfully, they need to be "ring-fenced" from the resources and capabilities of the bank giving them a certain level of autonomy that allow them to function differently from how they would have otherwise functioned had they been integrated into the banks' existing resources and capabilities. However, In the course of data collection, it emerged that in some cases banks embark on fintech related initiatives that are not branded or operated separately, and which instead are fintech initiatives that enhance the resources and capabilities of banks' existing businesses (e.g., an artificial intelligence powered personal assistant for their retail banking operations), in which case a separate submodality "Establishment of fintech initiatives" would be more appropriate. Moreover, in some cases, the fintech subsidiary is spun-out and ends up operating as a separate entity, albeit one with historical business and technological ties to the original parent company, thus yet another submodality is

required: “Spin-off of fintech subsidiaries”. The reason for spinning-off fintech subsidiaries are diverse, in some cases this could be because the subsidiary does not align with the banks’ strategy, it could also be that the fintech subsidiary will be more successful (including potentially in adopting strategies of interdependence with other stakeholders) if it is not owned by a bank, or it could be that the bank is adopting strategic openness (Alexy, et al., 2018) whereby it can derive relational rent through its complementarities or superior knowledge of the spin-off’s resources and capabilities without needing to own or control them.

The next two refinements to the submodalities under the “Acquisitions and Investments” modality relate to the submodality “Establishment of internal innovation labs, incubators, and/or accelerators”. The preliminary research identified three key ways in which banks generate, prototype, and deploy innovative ideas: internal innovation labs, internal incubators, and internal accelerators. However, two more categories emerged from the data collection process, the first is “internal think tank” (e.g., L’Atelier BNP Paribas) which some banks have and which are broader than innovation labs in that they often conduct research on wide ranging topics including futurological analyses, the second is the “innovation outpost” which is a small innovation lab (sometimes composed of only a few people) which a bank establishes in an innovation hotspot like Silicon Valley so that the bank is better informed on themes that are at the forefront of technological innovation.

The fifth refinement under the “Acquisitions and Investments” modality relates to the “Establishment of corporate venture capital subsidiary and fintech funds” submodality. In the process of collecting data, it emerged that while many banks create fintech funds, some funds are administered through banks’ own corporate venture capital arms, while some funds are administered by external venture capital firms on behalf of the bank through a joint fund. It is important where possible to differentiate between “own fund” and “external fund” as with external funds an additional level of interdependence is introduced (the external venture capital firm).

The other three modalities remain unchanged, except for the “Open Innovation Ecosystems” modality, which includes banks establishing their own external innovation labs, incubators, and accelerators, or participating in those established by others. I add to this modality the category of “innovation outpost”, when the outpost has for a purpose not only the development of a banks’ own resources and capabilities

to bring them up to date with the latest technological innovation, but also the aim of scouting for innovative fintech start-ups and other firms in innovation hotspots with whom the bank can potentially partner with.

Thus, the refined list of modalities and submodalities of banks' strategies of interdependence is presented as follows:

1. Acquisitions and investments
    - Acquisition of fintech or fintech related firms
    - Divestments
    - Significant investments or lead investments in fintechs
    - Establishment of corporate venture capital subsidiary and fintech funds (own funds, or externally administered funds)
    - Establishment of fintech subsidiaries
    - Establishment of fintech initiatives
    - Spin-off of fintech subsidiaries
    - Establishment of internal innovation labs, think tanks, incubators, accelerators, and/or innovation outposts
2. Partnerships
    - Partnerships or non-lead investments in fintechs
    - Partnerships with bigtech or telecommunication firms
    - Partnerships with other financial institutions
    - Consortium initiatives, especially blockchain consortia
    - Partnership cessations
3. Open innovation ecosystems
    - Establishment of banks' own external innovation labs, incubators, accelerators and/or innovation outposts
    - Participation in others' external innovation labs, incubators, and/or accelerators
4. Open IT infrastructure
    - Establishment of open-API portals, developer kits, and sandboxes
    - Open innovation technological interfaces for staff, external developers, and customers to co-innovate

6.2 – The Modalities of Banks' Strategies of Interdependence – Individual Case Level

6.2.1 – Barclays

Acquisition and Investment Modality

Barclays made 2 fintech acquisitions relatively early on (a payments fintech in 2014, and a customer loyalty focused fintech in 2012). Barclays, which owns Barclaycard, the UK's largest credit card provider with a market share of 27%[180], was early to establish a payments focused fintech subsidiary in 2012 – Pingit – which provides mobile payments, peer-to-peer transactions, and international money transfers[181]. In 2012, Barclays began trialling bPay, a wearables payment solution, which it rolled out as a fintech subsidiary in 2015, before integrating it into Pingit in 2019[182]. In 2015, Barclays launched the Barclays Technology Fund, a 100 million GBP fund to support fast growing UK start-ups, and from 2018, the bank allocated 10 million GBP a year of investment capital to invest in each annual cohort of 10 fintechs to emerge from the bank's external accelerator. In 2018, the bank launched its corporate venture capital arm Barclays UK Ventures (BUKV) to invest in fintechs as well as to explore partnerships to develop innovative ideas internally[183]. The bank did not establish any internal innovation labs, incubators, and/or accelerators. In terms of lead investments, Barclays was lead investor in 9 fintechs between 2017-19, 2 of which relate to loyalty scheme focused fintechs, and 2 that relate to fintechs that focus on lending to small and medium enterprises.

Partnership Modality

Barclays entered into 15 partnerships between 2012-19, 4 of which were with payments focused fintechs, and 4 with risk management focused ones. On the other hand, in 2019, Barclays terminated its partnership with cryptocurrency exchange Coinbase. In terms of bigtech partnerships, given Barclaycard's dominance of payments in the UK, and Barclays' payments related fintech subsidiaries Pingit and bPay, Barclays was reluctant to partner with bigtech payment solutions. Barclays was one of the only UK banks not to support Google Pay when it launched in the UK in 2016, however Barclays did partner with Apple Pay in 2016, with Alipay in 2017, and with PayPal in 2018. Barclays entered into 7 partnerships with other banks and incumbents between 2014-19, 4 of which relate to standards setting (Innovate Finance in 2014, the UK

[180] https://www.marketingweek.com/barclaycard-embarks-biggest-moment-transformation/
[181] https://www.theguardian.com/money/2012/feb/16/barclays-pingit-money-sending-smartphone
[182] https://www.ft.com/content/ed56e8c8-1c1b-11e5-8201-cbdb03d71480
[183] https://www.ft.com/content/6fb21702-3f14-11e8-b7e0-52972418fec4

Financial Conduct Authority's Regulatory Sandbox in 2016, the British Standards Authority's Fintech Collaboration Toolkit in 2018, and the European Union's International Association for Trusted Blockchain Applications). Barclays participated in 9 blockchain consortia between 2015-19, 2 which focus on trade finance, and 2 that focus on lending.

Open Innovation Modality

Barclays was early to launch innovation labs, incubators, and/or accelerators that were open to external fintechs, and did so in an extensive and coordinated way, launching innovation labs that are linked to well-funded accelerators in several fintech hotspots like London and New York. In 2015, Barclays launched Rise, a fintech innovation lab with offices in London, New York, Tel Aviv, and Mumbai (Rise also had offices in Cape Town and Vilnius until Barclays exited South Africa and Lithuania in 2018 and 2019 respectively). In 2014, Barclays partnered with Techstars (acceleration specialist) to launch the Barclays Accelerator in London, New York, and Tel Aviv. The accelerators support fintechs over a 13-week programme, offering them access to Barclays' Rise fintech innovation lab, as well as the Barclays Eagle Labs (which are not fintech specific) to prototype ideas[184]. Starting from 2018, Barclays allocated a 10 million GBP fund to support each annual cohort to be accelerated through the Barclays Accelerator. Barclays launched a separate accelerator in Cairo and a Female Innovation Lab in New York in 2019. Barclays only participated in 2 consortium innovation labs, incubators, and/or accelerators, in fact in one of those consortium initiatives (SWIFT Innotribe in 2014) it was the Barclays Accelerator, not Barclays that participated.

Open IT Infrastructure Modality

Barclays launched its open API platform along with a development portal and sandbox in 2018 in accordance with PSD2. Barclays also launched 2 open IT platforms to foster collaboration and cocreation between Barclays, its customers, and start-ups. In 2012, the bank launched Barclaycard Ring Community to crowdsource innovative ideas focused on payments. In 2015, Barclays launched the Launchpad App to give customers the opportunity to shape the development of new ideas and for start-ups and developers to suggest and trial new digital solutions[185].

[184] https://home.barclays/who-we-are/innovation/barclays-accelerator/locations/london/
[185] https://www.finextra.com/newsarticle/28199/barclays-launches-app-for-customers-to-trial-new-mobile-features

6.2.2 – BBVA

Acquisition and Investment Modality

BBVA made 5 acquisitions between 2014-17, including 2 direct banking fintechs (Simple in 2014, and Holvi in 2017), payment service provider Openpay in 2016, and San Francisco-based user experience and design firm Spring Studio in 2015. BBVA established 6 fintech subsidiaries between 2014-18, including 2 direct banking subsidiaries, Wizzo aimed at younger customers launched in 2014, and Azlo launched in 2018 in the US and Mexico for the small and medium enterprises[186], as well as payments fintech subsidiary Tuyyo launched in 2017 to service remittances from the US to Latin America and the Caribbean[187]. BBVA also launched 2 additional fintech subsidiaries which it subsequently decided to shelve, including direct banking fintech subsidiary Denizen aimed at expatriates and international travellers launched in 2018 which was closed down a year later due to the inability to scale the business, and small and medium enterprise lending fintech subsidiary Trust-u which was discontinued a year after its launch in 2017.

BBVA opened a significant number of internal innovation labs, incubators, and/or accelerators early on. BBVA opened its technology focused innovation lab and incubator in San Francisco in 2011, an innovation lab in Birmingham, Alabama in 2015, an innovation lab in Dallas, Texas in 2016, the BBVA AI Factory in Madrid in 2019 which focuses on artificial intelligence, and BBVA Next Technologies in 2018 which employs 1,200 technology experts in Mexico and Spain focused on blockchain, cybersecurity, big data, and artificial intelligence. In 2015, BBVA launched BBVA New Digital Business (NDB) with the aim to disrupt the bank before others do, through creating its own fintech ventures at the NDB offices in San Francisco, Madrid, and London, acquiring fintechs, investing in fintechs either through its own corporate venture capital arm BBVA NDB or through BBVA's main corporate venture capital subsidiary Propel Venture Partners, or through entering into strategic partnerships[188].

BBVA was comparatively early in establishing its own corporate venture capital subsidiary, launching BBVA Ventures in 2013 based in San Francisco along with a 100 million USD fintech fund to invest in promising fintechs. In 2016, BBVA decided to wind down BBVA Ventures and instead launch a new independent venture capital firm called Propel Venture Partners, based in San Francisco and London, and

[186] https://www.reuters.com/article/us-bbva-digital/bbva-backed-u-s-digital-banking-startup-azlo-readies-for-launch-idUSKCN1FZ1R2
[187] https://www.bbva.com/en/bbva-launches-tuyyo-global-mobile-money-transfer-service/
[188] https://www.bbva.com/ndb/en/

in which BBVA is a limited partner, transferring the 100 million USD fintech portfolio to Propel Venture Partners and committing an additional 150 million USD. Propel Venture Partners has a stated aim not to control any fintech it invests in but to act as an ally and advisor[189]. BBVA's internal innovation lab, incubator, and accelerator BBVA NDB also has its own corporate venture capital arm launched in 2015. BBVA, invested in several external innovation funds including 50 million USD in the Sinovation Fund IV in 2018 to explore artificial intelligence in the Chinese Market[190]. In 2018, BBVA also entered into a partnership with venture capital firm Anthemis to launch a start-up studio in London, which was accompanied with a partnership fund to invest in fintechs that the partnership incubated[191]. BBVA was lead-investor in 11 fintechs between 2013-19, 2 in payments related fintechs, 2 that relate to personal finance, and 2 that relate to direct banking, including a 39% stake in prominent mobile only bank Atom Bank which BBVA accumulated since 2015, German digital banking-as-a-service fintech SolarisBank in 2018, Brazilian direct bank Neon in 2018, and payments fintech SumUp in 2013.

BBVA launched the most fintech initiatives of the 20 banks considered, launching 9 initiatives between 2016-19. These fintech initiatives included 3 chatbots launched in 2012, 2014, and 2017, payment solution BBVA Cashup in 2017, and big data and business intelligence platform BBVA Commerce360 launched in 2016 for small and medium enterprises. In 2017, BBVA launched BBVA Bconomy which allows BBVA customers to integrate products from other banking institutions (e.g., investment funds, mortgages, securities, pension plans) into their mobile banking application[192]. BBVA was also the only bank of the 20 considered to launch internal blockchain initiatives build on in-house blockchain platforms, including a bond issuance initiative in 2019[193], the world's first syndicated lending blockchain initiative in 2018[194], and several corporate lending initiatives including the world's first corporate loan transaction on blockchain in 2018[195], and a 1 billion EUR synthetic securitization (the first in the European Union)[196]. BBVA's internal blockchain is built using a hybrid architecture, with an internal private blockchain solution based on Hyperledger Fabric to execute transactions, after which the transaction documents are registered on the public Ethereum blockchain. With this internal blockchain solution, BBVA encourages its customers to host their own blockchain nodes and build a "do-it-yourself" portal for corporate lending.

[189] https://techcrunch.com/2016/02/11/bbva-shuts-in-house-venture-arm-pours-250m-into-new-fintech-vc-propel-venture-partners/
[190] https://techcrunch.com/2018/04/16/sinovation-cofounded-by-the-ex-head-of-google-china-nabs-50m-from-bbva-for-its-500m-ai-fund/
[191] https://www.finextra.com/newsarticle/32801/bbva-and-anthemis-open-london-startup-studio
[192] https://www.bbva.com/en/bbva-opens-its-banking-app-in-spain-to-accounts-and-products-from-other-providers/
[193] https://www.bbva.com/en/bbva-issues-the-first-blockchain-supported-structured-green-bond-for-mapfre/
[194] https://www.bbva.com/en/bbva-signs-world-first-blockchain-based-syndicated-loan-arrangement-with-red-electrica-corporacion/
[195] https://www.bbva.com/en/bbva-indra-deliver-worlds-first-blockchain-supported-corporate-loan/
[196] https://www.bbva.com/en/investment-plan-for-europe-bbva-and-eib-group-have-signed-the-first-synthetic-securitization-in-blockchain-of-e1-billion/

Unlike a few other banks like UBS which originated *de novo* blockchain platforms as external open innovation initiatives BBVA originated these *de novo* blockchain networks – and remained as platform leader – as fintech initiatives build on an internal private blockchain network.

Partnership Modality

BBVA partnered with 10 fintechs between 2014-19. It partnered with other banks and incumbents in 3 fintech initiatives between 2015-19, including with the Spanish government, the Bank of Spain, and 27 Spanish banks to create the Spanish mobile payments platform Bizum in 2016, as well as with the European Union, start-ups, regulators, and other banks to launch the International Association of Trusted Blockchain Applications (INATBA) in 2019. The bank also entered into 9 bigtech partnerships of which 4 related to payments and 4 related to personal banking. BBVA partnered with Apple Pay in 2015, with Samsung Pay in 2016, with Google Pay in 2016, and with Alipay in 2017; BBVA also developed the technological banking platform that allows Alipay to be made available at several prominent Spanish department stores[197]. In 2017, BBVA partnered with Facebook to launch a chatbot that allows customers to access account information and make payments via Facebook Messenger or WhatsApp, BBVA integrated this functionality into its payments fintech solution BBVA Cashup and with the Spanish payment application Bizum (in which BBVA is a shareholder)[198]; that year, BBVA also partnered with Telegram, Google, and Apple to launch chatbots that work in the same way but which interface with Telegram's chat functionality, Google Hangouts, and Apple's Siri[199]. BBVA participated in 10 blockchain initiatives between 2016-19, 3 of which related to payments, and 3 which related to blockchain standards (Hyperledger in 2016, Alastria in 2017, and the Enterprise Ethereum Alliance in 2017). BBVA also terminated its participation in 3 prominent blockchain consortia after taking part in initial trials (e.g., the shared know your customer utility CordaKYC, and the trade finance networks Marco Polo and Voltron).

Open Innovation Modality

BBVA was also early in establishing innovation labs, incubators, and/or accelerators that are open to external fintechs. In 2009, it launched an annual fintech competition for start-ups called BBVA Open Talent. BBVA launched the BBVA Innovation Centre in Spain, Mexico, and the US in 2011 and in Colombia in 2013 (these were subsequently renamed BBVA Open Space)[200]. In 2018, BBVA partnered

[197] https://www.bbva.com/en/bbva-process-alipay-payments-spains-corte-ingles/
[198] https://www.bbva.com/en/bbva-customers-can-use-voice-and-chatbots-send-money-other-smartphones/
[199] https://www.bbva.com/en/bbva-customers-can-use-voice-and-chatbots-send-money-other-smartphones/
[200] https://openinnovation.bbva.com/en/open-space

with venture capital firm Anthemis Group to launch the BBVA & Anthemis Venture Creation Partnership, an incubator/accelerator based in London. In 2019 the bank launched the BBVA Open Innovation Acceleration Program aimed at fintechs with international outlooks seeking to build fast-growing businesses[201]. As well as these innovation labs, incubators, and accelerators, BBVA launched an open innovation programme in 2009 called BBVA Open Innovation, which brings together several of BBVA's innovation labs, incubators, and accelerators. The programme seeks to bring together innovative solutions to BBVA and its customers, the programme includes BBVA's Open Space innovation labs, as well as "connection festivals" where fintechs can meet senior BBVA leaders, "fast-track" programmes to create proofs of concept, BBVA Open Talent, twice yearly fintech conferences (Open Summit), a series of on-going collaborative meetings (Open Talks), and the open IT platform BBVA Open Marketplace[202]. BBVA only participated in 1 consortium innovation lab, incubator, and/or accelerator in 2014.

Open IT Infrastructure Modality

BBVA was one of only 3 banks of the 20 considered to launch its open API store, developer portal, and sandbox in 2017, a year before PSD2 came into effect; moreover, BBVA extended its open API store, developer portal, and sandbox beyond Spain to the US and Mexico where there were no regulatory pressures to create open APIs. BBVA also launched 2 additional open IT platforms to foster collaboration between the bank and external parties. In 2016, the bank launched BBVA Beta Testers, through which BBVA can gather feedback on their applications, processes, and products from staff, external parties, and customers. In 2018, the bank launched BBVA Open Marketplace, a platform where fintechs can register to connect with different units at BBVA to explore collaboration[203].

6.2.3 – BNP Paribas

Acquisition and Investment Modality

BNP Paribas undertook several investments and make several acquisitions that were focused on boosting its direct/online banking capabilities. In 2013, BNP Paribas launched digital-only bank Hello Bank! in several European countries including France, Belgium, and Germany[204]. In Germany, BNP Paribas'

[201] https://www.bbva.com/en/bbva-launches-new-fintech-acceleration-program/
[202] https://www.bbva.com/en/bbva-open-innovation-changing-to-become-even-stronger/
[203] https://openinnovation.bbva.com/en/open-marketplace
[204] https://group.bnpparibas/en/press-release/bnl-launches-hello-bank

subsidiary Consorsbank adopted the digital-only business model and branding of Hello Bank! and expanded through BNP's acquisition in 2014 of Direkt Anlage Bank which it integrated into Consorsbank[205]. In 2017, BNP Paribas acquired Compte Nickel, a direct banking service offered through a network of tobacconists and newsagents across France; a year after the acquisition, Compte Nickel's footprint doubled to 1 million accounts, and by 2019 it had 7,000 points of sales across France[206]. On the other hand, BNP Paribas only two fintech initiatives in the period considered, including a personal banking chatbot in 2019.

In 2014, BNP Paribas Asset Management launched a subsidiary called BNP Paribas Capital Partners which specializes in hedge funds, private equity, and incubation. In 2018, BNP Paribas Capital Partners launched a corporate venture capital arm, Opera Tech Ventures, to invest in fintechs[207], and a financial services and insurance innovation fund that invests in both promising fintechs and other funds that invest in fintechs (e.g., Serena Data Ventures which is dedicated to data and artificial intelligence fintechs, Israeli fintech fund Viola Ventures, and Ventech China which invests in Chinese technology start-ups and fintechs)[208]. BNP Paribas was lead investor in 5 fintechs between 2016-19, including the prominent fintech Symphony Communication Services, a 10% stake in Caple BV which provides alternative credit to small and medium enterprises, and PayCar which simplifies and secures payments for used cars and which was accelerated at BNP Paribas' Fintech Boost accelerator in 2016 and subsequently remained an ecosystem partner of BNP Paribas after it was acquired by leBoncoin.fr in 2019.

BNP Paribas is one of only 3 banks considered which has its own internal think tank – L'Atelier BNP Paribas – which acts as an independent research and foresight arm of the bank that investigates and identifies new and emerging technology-related markets[209]. L'Atelier BNP Paribas was established in Paris in 1978 and later expanded to San Francisco and Shanghai. BNP Paribas also set up a number of internal innovation labs to enhance its capabilities in specific areas. The bank launched a Cash Management Fintech Lab in Europe in 2017 which expanded to Asia Pacific in 2019, as well as the BNP Paribas Design Factory Asia launched in Singapore in 2017 which is focused on wealth management.

[205] https://www.euromoney.com/article/b19xm3g9v8rjxq/hello-bank-bnp-paribas-creates-a-pan-european-digital-brand
[206] https://nickel.eu/fr/magazine/1-000-000-de-comptes-nickel-revivez-le-passage-au-million-comme-si-vous-y-etiez
[207] https://group.bnpparibas/en/hottopics/fintech/briefing
[208] https://group.bnpparibas/en/press-release/bnp-paribas-launches-investment-fund-support-startups-transforming-financial-services-insurance
[209] https://atelier.net/about/

Partnership Modality

BNP Paribas entered into partnerships with or took non-lead investments in 17 fintechs during the period considered, including with/in 3 asset and wealth management fintechs, 3 crowdfunding fintechs, and 2 blockchain fintechs; 11 of these partnerships were between 2017-2019, with the remaining 6 between 2013-2016. BNP Paribas was relatively late in partnering with bigtech. It partnered with Apple Pay in 2019, with Google Pay in 2017 though only in Belgium, and with wearable payment providers Garmin Pay and Fitbit Pay in 2019 though only in Belgium and through Hello Bank! However, to support Chinese tourists visiting Europe, BNP Paribas partnered with Alipay in 2016 and with WeChat Pay in 2017. BNP Paribas limited the scope of these partnerships with bigtech to payments; the only partnership that extended beyond payments was BNP Paribas' partnership with Tencent to allow Chinese corporate clients to execute FX transactions through WeChat via BNP Paribas' Symphony platform (itself a result of BNP Paribas' investment and partnership in the fintech unicorn Symphony Communication Services)[210]. BNP Paribas collaborated with several other banks and incumbent firms on consortium payment platforms, including its collaboration in 2013 with La Banque Postale, Société Générale, and GIE Cartes Bancaires to launch the online payment platform PayLib which was subsequently supported by the majority of French banks, its collaboration in 2017 with Auchan, Carrefour, Crédit Mutuel, Oney (Groupe BPCE), Total, and Mastercard to launch mobile payments solution Lyf Pay, its collaboration with several banks in 2015 to launch Polish payments solution BLIK, and its collaboration with several banks in 2018 in the Benelux payment solution Payconiq. BNP Paribas' significant partnerships with banks and other incumbents in payments may explain its reticence to partner with competing bigtech payment solutions. BNP Paribas participated in 17 blockchain consortia between 2015-2019, 4 of which relate to trade finance (BNP Paribas is one of the largest trade finance providers globally[211]).

Open Innovation Modality

BNP Paribas established a number of fintech accelerators dedicated to its French and US markets, while participating in consortium initiatives globally. In 2016, Bank of the West (BNP Paribas' subsidiary in California) partnered with Silicon Valley-based innovation platform Plug and Play; a year later, the partnership was expanded into a global partnership, with BNP Paribas collaborating with Plug and Play to launch an international fintech acceleration programme based in Paris[212]. Concurrently, BNP Paribas'

[210] https://www.globenewswire.com/news-release/2019/11/06/1941771/0/en/Symphony-and-Tencent-Announce-Partnership-to-Integrate-WeChat-With-Symphony-s-Collaboration-Community.html
[211] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/after-years-of-decline-banks-set-for-trade-finance-revenue-growth-in-2021-61708844
[212] https://group.bnpparibas/en/press-release/bnp-paribas-plug-play-strategic-partnership-launch-season-3-acceleration-programme-station

internal think tank L'Atelier BNP Paribas launched a fintech acceleration programme in Paris in 2016 called Fintech Boost, which it later replicated in the US through the launch of Finlabs in 2018[213]. BNP Paribas also runs a network of 60 "We Are Innovation" or WAI centres across France that offers start-ups with banking services, internationalization support, access to BNP Paribas' investment funds, and networking opportunities. Initiated in 2012, WAI was expanded and relaunched in 2016, with one centre dedicated to fintech[214]. While BNP Paribas has focused the open-innovation initiatives it has originated and lead to its French and US markets, it has also participated in consortium acceleration and innovation initiatives globally including in Germany, Denmark, South Africa, and Italy.

Open IT Infrastructure Modality

BNP Paribas launched its API store in 2019 in compliance with PSD2. However, beyond this BNP Paribas has launched several technological interfaces to facilitate open collaboration and innovation between staff, external parties, and customers. These initiatives include OpenUp launched in 2016, which links start-ups with BNP Paribas' internal teams and projects[215].

6.2.4 – Crédit Agricole

Acquisition and Investment Modality

In 2019, Crédit Agricole's asset management subsidiary Amundi acquired personal finance fintech WeSave. Crédit Agricole established two direct banking fintech subsidiaries (BforBank launched in 2010[216], and Findio launched in 2015[217]) and two chatbot initiatives launched in 2018 and 2019. Crédit Agricole did not establish a corporate venture capital subsidiary and created a comparatively small fintech fund (50 million EUR) in 2017 whose administration it delegated to Breega Capital[218]. The bank only made 4 lead investments in fintechs between 2016-2019, 2 in crowdfunding fintechs, and 2 in payment fintechs including blockchain-based payments and settlement fintech SETL. Crédit Agricole is the only bank of the 20 considered that has its own internal university – the IFCAM[219] – which is responsible for

[213] https://group.bnpparibas/en/news/finlabs-fintech-programme-bank-west-l-atelier-bnp-paribas
[214] https://banqueentreprise.bnpparibas/fr/focus-entreprises/innovation/dossiers-thematiques/2018/bnp-paribas-partenaire-des-entreprises-innovantes?
[215] https://group.bnpparibas/en/news/bnp-paribas-launches-openup-digital-platform-connecting-start-ups-bank
[216] https://www.retailbankerinternational.com/opinion/b-is-for-bank-says-crdit-agricole/
[217] https://translate.google.com/translate?hl=en&sl=nl&u=https://www.findio.nl/over-findio&prev=search&pto=aue
[218] http://www.agefi.fr/fintech/actualites/quotidien/20170322/credit-agricole-cree-deux-fonds-destines-aux-start-214219
[219] https://www.ca-ifcam.fr/Pages/siif.aspx

upskilling employees; in 2017, IFCAM launched an internal innovation lab[220]. The bank launched two other internal innovation labs in 2017 and 2018.

Partnership Modality

Crédit Agricole took a minority stake and/or partnered with 10 fintechs between 2014-2019, including 4 payments fintechs. Payments was also a key area in which Crédit Agricole partnered with other banks and incumbent firms representing 3 of 6 such partnerships. After launching its own payment solution – Kwixo – in 2011, Crédit Agricole abandoned the initiative in 2014 in favour of joining the consortium payment initiative Paylib[221]. The bank's collaboration with Wirecard in 2018 allowed it to accept payments through the Chinese applications Alipay and WeChat Pay[222]. As well as payments, CACEIS (a Crédit Agricole subsidiary) collaborated with Eiffel Investment Group, Gide, PricewaterhouseCoopers, and Paymium to create the French Association for the Management of CryptoCurrencies (Association Française pour la Gestion des Cybermonnaies - AFGC), which was later renamed French Digital Asset Association (FD2A). Crédit Agricole's partnerships with bigtech were limited and came comparatively late. It began offering its customers access to Samsung Pay in France in 2019. It offered its customers in Poland and Ukraine access to Apple Pay in 2019; while offering access to Google Pay to its customers in Ukraine in 2018 and to its customers in Italy and Poland in 2019. Since 2015, Crédit Agricole has participated in 11 blockchain consortia, including 3 focused on providing a shared KYC (Know Your Customer) utility, and 2 related to fund management (Amundi is Europe's largest asset management firm)[223].

Open Innovation Modality

In 2014, Crédit Agricole launched Le Village by CA, a network of 33 incubators/accelerators across France, Italy and Luxembourg (covering fintech and other industries), with additional innovation outposts in London, New York, Shanghai, and Tokyo[224]. In 2018, the bank launched La Fabrique by CA, a fintech start-up studio to incubate and accelerate start-ups whose solutions align with Crédit Agricole's projects[225]. Unlike most of the other banks considered Crédit Agricole only participated in one consortium innovation lab/incubator/accelerator in 2019.

[220] https://ifcam-formation.fr/blog/2017/05/09/digital-lab/
[221] https://www.lesechos.fr/2014/11/le-credit-agricole-abandonne-kwixo-pour-paylib-297487
[222] https://www.lesechos.fr/2018/04/credit-agricole-sallie-avec-wirecard-dans-le-paiement-digital-988145
[223] https://about.amundi.com/
[224] https://levillagebyca.com/en
[225] https://www.lafabriquebyca.com/

Open IT Infrastructure Modality

Crédit Agricole was early to embrace several open IT innovation platforms. For example, in 2012, it launched its CA Store, which allows customers and start-ups to suggest, evaluate, and co-create innovative solutions, it was later expanded to include an API store, developer portal, and sandbox in compliance with PSD2.

6.2.5 – Crédit Mutuel

Acquisition and Investment Modality

Crédit Mutuel made 9 fintech-related acquisitions between 2009-19. 3 acquisitions were in the Payments subsector (Monext in 2009 which was a major player in the French electronic payment market with 550 million transactions per year[226], Mangopay in 2015, and Pumpkin in 2017 which allows individuals to securely send money using only a phone number or a Facebook connection), 3 acquisitions were in the direct/online banking subsector (including a 50% stake in Banque Casino in 2011[227], with the other 50% being held by French retailer Groupe Casino), and, 2 acquisitions were in crowdfunding subsector (Leetchi in 2015, and HelloAsso in 2017). Crédit Mutuel also established 9 fintech subsidiaries, 4 were crowdfunding subsidiaries launched between 2015-18, 3 of which were in direct/online banking (including Fortuneo Banque launched in 2009 in France and Belgium). In 2010, Crédit Mutuel Arkéa launched a banking-as-a-platform called Arkéa Banking Services, which provides a white-labelled banking platform to other banks, payments companies, insurance providers, telecommunications operators, and mass market retailers, offering services ranging from current accounts, payments, savings and credit products, and fully implemented banking platforms[228]. The bank has two venture capital subsidiaries, including NewAlpha Asset Management launched in 2015, which provides incubation, investment, and support for entrepreneurial projects. NewAlpha launched a fintech specific fund called NewAlpha Fintech, which it closed in 2017 with 56 million EUR in capital raised[229]. The bank also launched 3 internal innovation labs/incubators, The Square by Crédit Mutuel Arkea in 2016, Innovation Cube by CMNE by Crédit Mutuel Nord Europe launched in 2017, and, Cognitive Factory launched in partnership with IBM in 2018.

[226] https://www.cm-arkea.com/banque/assurance/credit/upload/docs/application/pdf/2014-02/annual-report-credit-mutuel-arkea-31122010.pdf
[227] https://www.bfcm.creditmutuel.fr/partage/fr/CC/BFCM/telechargements/information-financiere/BFCM_INFORMATION_DOCUMENT_MAI2013.pdf
[228] https://www.cm-arkea.com/banque/assurance/credit/mutuel/c_11777/en/abs-in-gb
[229] https://www.privateequitywire.co.uk/2017/06/27/253306/newalpha-closes-first-vc-fund-eur56m

Crédit Mutuel's lead investments in fintechs were comparatively limited, the bank was lead investor in 5 fintechs between 2011-19, 2 of which related to payment fintechs.

The Crédit Mutuel group is made up of 5 regional groups: 1) Crédit Mutuel Alliance Fédérale; 2) Crédit Mutuel Arkéa; 3) Maine-Anjou, Basse-Normandie regional group (Laval); 4) Nord Europe regional group (Lille); 5) Océan regional group (La Roche-sur-Yon). It is noteworthy, that Crédit Mutuel Arkéa is overrepresented compared to the other 4 regional groups in the acquisition and investment modality. Crédit Mutuel Arkéa represents 5 out of the 9 fintech acquisitions made, 7 out of the 9 fintech subsidiaries, 2 out of the 5 lead investments in fintechs, and 1 out of the 3 internal innovation labs/incubators.

Partnership Modality

Crédit Mutuel entered into 9 fintech partnerships between 2014-19, 3 with crowdfunding-focused fintechs, 3 with asset and wealth management-focused fintechs, and 2 with personal finance-focused fintechs. In several cases, the bank took a significant (non-lead) equity stake with the fintechs it partnered with, for example it acquired 30% of personal banking fintech Linxo in 2017, 28% in asset and wealth management fintech Vivienne Investissement in 2016, and 30% in asset and wealth management fintech Masuccession.fr. In terms of partnerships with bigtechs, Crédit Mutuel Arkéa partnered with Apple Pay in 2017, Crédit Mutuel Arkéa also partnered with a number of other bigtechs via its fintech subsidiaries Max and Fortuneo Banque (Samsung Pay and Google Pay in 2019, and wearables payment providers Fitbit Pay and Garmin Pay in 2018). Crédit Mutuel entered into 5 partnerships with other banks and incumbents between 2013-18, 4 of which were focused on payments, including Lyf Pay which resulted from the merger of BNP Paribas' Wa! and Credit Mutuel's Fivory wallets in 2016[230], and Monético International, which Crédit Mutuel launched in 2013 in collaboration with the leading Canadian cooperative group Mouvement Desjardins and which provides innovative payment solutions to both banks' customers[231]. Of the 20 banks considered, Crédit Mutuel was the bank to have least participated in blockchain consortia, participating in only 1 blockchain consortium, the fund management network Iznes in 2017. Crédit Mutuel Arkéa was again overrepresented in the partnership modality, including accounting for 7 out of the 9 fintech partnerships, 5 out of 5 bigtech partnerships, and 1 out of 1 blockchain consortia.

[230] https://www.oney.com/les-communiques/naissance-dun-acteur-majeur-paiement-mobile-lyf-pay/
[231] https://www.lesechos.fr/2013/04/credit-mutuel-et-desjardins-creent-une-societe-monetique-320652

Open Innovation Modality

Crédit Mutuel was comparatively late in establishing innovation labs, incubators, and/or accelerators open to external fintechs. Crédit Mutuel Arkéa launched a fintech innovation lab in Brest in 2018, Crédit Mutuel's subsidiary Crédit Industriel et Commercial (CIC) launched an innovation lab/incubator in Lyon in 2016, and an innovation lab/incubator/accelerator in Marseille and Lyon in 2018. The bank only participated in 2 consortium innovation labs, incubators, and/or accelerators. All of Crédit Mutuel's open innovation initiatives were confined to France and were often regional initiatives in line with the cooperative bank's business operations.

Open IT Infrastructure Modality

Beyond launching an open-API portal, developer kit, and sandbox in compliance with PSD2, Crédit Mutuel did not engage in any other open IT infrastructure initiative in the period considered.

6.2.6 – Credit Suisse

Acquisition and Investment Modality

Credit Suisse made 1 fintech acquisition, that of invoice lending fintech TradePlus24 in 2017, established only 1 fintech subsidiary relatively late in 2019 (Credit Suisse Direct Banking for retail and commercial customers in Switzerland)[232], and launched only one fintech initiative in 2018 (an artificial intelligence-powered virtual assistant). Credit Suisse is one of only 3 banks of those considered to have its own internal think tank, the Credit Suisse Research Institute launched in 2008. The bank also launched 2 internal innovation labs, incubators, and/or accelerators. In 2015, the bank launched CS Labs in 3 cities to explore emerging technologies, specifically in machine learning & artificial intelligence (San Francisco), cloud machine learning (London), and machine learning in trading services (New York)[233]. The bank also launched the Credit Suisse Singapore Innovation Hub in 2014 which is focused on private banking[234].

In 2013, Credit Suisse launched a New-York-based corporate venture capital arm, Credit Suisse NEXT Investors, however the team behind Credit Suisse Next Investors, had been investing in financial

[232] https://www.reuters.com/article/us-credit-suisse-direct-banking/credit-suisse-to-shift-focus-from-branches-to-digital-banking-idUSKCN1VG0CD
[233] https://www.efinancialcareers.co.uk/news/2018/05/top-machine-learning-teams-banks
[234] https://www.credit-suisse.com/about-us-news/en/articles/media-releases/cs-launches-enhanced-digital-private-banking-in-hong-kong-201606.html

technology firms on behalf of Credit Suisse since 2000[235]. The corporate venture capital arm launched the NEXT Investors I fund in 2014 to invest in fintech, this 404 million USD fund was composed of the 269 million USD portfolio of companies that the team behind Credit Suisse NEXT Investors had been investing in on behalf of Credit Suisse since 2000 as well as an additional 135 million USD that Credit Suisse committed in 2013[236]. In 2018, Credit Suisse NEXT Investors launched a second fund, NEXT Investors II, which raised an additional 261 million USD, this time mostly from outside investors. Credit Suisse established a second corporate venture capital arm in collaboration with the Swiss Venture Club, this wholly owned subsidiary of Credit Suisse, called Credit Suisse Entrepreneur Capital, was launched in 2010, which also had a 200 million CHF fund allocated to investment in emerging technologies, of which 30 million CHF were allocated to fintech. However, Credit Suisse was only lead-investor in 5 fintechs between 2010-16, 2 of which related to risk management fintechs.

Partnership Modality

Credit Suisse partnered with 8 fintechs between 2014-19, 3 that relate to asset and wealth management, and 2 that relate to risk management. The bank entered into 2 partnerships with other banks and incumbents, including the Swiss mobile payment solution TWINT in 2014. Credit Suisse was relatively late in partnering with bigtechs in payments, partnering with Apple Pay, Samsung Pay, and SwatchPAY in 2019. However, Credit Suisse also partnered with Apple and Tencent in 2018 in asset and wealth management – a core business for the bank – to integrate Apple Chat and WeChat into their private banking offering for customers in Hong Kong and Singapore[237]. Credit Suisse also participated in 9 blockchain consortia between 2016-19, many of which related to securities trading and capital markets use-cases. Credit Suisse was also one of the few banks of the 20 considered to have originated de novo a blockchain consortium, a syndicated lending blockchain initiative launched in 2016[238].

Open Innovation Modality

Credit Suisse only launched 1 innovation labs, incubators, and/or accelerators that is open to external fintechs; in 2014, it launched Credit Suisse Private Innovation Circle, which brings together select Credit

[235] https://www.fnlondon.com/articles/credit-suisse-fintech-duo-try-to-be-more-than-just-money-20150527
[236] https://www.wsj.com/articles/credit-suisse-unit-closes-261-million-growth-equity-fund-1532433600
[237] https://www.fnlondon.com/articles/credit-suisse-launches-whatsapp-rival-for-staff-as-banks-grapple-with-text-tracking-20201125
[238] https://www.finextra.com/newsarticle/29508/credit-suisse-drives-blockchain-project-in-syndicated-loans-market

Suisse clients and pioneering start-ups that are in capital raising mode[239]. The bank also participated in 3 consortium innovation labs, incubators, and/or accelerators between 2010-17, all based in Asia.

Open IT Infrastructure Modality

Credit Suisse launched its open-API store, developer portal, and sandbox in 2018, other than this, it did not engage in any other open IT infrastructure activities.

6.2.7 – Deutsche Bank

Acquisition and Investment Modality

Deutsche Bank made one acquisition in 2018, that of open banking fintech Quantiguous, established two fintech subsidiaries, including an organizationally segregated start-up factory called Breaking Wave which it launched in 2019[240], and launched two fintech initiatives (a mobile payment solution in 2017, and a chatbot in 2018). Deutsche Bank does not have a corporate venture capital fund, it does however have its Deutsche Bank Digi-Ventures Fund[241] which invests in digital technologies launched in 2017. Deutsche Bank was only lead investor in 4 fintechs (which the bank invested in between 2016-2019). The bank launched an internal innovation lab in Frankfurt in 2016 and an internal fintech innovation lab in Shanghai in 2019.

Partnership Modality

Deutsche Bank entered into 7 partnerships with fintechs between 2011-2019, most of which were with well-established fintechs that had already partnered with several other banks (e.g., R3, Symphony Communication Services, AcadiaSoft, and Neptune Networks). Deutsche Bank entered into 7 partnerships with other incumbents between 2015-2019, most prominently in the payments space. In 2015, Deutsche Bank and Commerzbank launched online payments service Paydirekt in Germany (each bank held a 16.67% stake); despite the service eventually growing to 2.7 million customers in Germany, it lagged behind bigtechs like PayPal which has 23 million customers in Germany as of 2019[242]. Deutsche Bank also partnered with other incumbent-lead payments initiatives such as Bizum in Spain and Payconiq in

[239] https://www.credit-suisse.com/microsites/iwm/pic/en.html#:~:text=Credit%20Suisse%20launched%20the%20Private,together%20in%20an%20impactful%20way.
[240] https://www.fintechmagazine.com/venture-capital/breaking-wave-how-deutsche-bank-going-fintech
[241] https://www.handelsblatt.com/english/fintech-fever-deutsche-bank-turns-finance-guru/23572746.html
[242] https://translate.google.com/translate?hl=en&sl=de&u=https://www.handelsblatt.com/finanzen/banken-versicherungen/zahlungsverkehr-vier-sparkassen-ziehen-sich-bei-paydirekt-zurueck/24989166.html&prev=search&pto=aue

the Benelux. Deutsche Bank was late to partner with bigtechs, partnering with Apple Pay in 2018, and with Samsung Pay in 2019 (only in Spain). Deutsche Bank also leveraged its lead investment in and partnership with payments fintech Modo, to offer Deutsche Bank customers access to bigtech payment platforms Alipay, WeChat Pay, PayPal, and M-Pesa in 2018[243]. Deutsche Bank also leveraged its partnership with collaboration fintech Symphony Communication Services to allow its Chinese corporate clients as of 2019 to conduct FX trading through WeChat via Deutsche Bank's Symphony platform[244]. Deutsche Bank only participated in 7 blockchain consortia between 2016-2019, 2 of which were payments related, and 2 of which related to a shared know your customer capability; in 2018, Deutsche Bank became a premier member of the Hyperledger consortium[245].

Open Innovation Modality

Deutsche Bank launched its Deutsche Bank Innovation Labs (later renamed Deutsche Bank Innovation Network) in 2015 in London and Berlin, with additional labs added in Palo Alto in 2016, New York in 2017, and Singapore in 2018. The Lab connects fintech start-ups to Deutsche Bank and consequently helps the bank to adopt emerging technologies, create a more innovative culture, and support its digital transformation[246]. Deutsche Bank also participated in 6 consortium innovation labs, incubators, and/or accelerators in different cities between 2010-2019.

Open IT Infrastructure Modality

Deutsche Bank launched an API portal with a developer toolkit and sandbox in accordance with PSD2. The bank also launched the Deutsche Bank Pitch Portal in 2017 for fintechs and established technology companies to introduce their ideas to different Deutsche Bank departments for the purpose of collaboration.

6.2.8 – Groupe BPCE

Acquisition and Investment Modality

[243] https://www.finextra.com/newsarticle/32572/deutsche-bank-buys-stake-in-modo-to-expand-payments-biz-to-non-bank-platforms
[244] https://www.finextra.com/pressarticle/80530/deutsche-bank-introduces-wechat-on-symphony
[245] https://www.hyperledger.org/announcements/2018/05/16/hyperledger-adds-deutsche-bank-as-premier-member
[246] https://www.db.com/what-we-do/focus-topics/innovation-network

Groupe BPCE executed 8 fintech-related acquisitions between 2015-19, including its high-profile acquisition in 2016 of German digital-only bank Fidor which subsequently ran into integration and alignment challenges leading the bank to consider divestiture options[247], and its 50.1% stake in digital-only bank Oney Bank in 2019. As well as these two acquisitions of digital-only banking fintechs, Groupe BPCE also acquired 4 payment fintechs in 2016 and 2017, 1 crowdfunding fintech in 2015, and a customer-loyalty focused fintech in 2018. In terms of fintech subsidiaries, one of the bank's key fintech subsidiaries is Natixis Payments, which boasts over 20% market share of payments in France[248], with over 22 million cards managed, over 7 billion transactions a year and the biggest Visa card issuer in continental Europe[249]. In 2011, Groupe BPCE established S-Money, a fintech subsidiary focused on innovative payment solutions. Groupe BPCE's acquisitions of payments-related fintechs were subsequently integrated into Natixis Payments and S-Money. Groupe BPCE also established 3 crowdfunding-related fintech subsidiaries in 2015. Groupe BPCE did not set up a corporate venture capital arm nor did it set up its own fintech fund. The bank had very few fintech-related lead investments (3 between 2017-19). In terms of internal innovation labs, incubators, and/or accelerators, Group BPCE, established an internal innovation programme in 2015 (the Spark Program) which it enhanced with the introduction in 2017 of an internal innovation lab and incubator in Paris (the BIG Factory).

Partnership Modality

Groupe BPCE entered into 12 partnerships with fintechs between 2015-19, 2 that are crowdfunding related fintech partnerships, and 6 partnerships with payment fintechs, including becoming the first major bank in Europe in 2019 to offer access to the prominent fintech TransferWise through its own applications[250]. Groupe BPCE undertook partnerships with bigtechs in the payments subsector in a limited but targeted way, in 2014 S-Money partnered with Twitter to allow customers to transfer money using Twitter[251], Groupe BPCE partnered with Apple Pay in 2016, with Alipay and WeChat Pay in 2018, and was the first banking group in France to launch Samsung Pay in 2018[252]. Groupe BPCE undertook 5 fintech-related partnerships with other banks and incumbents, 3 of which related to payments (PayLib in 2013, Lyf Pay in 2017, and Natixis' partnership with Visa in 2019 to launch Xpollens). The bank participated in 12

[247] https://www.spglobal.com/marketintelligence/en/news-insights/trending/qxxsm0ellmfvwdgqy64c-g2
[248] https://pressroom-en.natixis.com/news/with-natixis-payments-groupe-bpce-becomes-the-first-banking-group-in-france-to-offer-instant-payment-to-its-customers-f7e9-8e037.html
[249] https://www.payments.natixis.com/en/profile/
[250] https://cn.reuters.com/article/instant-article/idUSKCN1J01T6
[251] https://www.ft.com/content/6f6c273c-525b-11e4-b55e-00144feab7de
[252] https://newsroom-en.groupebpce.fr/news/groupe-bpce-becomes-the-first-banking-group-to-launch-samsung-pay-in-france-4807-53927.html

blockchain consortia between 2015-19, 4 of which relate to lending, and 3 that relate to a shared know your customer utility. In 10 out of the 12 blockchain consortia, Groupe BPCE participated through Natixis.

Open Innovation Modality

In 2017, Groupe BPCE launched an innovation lab, incubator, and accelerator called 89C3 that is focused on both developing internal capabilities as well as partnering with external fintechs. 89C3 aims to eventually mobilize 1,000 Groupe BPCE employees as well as open several acceleration centres in France and overseas[253]. Caisse D'Epargne (part of Groupe BPCE) also launched 2 regional incubators/accelerators in France in 2016 (NéoBusiness and Hub612). Groupe BPCE only participated in 2 consortium innovation labs, incubators, and/or accelerators, 1 in Hong Kong in 2010 and 1 in France in 2019.

Open IT Infrastructure Modality

As part of Groupe BPCE's open innovation platform 89C3, the bank embraced an open data and open-API approach beyond what was called for by PSD2. It launched its open-API portal, developer toolkits, and sandbox in 2017, a year ahead of most banks and supplemented this with a user experience (UX) charter and podcasts for developers to access. As part of 89C3, Groupe BPCE also launched Start-Up PASS to facilitate the way the bank works with start-ups, including a platform to digitalize many processes and formalities.

6.2.9 – HSBC

Acquisition and Investment Modality

HSBC made no fintech acquisitions in the period considered, and was one of only 3 banks not to establish any internal innovation labs, think tanks, incubators, or accelerators in the time period considered. In 2014, HSBC launched its London-based corporate venture capital arm HSBC Strategic Innovation Investments[254], and a 200 million USD fund to invest in fintechs globally[255]. In 2017, HSBC launched its San Francisco-based Venture Capital Coverage Group, which manages relationships with venture capital firms and their portfolio companies creating links for them with HSBC's global banking network and

[253] https://groupebpce.com/en/all-the-latest-news/news/2017/89c3-groupe-bpce-s-new-digital-ecosystem
[254] https://pitchbook.com/profiles/investor/122432-95#overview
[255] https://www.wsj.com/articles/BL-DGB-35244

technology initiatives[256]. In terms of establishing fintech subsidiaries, HSBC launched 3 direct banking and 1 payment subsidiaries. HSBC launched UK based telephone banking subsidiary First Direct in 1989 which it subsequently digitalized turning it into an online only direct bank that currently serves 1.45 million customers[257], and later replicated this for non-UK customers through HSBCdirect[258]. In 2019, HSBC launched an application-only business banking platform aimed at small and medium enterprises, which also integrates with third party platforms like the accounting platform Xero[259]. In 2017, the bank launched its PayMe e-wallet in Hong Kong aimed initially at small and medium enterprise business banking, later extending the offering to younger customers to facilitate peer-to-peer (P2P) payments; PayMe had 1.9 million users in Hong Kong as of 2020[260].

HSBC also launched a number of fintech initiatives, for example HSBC and its Hong Kong subsidiary Hang Seng Bank launched 6 chatbots in 2018 and 2019 (5 in Hong Kong and mainland China, and 1 in the US), and in 2017 HSBC launched a digital social platform that connects businesses around the world with a matching engine that links potential buyers and sellers[261]. In some cases, having launched a fintech initiative HSBC preferred to subsequently incorporated it as an enhancement to existing services, for example, in 2018 First Direct launched an open-banking-based money management application called Artha which it developed with the help of fintech company Bud, which HSBC was lead investor in in 2019, First Direct later incorporated Artha's functionality into its mobile banking application[262]. Bud is one of 7 fintechs HSBC acted as lead-investor in. No one fintech subsector is overrepresented in HSBC's lead investments and 6 of the 7 lead-investments were executed in the period 2017-2019. As well as Bud, other prominent fintechs that HSBC was lead investor in include the enterprise blockchain firm R3, lending fintech LendInvest, and the treasury and risk management fintech Kyriba.

Partnership Modality

HSBC undertook 10 partnerships with fintechs in the period considered, 6 of which were in the period 2017-2019. The bank partnered with a number of prominent fintechs that also received backing from numerous other banks and financial institutions, including Symphony Communications Services which

[256] https://www.crunchbase.com/organization/hsbc-venture-capital-coverage-group
[257] https://www1.firstdirect.com/press-releases/about-first-direct/
[258] https://www.wsj.com/articles/SB10001424052748704534904575131913306941780
[259] https://www.finextra.com/newsarticle/34771/hsbc-begins-beta-tests-of-app-only-business-bank-kinetic
[260] https://www.fintechfutures.com/2020/05/hsbc-launches-e-wallet-payme-for-teens-in-hong-kong/
[261] https://www.fintechfutures.com/2017/06/hsbc-launches-social-network-for-business-customers/
[262] https://www.computerweekly.com/blog/Fintech-makes-the-world-go-around/HSBC-to-turn-off-mobile-app-after-it-finds-life-in-open-banking-features

provides banks with collaboration tools, blockchain-based payments fintech Ripple, risk management fintech AcadiaSoft, and bond trading utility Neptune Networks. HSBC began partnering with bigtech early on and expanded its collaboration beyond payments, moreover, the bank partnered extensively with Chinese bigtech, which is important given that HSBC derives a significant proportion of its revenues from China and Asia Pacific. HSBC began partnering with Apple Pay in 2015, with Google Pay in 2016, with Samsung Pay in 2017, and with PayPal in 2018. HSBC partnered with Tencent (which owns WeChat and WeChat Pay) extensively in China and in Asia Pacific, in 2019, HSBC was the first non-Chinese bank to issue a digital credit card in China which integrates with WeChat Pay (as well as Alipay which is owned by Alibaba affiliate Ant Financial)[263]. In 2018, HSBC was also the first non-Chinese bank to launch a mobile service for its corporate customers to manage their accounts through WeChat including integrating HSBC's chatbot with WeChat[264]. Hang Seng Bank entered into a fintech alliance with Tencent in 2018, whereby the two firms agreed to partner on a number of initiatives including payments and remote account opening[265], that year Hang Seng Bank also launched a "WeChat Account" for its small and medium enterprise and commercial customers[266].

HSBC partnered with other banks and financial institutions especially for the purpose of standards setting, including in some cases by acting as ecosystem leader. For example, in 2014 HSBC along with other firms collaborated in the launch of Innovate Finance, an independent industry body that represents and advances the global FinTech community in the UK[267]; in 2016 HSBC was one of only two banks to participate in the UK Financial Conduct Authority's first regulatory sandbox cohort[268]; in 2018, the bank partnered with the British Standards Institute and other banks to develop the Fintech Collaboration Toolkit[269]; and, in 2019, HSBC partnered with SWIFT to define a common industry standard for open-APIs in Hong Kong[270]. As one of the largest trade finance providers globally[271], HSBC collaborated with other banks in non-blockchain trade finance consortia and trade finance standards, for example HSBC collaborated with

[263] https://www.finews.asia/finance/29617-hsbc-launches-digital-credit-card-in-mainland-china

[264] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiwqOjBlp3qAhU973MBHRHOATIQFjABegQIChAE&url=https%3A%2F%2Fwww.about.hsbc.com.cn%2F-%2Fmedia%2Fchina%2Fen%2Fnews-and-media%2F180419-meet-xiaohui-hsbcs-new-chatbot-en.pdf&usg=AOvVaw0sZh-XVb3LuqoYmH9ILsHN

[265] https://www.finextra.com/newsarticle/33087/tencent-and-hang-seng-bank-form-fintech-partnership

[266] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiC1cn4mZ3qAhU67HMBHcGTDc0QFjAAegQIBBAB&url=https%3A%2F%2Fwww.hangseng.com%2Fcms%2Fccd%2Feng%2FPDF%2F073018e.pdf&usg=AOvVaw3F2Eue-l19HchXyxSLLXdP

[267] https://www.level39.co/innovate-finance-launches-level39-53-members-announced/

[268] https://www.fca.org.uk/firms/regulatory-sandbox/cohort-1

[269] https://www.bsigroup.com/en-GB/about-bsi/media-centre/press-releases/2018/november/new-government-backed-guidelines-to-boost-engagement-between-fintechs-and-financial-institutions/

[270] https://www.swift.com/news-events/press-releases/swift-and-hsbc-to-define-industry-standard-for-apis-in-hong-kong

[271] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/after-years-of-decline-banks-set-for-trade-finance-revenue-growth-in-2021-61708844

several banks in 2019 to launch the Trade Finance Distribution (TFD) Initiative to drive standardization and common data standards in trade finance[272], and with several banks in 2018 to launch the Trade Information Network to facilitate trade finance between corporates and banks[273]. HSBC partnered with other banks and corporates in 11 blockchain consortia, especially in trade finance related blockchain consortia (we.trade in 2016, Voltron – renamed Contour in 2020 – in 2018, Tradeshift in 2018, and eTradeConnect in 2018). HSBC also took a standards setting leadership approach in the blockchain consortia it participated in, for example, in 2016, HSBC was one of only five non-Singaporean banks to participate in Project Ubin, the Monetary Authority of Singapore's pioneering project to conduct inter-bank payments on blockchain[274] and the only non-Canadian bank to participate in Project Jasper, a similar project launched by the Bank of Canada in 2016[275].

Open Innovation Modality

While HSBC has not set up any internal innovation labs, incubators, or accelerators, it was however prominent in launching external ones including 4 innovation labs (data and innovation labs both launched in 2019 in London and Toronto; an innovation lab focused on trade finance launched in Singapore in 2015; and, a research and development innovation lab in Hong Kong in 2016), and 2 accelerators (both in India and both launched in 2018). HSBC also participated in several consortium innovation labs, incubators, and accelerators, including prominent ones like Level39 in London in 2013, and the FinTech Innovation Lab – London in 2010.

Open IT Infrastructure Modality

In 2019, HSBC launched a developer portal for open APIs with developer toolkits and sandboxes in compliance with PSD2. However, the banks also partnered with SWIFT in 2019 in a joint initiative to define a common industry standard for APIs, to facilitate the implementation of the next phase of open banking in Hong Kong[89].

[272] https://www.tradefinancedistribution.com/
[273] https://www.finextra.com/newsarticle/32799/top-banks-come-together-to-build-trade-information-network
[274] https://www.mas.gov.sg/schemes-and-initiatives/Project-Ubin
[275] https://www.payments.ca/sites/default/files/project_jasper_primer.pdf

6.2.10 – ING

Acquisition and Investment Modality

ING made 3 fintech acquisitions, customer loyalty focused fintech Qustomer in 2015, small and medium enterprise lending fintech Lendico in 2018, and payment solution provider Payvision in 2018. In terms of fintech subsidiaries, ING only has one, ING Direct, its direct bank that was launched in 1997 and which ING subsequently digitalized. In 2017, ING launched its corporate venture capital arm ING Ventures along a 300 million EUR fund to invest in fintechs[276], as well as a 25 million EUR a year fund to accelerate internal fintech initiatives which was launched in 2013. In 2016, ING launched the Think Forward Initiative with the support of a number of partners including Deloitte, IBM, Amazon Web Services, and the Center for Economic Policy Research[277]. The initiative includes the TFI Research Hub which conducts data-driven research into social and behavioural sciences to learn more about people's decision-making processes, the TFI Accelerator to translate these insights into technological innovations and which is open to external fintechs, and the TFI Community Hub which promotes the activities of the other two hubs[278]. The Think Forward Initiative thus has an internal innovation component and an external acceleration/partnership component. Since 2015, ING has run its ING Innovation Bootcamp internal incubator where employees are encouraged to come up with innovative fintech solutions and compete for seed funding to bring their ideas to fruition. In 2018, ING supplemented this by launching the PACE Accelerator, a 12-week acceleration programme to rapidly validate internal innovation ideas and take them to market.

ING is significantly overrepresented in the number of internal fintech subsidiaries/initiatives it subsequently spun-off. ING accounts for 9 out of the 11 spin-offs observed by the 20 banks between 2008-19. The majority of the spin-offs were initially incubated and accelerated at ING's internal innovation labs, incubator, and accelerator. They include 4 payments related fintechs, including the prominent payment fintech Payconiq, which was launched in the Netherlands in 2015, received backing from the majority of Dutch banks, expanded into Luxembourg through the acquisition of Digicash Payments in 2017, and then merged with Belgium based Bancontact to form Bancontact Payconiq Company with wide support from the majority of banks across the Benelux region. Other prominent fintech spin-offs include

[276] https://www.ing.com/Newsroom/News/Press-releases/ING-launches-ING-Ventures-a-EUR-300-million-fintech-fund.htm
[277] https://www2.deloitte.com/nwe/impact-report-2019/think-forward.html
[278] https://www.thinkforwardinitiative.com/initiative/about-tfi

the corporate banking fintech Cobase launched in 2016, personal banking fintech Yolt launched in 2016, and, artificial intelligence-based bond trading solution Katana Labs which was spun-off in 2019 after 2 years of incubation at ING. ING was also lead investor in 9 fintechs between 2015-19, including 4 that specialized in lending (e.g., Hong Kong based fintech unicorn WeLab), and 2 that specialized in payments.

Partnership Modality

ING partnered with 13 fintechs, between 2014-19, including with 4 crowdfunding fintechs, with 2 that relate to payments, 2 to blockchain, and 2 to personal finance, as well as a strategic partnership with fintech unicorn Kabbage[279]. ING partnered with several bigtechs; it was late to partner with them in its core market in the Netherlands and other European countries (Apple Pay, Google Pay, and Garmin Pay in 2019), while partnering with bigtechs earlier on in Australia (Google Pay in 2016, Apple Pay in 2017, in 2018 ING Australia became the first bank in Australia to integrate bank accounts with Apple's Siri virtual assistant, in 2017 ING Australia partnered with Facebook to launch a chatbot through Facebook Messenger). Through its acquisition of the fintech Payvision, ING was also able to extend its bigtech partnerships to PayPal in 2018, and to Chinese fintechs WeChat Pay and Alipay in 2018 for ING's customers in China. ING entered into 6 partnerships with other banks and incumbents, 3 of which relate to payments including an innovative partnership with Dutch supermarket chain Albert Heijn in 2019 to create cashierless stores[280], and 1 that relates to standards setting (the Dutch Blockchain Coalition in 2017[281]). ING entered into 12 blockchain consortia between 2017-19, 4 of which relate to commodities, 2 that relate to lending, and 2 that relate to trade finance. ING was also one of the few banks from the ones considered to have initiated and assumed the position of ecosystem leader in a blockchain network (commodities financing blockchain platform Komgo which was launched in 2018 and that was incubated in ING's Innovation Bootcamp in 2016[282]).

Open Innovation Modality

ING was prominent in launching innovation labs, incubators, and accelerators that are open to external fintechs. As well as the TFI Accelerator launched in 2016 as part of ING's Think Forward Initiative, ING also launched the ING Labs in 2017 in Amsterdam, Brussels (initially launched in 2015), London, and

[279] https://www.ing.com/Newsroom/News/Press-releases/ING-to-start-strategic-partnership-and-launch-pilot-with-fintech-Kabbage.htm
[280] https://www.finextra.com/newsarticle/34350/ing-partners-dutch-supermarket-to-trial-cashierless-store
[281] https://dutchblockchaincoalition.org/uploads/pdf/Visiondocument-Blockchain-For-Good-EN.pdf
[282] https://www.gtreview.com/magazine/volume-17-issue-1/komgo-unwrapped-financing-commodity-trade-blockchain/

Singapore, where it employs ING's PACE innovation methodology[283]. In 2018, ING launched a series of incubators, the ING Innovation Centers, in Germany, Turkey, and Poland. In 2019, ING launched the Fintech for Impact incubator in the Philippines. ING also participated in 4 consortium innovation labs, incubators, and/or accelerators since 2010.

Open IT Infrastructure Modality

As well ING's open API portal, developer toolkit, and sandbox launched in 2018 in compliance with PSD2, ING also launched several open IT initiatives, including a number of open IT innovation platforms to facilitate collaboration and cocreation between ING staff, customers, and third parties, such as ING Web Café launched in France in 2013, ING Turuncu Destek launched in Turkey in 2014, Orange Sharing launched in 2015 to share innovative ideas and best practices internally, and the ING Touchpoint Platform launched in 2017 aimed at fostering collaboration between ING staff and third parties to rapidly bring innovative solutions to market by ensuring architectural modularity. Beyond the technological aspects of open IT, ING was one of the few banks of the 20 considered to also widely apply its own innovation methodology (PACE launched in 2016) based on agile, lean start-up, and design thinking, and in 2017 extended this agile way of working across the organization through the launch of the ING one Way of Working (WoW) inspired by agile principles[284].

6.2.11 – Intesa Sanpaolo

Acquisition and Investment Modality

Intesa Sanpaolo made no fintech acquisitions and did not establish any internal innovation labs, incubators, and/or accelerators. It established 5 fintech subsidiaries between 2011-18, 3 of which relate to payments, including XME Pay Digital Wallet launched in 2018 which enables users to pay online, in stores, and conduct peer-to-peer payments and which integrates with several bigtech payment solutions[285]. The bank has two corporate venture capital arms, including Neva Finaventures, which was launched in 2016, and which is linked to the Intesa Sanpaolo Innovation Center, and a 30 million EUR fintech fund

[283] https://www.ing.com/About-us/Innovation/ING-Labs.htm
[284] https://www.ing.com/Newsroom/News/Squads-sprints-and-stand-ups.htm
[285] https://group.intesasanpaolo.com/en/newsroom/press-releases/2018/11/CNT-05-00000005200DE

launched in 2016[286]. Intesa Sanpaolo only made 3 lead investments in fintechs comparatively late (2018-19), though in each case it acquired a significant stake in each fintech (16.09% in payments fintech MatiPay in 2019, 16.7% of crowdfunding fintech Backtowork in 2019, and 37.9% of personal finance fintech Oval Money in 2018).

Partnership Modality

Intesa Sanpaolo entered into partnerships with 6 fintechs between 2015-18, and with 1 bank and/or incumbent firm on a fintech initiative in 2019 (the International Association for Trusted Blockchain Applications (INATBA), a blockchain standards setting body). The bank participated in 5 blockchain consortia between 2017-19, 2 of which related to payments, as well as the Spunta Banca Project, an interbank settlement blockchain network, launched in 2018 and headed by the Associazione Bancaria Italiana (ABI)[287]. In terms of bigtech partnerships, Intesa Sanpaolo participated in the E-Marco Polo initiative that was launched by the Italian Government and Alibaba in 2014, though it did not subsequently enter into a wider ranging partnership with Alibaba as its Italian rival UniCredit did. Intesa Sanpaolo was relatively late in partnering with bigtechs in payments (Apple Pay and Google Pay in 2018, Samsung Pay, Fitbit Pay, and Garmin Pay in 2019).

Open Innovation Modality

Intesa Sanpaolo launched the Intesa Sanpaolo Innovation Center in Turin in 2015 with the aim of exploring and learning new business models and developing the skills and assets necessary to support the long-term competitiveness of the Group. This innovation lab, incubator, and accelerator is open to participation from external fintechs; it expanded to London in 2016, and opened two additional labs in 2018, one focusing on the circular economy, and the other on artificial intelligence and neuroscience[288]. The bank also participated in 4 consortium innovation labs, incubators, and/or accelerators between 2014-18.

Open IT Infrastructure Modality

In 2019, Intesa Sanpaolo launched its open-API portal, developer toolkit, and sandbox. Other than this, it did not launch any other open IT infrastructure initiatives.

[286] https://www.crunchbase.com/organization/neva-finventures-2
[287] https://www.abi.it/DOC_Info/Press-releases/09-10-Spunta%20super%20test%20annuali.pdf
[288] https://www.intesasanpaoloinnovationcenter.com/en

6.2.12 – Lloyds Banking Group

Acquisition and Investment Modality

Lloyds Banking Group made no fintech-related acquisitions in the time period considered, initiated no fintech initiatives, and only has one fintech subsidiary (a direct bank acquired by Lloyds Banking Group in 2001 and later converted into an online only bank in 2005). While the bank launched a private equity business (Lloyds Development Capital) in 1981, the bank did not allocate a dedicated fintech-focused corporate venture capital unit or fintech fund. Lloyds Banking Group only made 1 lead investment in a fintech, a 10% stake in banking infrastructure focused fintech Thought Machine in 2018. In 2016, the bank's life insurance and pension subsidiary, Scottish Widows launched an internal innovation lab, the bank followed this up in 2019 with the launch of a 500-employee strong internal innovation lab in Edinburgh – the Digital Tech Hub – which supports the entire group[289].

Partnership Modality

Lloyds Banking Group entered into only 4 partnerships with fintechs between 2015-19, 2 of which were with payments related fintechs. The bank only partnered with 2 bigtechs in the payments space (with Apple Pay in 2015, and with Google Pay in 2016). It also partnered with other banks and incumbents on 5 initiatives between 2014-19, 3 of which 3 were related to standards setting (Innovate Finance in 2014, the UK Financial Conduct Authority's Regulatory Sandbox in 2016, the British Standards Authority's Fintech Collaboration Toolkit in 2018). Lloyds Banking Group was late to participate in blockchain consortia and only participated in 4 consortia between 2018-19, 3 of which related to interbank payments.

Open Innovation Modality

Lloyds Banking Group established 1 innovation lab open to external fintechs, the LBG Innovation Lab, which was launched in 2015 to facilitate collaboration between external fintechs and the bank[290]. The bank only participated in 3 consortium innovation labs, incubators, and/or accelerators in the time period considered.

Open IT Infrastructure Modality

[289] https://www.bbc.com/news/uk-scotland-scotland-business-48214339
[290] https://www.information-age.com/lloyds-banks-1-75bn-bet-future-banking-123464191/

Lloyds Banking Group launched an open API portal, developer toolkit, and sandbox in compliance with PSD2. However, the bank also launched the Lloyds Banking Group Fintech Mentoring Scheme in 2016, a platform through which fintech start-ups can seek mentoring from Lloyds Banking Group staff.

6.2.13 – Nordea

Acquisition and Investment Modality

Nordea only made 1 fintech acquisition, that of leading Norwegian online bank Gjensidige Bank in 2019. Nordea did not establish any fintech subsidiaries, however it did launch 3 fintech initiatives in 2017 and 2018, a payment solution, an artificial intelligence-powered personal assistant, and an artificial intelligence-powered robo-advisor. Nordea terminated 1 other fintech initiatives it had launched, the crowdfunding platform Nordea Crowdfunding launched in 2016 and wound down in 2018. Nordea established 2 internal innovation labs, incubators, and/or accelerators, LC&Ix, an internal innovation lab/incubator launched in 2019 that is focused on corporate and institutional banking, and Nordea Runway, an intrapreneurship programme launched in 2018 that allows Nordea employees to incubate innovative ideas for 3 months before exploring with senior management the potential for taking them to market. In 2017, Nordea launched its corporate venture capital arm Nordea Ventures along with an investment fund that is associated with it[291], and made 4 lead investments in fintechs between 2016-19.

Partnership Modality

Nordea partnered with 10 fintechs between 2017-19, 2 of which related to payments fintechs and 2 that related to personal finance fintechs. Nordea entered into 7 partnerships with other banks and incumbents between 2012-19, 5 of which related to payments, Swish in Sweden in 2012 in collaboration with 5 other leading Swedish banks[292], Vipps in Norway in 2017[293], Siirto in Finland in 2016[294], and P27 which was launched in 2017 as a joint initiative by Danske Bank, Handelsbanken, Nordea, OP Financial Group, SEB and Swedbank to explore the possibility of establishing a pan-Nordic payment infrastructure for domestic and cross-border payments in the Nordic currencies and the Euro[295]. In 2013, Nordea, Jyske Bank, and 70 regional Danish banks launched the mobile payments network Swipp to compete with Danske Bank's

[291] https://www.finextra.com/newsarticle/31392/nordea-sets-up-fintech-fund-invests-in-betalo
[292] https://www.swish.nu/about-swish
[293] https://www.reuters.com/article/nordea-bank-dnb/update-1-nordea-joins-rival-dnbs-vipps-payment-app-in-norway-idUSL8N1MM1BT
[294] https://www.fintechfutures.com/2016/11/three-finnish-banks-launch-real-time-mobile-payments-platform-siirto/
[295] https://nordicpayments.eu/about/

MobilePay, after Swipp failed to take off, Nordea joined MobilePay in 2016[296]. Nordea entered into 6 partnerships with bigtechs between 2017-18, 5 relating to payments (Apple Pay and Samsung Pay in 2017, and Google Pay, Garmin Pay, and Fitbit Pay in 2018), and 1 relating to personal banking (a partnership with Facebook in 2017 to allow customers to make payments via Facebook Messenger). Nordea only joined 3 blockchain consortia between 2016-18.

Open Innovation Modality

In terms of innovation labs, incubators, and/or accelerators that are open to external fintechs, Nordea only established 1, the Nordea Startup Accelerator in partnership with Nestholma in Helsinki and Stockholm, the programme was only run for 2 years between 2015-16 before being terminated. Nordea participated in 6 consortium innovation labs, incubators, and/or accelerators between 2010-19.

Open IT Infrastructure Modality

Nordea was early to launch its open-API store, developer portal and sandbox in 2017. In 2014, Nordea also launched the open IT platform Nordea Next which allows customers to participate in idea-evaluation experiments.

6.2.14 – Rabobank

Acquisition and Investment Modality

Rabobank made 1 fintech acquisition in 2012, an 80% stake in payments fintech MyOrder, which it sold 6 years later in 2018. Rabobank made a number of other fintech related divestitures including terminating in 2015 its payments solution MiniTix which it launched in 2003, and terminating in 2019 its cryptocurrency wallet Rabobit a year after launching it. Rabobank created 5 fintech subsidiaries, including the digitalization of its direct bank RaboDirect which was launched in 1994, the small and medium enterprise lending platform Facturis launched in 2011, and the payment subsidiary SurePay launched in 2017. Rabobank also launched 8 fintech initiatives between 2015-19, 2 of which relate to payments, and 2 that relate to lending. These fintech initiatives include treasury and risk management fintech initiative TreasurUp which was accelerated in Rabobank's internal Moonshot acceleration programme in 2015,

[296] https://www.wiwi.europa-uni.de/de/forschung/publikationen-projekte/dp/_dokumente/406_Moritz_Stadtmann_Stadtmann.pdf

crowdfunding initiative Rabo & Crowd launched in 2018, and peer-to-peer lending fintech initiative Rabo & Co[297]. In terms of internal innovation labs, incubators, and/or accelerators, Rabobank launched the Rabobank Moonshot Campaign in 2015, which allows Rabobank staff to accelerate innovative ideas over a 3-month period after which a decision is made whether or not to commercialize their innovations[298]. In 2016, Rabobank also launched the internal Blockchain Acceleration Lab to explore how the bank can harness blockchain technology. Rabobank was relatively late to establish its own corporate venture capital arm. It launched Rabo Frontier Ventures in 2018, along with a 60 million EUR investment fund[299], which was expanded in 2019 to 150 million EUR, to invest in promising and innovative start-ups in the food, agriculture, and fintech spaces. Rabobank only made 1 fintech lead investment in 2019.

Partnership Modality

Rabobank entered into 11 partnerships with fintechs between 2013-19, 6 of which were with crowdfunding related fintechs. Rabobank was early to partner with crowdfunding fintechs, partnering with 2 as early as 2013. Rabobank partnered with other banks and incumbents on 5 fintech initiatives, including Benelux payment solution Payconiq in 2017, the Trade Finance Distribution Initiative in 2019 which is a trade finance standards setting initiative, and the Dutch Blockchain Coalition in 2017 which is an industry body in the Netherlands that is focused on the application of blockchain technology[300]. Rabobank had comparatively few bigtech partnerships, which were also entered into comparatively late. Rabobank partnered with Apple Pay in 2019, Fitbit Pay in 2019, and with Garmin Pay in 2018; it also partnered with Google in 2018 to launch an artificial intelligence-powered personal banking assistant called Rabo Assistant which uses Google's Google Assistant technology[301]. Rabobank participated in 9 blockchain consortia between 2016-19, 3 that relate to payments, 2 that relate to trade finance, and 2 that relate to commodities, including the commodities trading blockchain platform Repo:NOW which has Rabobank as the primary banking partner[302].

Open Innovation Modality

[297] https://www.finextra.com/newsarticle/29045/rabobank-to-build-online-p2p-platform-linking-private-banking-customers-with-smes
[298] https://www.rabobank.com/en/about-rabobank/innovation/innovative-entrepreneurs/articles/20170530-new-rabobank-moonshots-and-startups-present-themselves-on-demo-day.html
[299] https://www.rabobank.com/en/press/search/2018/20180130-rfv.html
[300] https://dutchblockchaincoalition.org/uploads/pdf/Visiondocument-Blockchain-For-Good-EN.pdf
[301] https://rabobank.jobs/en/grow-magazine/keeping-rabobank-at-the-forefront-of-digitalization-and-innovation/
[302] http://reponow.io/

Rabobank was the only bank of the 20 considered not to establish an innovation lab, incubator, and/or accelerator that is open to external fintechs. Rabobank did however participate in 8 consortium innovation labs, incubators, and/or accelerators (the most out of the 20 banks considered, along with HSBC which also participated in 8 such consortia).

Open IT Infrastructure Modality

Rabobank launched its open API store, developer portal and sandbox in 2018 in accordance with PSD2. The bank also launched an open IT platform – Rabobank Innovate With Your Bank – in 2014 to allow Rabobank customers and staff to collaborate in the cocreation of new products and services.

6.2.15 – Royal Bank of Scotland

Acquisition and Investment Modality

In 2008, the Royal Bank of Scotland (RBS) had to be rescued by the UK government which resulted in the UK government holding as much as 84.4% of the shares of Royal Bank of Scotland in 2019 (which was reduced to 62% as of December 2019)[303]. In the aftermath of the GFC, RBS made a number of divestments, including its US subsidiary Citizens Financial Group in 2015, its insurance holding in 2012 which subsequently became the insurance company Direct Line Group, and its payment processing arm Worldpay Group in 2013. The bank only made two small fintech-related acquisitions relatively late, one of small and medium enterprise accounting fintech FreeAgent in 2018, and a 25% stake in the digital bank Loot which targets millennials and students, however Loot ended up going into administration when a deal whereby RBS would acquire the remaining 75% fell through[304]. RBS has a corporate venture capital arm – NatWest Ventures launched in 1987 – however this is not fintech specific nor did it seek to establish a fintech unit or set-up a fintech fund. RBS was only lead investor in 2 fintechs, including payments unicorn Transferwise in 2018.

RBS established several fintech subsidiaries, launching 5 between 2016-19, including digital only bank Bó in 2019, a digital only bank for businesses called Mettle in 2019, merchant acquiring payment service Tyl by Natwest in 2019, and unsecured lending platform Esme Loans launched in 2016 that targets small

[303] https://www.bbc.co.uk/news/uk-scotland-scotland-business-52478639
[304] https://techcrunch.com/2019/05/22/loot-administration/

and medium enterprises. RBS also undertook 4 fintech initiatives between 2016-19, including artificial intelligence-powered personal banking chatbot Cora launched in 2018[305], and invoice lending initiative NatWest Rapid Cash launched in 2019[306]. RBS spun-off 1 fintech initiative; in 2016 RBS' Innovation Engineering team built the Emerald platform, a Clearing and Settlement Mechanism (CSM) based on the Ethereum blockchain, RBS spun-off Emerald and continued to progress it as an open-source initiative[307]. RBS also established a number of internal innovation labs, incubators, and/or accelerators, including the RBS Digital Studio in London in 2015, the Open Experience (OX) innovation lab/incubator launched in Edinburgh in 2016, and in London in 2018, and Ulster Bank StartUp, an incubation and intrapreneurship programme launched in Dublin in 2018 by RBS' Irish subsidiary Ulster Bank. RBS also established an innovation outpost early on in 2014 in San Francisco called RBS Silicon Valley Solutions.

Partnership Modality

RBS entered into 11 partnerships with fintechs between 2015-19, 6 of which were with lending-related fintechs. RBS partnered with banks and other incumbents on 5 fintech initiatives between 2014-18, 3 of which relate to standards setting (Innovate Finance in 2014, the UK Financial Conduct Authority's Regulatory Sandbox in 2016, the British Standards Authority's Fintech Collaboration Toolkit in 2018). RBS's partnerships with bigtech were relatively limited, partnering with Apple Pay in 2015, and with Google in payments (Google Pay) in 2016 and for customer inquiries (Google Assistant) in 2019. RBS participated in 5 blockchain consortia between 2016-19, 3 of which relate to lending. RBS was also one of the few banks to originate *de novo* a blockchain platform – Emerald – which it later spun-off and open-sourced and which subsequently became the technology underpinning Project GreenPay, an inter-bank payments network in Ireland launched in 2017 by a consortium of Irish banks including Ulster Bank (RBS' Irish subsidiary), Permanent TSB, and Allied Irish Banks, along with Deloitte[308].

Open Innovation Modality

In terms of innovation labs, incubators, and/or accelerators open to external fintechs, RBS launched 2 such initiatives. In 2016, RBS partnered with technology incubator/accelerator Rocketspace to launch its Rocketspace London hub which focuses on fintech and which was Rocketspace's first location outside of San Francisco. In 2018, RBS launched specialist fintech accelerators at 4 of its RBS/NatWest Accelerator

[305] https://www.ft.com/content/fca8c484-e071-11e5-9217-6ae3733a2cd1
[306] https://www.rbs.com/rbs/news/2019/07/natwest-pilots-new-working-capital-product-rapid-cash.html
[307] https://www.finextra.com/newsarticle/29486/rbs-tests-demonstrate-ability-of-ethereum-to-support-a-national-domestic-payments-system
[308] https://www.irishtimes.com/business/financial-services/banks-join-forces-to-test-new-payment-technology-1.3082772

sites (Bristol, Edinburgh, London, and Manchester)[309]. The bank also participated in 2 consortium fintech innovation labs, incubators, and/or accelerators.

Open IT Infrastructure Modality

RBS launched its open-API store, developer portal, and sandbox in 2018 in compliance with PSD2. RBS also launched two open innovation technological interfaces relatively on, for example, in 2013, RBS launched an online 'Ideas Bank' portal to crowdsource ideas for future product initiatives. Some of these initiatives were subsequently developed by NatWest Labs for customers to trial and give feedback on[310].

6.2.16 – Santander

Acquisition and Investment Modality

Santander acquired 4 fintechs between 2016 and 2019, including 2 payments and financial inclusion fintechs in Brazil – Superdigital[311] and Getnet[312] – as well as a 50.1% controlling stake in UK small and medium enterprise banking fintech Ebury in 2019[313]. Santander is also one of the banks that has divested from investments or ceased partnerships the most out of the 20 considered, having done so 6 times between 2008-2019, including winding down a payment solution (Yaap Money) it developed with Telefonica and CaixaBank in 2014 after two years, leaving blockchain consortium R3 in 2016, abandoning German consortium payment solution Paydirekt in 2019, and divesting from its direct banking subsidiary WiZink 2018 (which Santander inherited through its acquisition of Banco Popular). In 2014, Santander launched Santander InnoVentures, its corporate venture capital subsidiary based in London, but which has a global reach, and which focuses on fintech investments[314]. Santander allocated 100 million EUR to InnoVentures in 2014, adding an additional 100 million EUR in 2016[315]. Santander was the most prolific lead-investor of the 20 banks considered, with 14 lead investments between 2013-2019 representing 15% of all lead investments undertaken by the 20 banks. Santander focused on lending (4 lead investments) and payments (3 lead investments) in particular, and was a lead investor in prominent fintechs including Ripple, iZettle (later acquired by PayPal), and MarketFinance.

[309] https://www.business.natwest.com/business/business-services/entrepreneur-accelerator.html
[310] https://www.finextra.com/newsarticle/24637/royal-bank-of-scotland-rolls-out-ideas-bank
[311] https://www.reuters.com/article/banco-santander-brazil-idUSL2N16M119
[312] https://www.reuters.com/article/us-getnet-m-a-santander-brasil-idUSKBN1OI16D
[313] https://www.ft.com/content/ab45172e-feda-11e9-b7bc-f3fa4e77dd47
[314] https://www.fintechfutures.com/2016/07/santander-innoventures-gets-another-100m-for-fintech-investment/
[315] https://www.reuters.com/article/santander-fintech-idUSL8N1A52DQ

Santander has also established a number of fintech subsidiaries. As well as converting two of its direct banks launched in the 1990s into digitalized, online only banks, Santander also launched a number of payment fintech subsidiaries, including One Pay FX, an international money transfer business that is based on blockchain technology (Ripple[316]), and PagoFX, launched in 2019, which expands this offering to non-Santander customers[317]. Santander also established a number of internal fintech innovation labs including the Santander Centres of Digital Expertise, a 5,000 staff-strong technology hub in the UK in 2018 (which opens fully in 2022), a Digital Investment Unit launched in 2018, and a blockchain lab launched in 2016. In 2019, Santander announced a 4-year, 20 billion EUR digital transformation strategy, which saw the establishment of a consolidated fintech unit, the Santander Global Platform. The Santander Global Platform aims to build Santander's own digital and fintech solutions which it can then scale in a software-as-a-service (SaaS) model to the Santander Group, customers, and external parties. The Santander Global Platform encompasses Santander's digital banks, Santander's Banking-as-a-platform technology subsidiary Open Digital Services, global payment services (e.g., PagoFX, Superdigital), and innovation labs (e.g., Centres of Digital Expertise)[318].

Partnership Modality

Santander entered into 13 partnerships with fintech start-ups between 2014-2019 (3 in lending, 2 in payments, and 2 in blockchain), and just as with the acquisition and investment modality, Santander was comparatively overrepresented in terms of partnership cessations (e.g., leaving prominent financial services blockchain consortium R3 in 2016). The bank was also early to partner with bigtechs, mostly in payments (e.g., Apple Pay in 2015, Google Pay in 2016, Samsung Pay in 2017, Alipay in 2018, and WeChat Pay in 2018), including wearables (e.g., Garmin Pay and Fit Bit Pay in 2018), but also extended a few partnerships beyond payments (e.g., with eBay in 2019 in small and medium enterprise lending[319]). Santander also partnered extensively with other incumbents and financial institutions (10 partnerships between 2014-2019) including 4 partnerships in payments (e.g., Spanish mobile payments platform Bizum launched in 2016, which is owned by 27 Spanish banks, the Bank of Spain, and the Spanish government[320]), and 3 partnerships related to standards setting (e.g., Innovate Finance, the British

[316] https://ripple.com/insights/live-transaction-santanders-onepay-fx/
[317] https://www.santander.com/en/stories/simple-fair-international-payments-with-one-pay-fx-and-pagofx
[318] https://www.santander.com/content/dam/santander-com/en/documentos/informe-anual/2019/ia-2019-annual-report-en.pdf
[319] https://www.ft.com/content/661334ac-83b4-11e9-b592-5fe435b57a3b
[320] https://www.expansion.com/empresas/banca/2016/10/06/57f623e822601d41548b4583.html

Standards Institute's Fintech Collaboration Toolkit, and the Global Payments Steering Group which was launched in 2016 to create and maintain the transaction rules for Ripple transactions and formalize standards that govern activities that involve Ripple[321]). Santander has also partnered with banks and other firms in 11 blockchain consortia between 2016-2019, 4 of which were payments related, 3 were trade finance related, and 2 involved blockchain standards. Having made the decision to leave R3 in 2016 – a prominent financial services focused blockchain consortium with wide participation from banks internationally – Santander's has only participated in blockchain consortia based on Ethereum or Hyperledger Fabric technology (or in a few cases, where the underlying technology was undecided). Santander's participation in blockchain standards setting initiatives is noteworthy, particularly its participation in 2017 in the Enterprise Ethereum Alliance, and the Spanish non-profit Alastria which promotes the digital economy through the development of blockchain-based technologies[322].

Open Innovation Modality

While Santander established several internal innovation labs, it only launched one external accelerator in Brazil in 2017, preferring to engage with fintechs in external open innovation initiatives through consortium innervational labs, incubators, and/or accelerators (participating in 6 such consortium initiatives around the world as early as 2010).

Open IT Infrastructure Modality

Santander launched its developer hub, with an open API store and sandbox in 2018, making it available in Europe in line with PSD2 but also extending access to other geographies such as Mexico. In 2014, the bank launched a platform to crowdsource ideas among the bank's employees and its customers to foster community cocreation and innovation.

6.2.17 – Société Générale

Acquisition and Investment Modality

Société Générale made 3 acquisitions (all in 2018), including payments provider and e-money issuer Treezor, personal finance fintech Fiduceo (acquired by Boursorama Banque), and crowdfunding fintech

[321] https://ripple.com/insights/announcing-ripples-global-payments-steering-group/
[322] https://alastria.io/en/

Lumo. A key Société Générale fintech subsidiary is Boursorama Banque which started as an online brokerage in 1995 and which was developed into a direct banking subsidiary; in 2019, Société Générale's retail banking arm Crédit du Nord launched its own direct bank aimed at small and medium enterprises, Prismea, which emerged from an internal Start-Up Call project[323]. The internal Start-Up Call also yielded two further fintech subsidiaries, blockchain-based capital markets solution Forge which became a subsidiary in 2018, and asset and wealth management fintech Kwiper which was spun-off in 2018. In terms of fintech initiatives, Société Générale launched a mobile money solution called YUP in 2017 that operates on an agency banking model across the bank's network in Sub-Saharan Africa; through Société Générale's investment and partnership in the fintech TagPay, it was able to extend YUP's services to customers without bank accounts via mobile telephones thus promoting greater financial inclusion[324].

Société Générale established its corporate venture capital subsidiary SG Ventures in 2018[325] and a 150 million EUR innovation fund in 2019[326]. Société Générale was lead investor in only 2 fintechs, mobile payment technology provider TagPay in 2016, and used car specialist lender Reezocar in 2018. Société Générale did not establish any internal innovation labs, incubators, and/or accelerators, although its vehicle leasing subsidiary ALD Automotive launched an innovation lab in Amsterdam in 2016[327].

Partnership Modality

Société Générale entered into 16 fintech partnerships between 2010-19 (4 relating to securities trading, 2 relating to risk management, 2 relating to crowdfunding, 2 related to small and medium enterprise banking, and 2 relating to payments). Société Générale was comparatively late to partner with bigtechs in payments (Apple Pay and Google Pay in 2017, Samsung Pay and Garmin Pay in 2018), however once it did, it extended some of these partnerships beyond payments, for example in 2018, Boursorama Banque became the first bank in France to offer customers the option to use voice-command operated Google Assistant for bank account management purposes[328]. In most cases Société Générale direct banking subsidiary Boursorama Banque acted as the partnering entity from the bank's side (e.g., with Samsung Pay, Google Pay, Google Home Assistant, and, Garmin Pay). The bank did not enter into partnerships with any of the

[323] https://www.societegenerale.com/en/societe-generale-group/strategy/innovation-and-digital
[324] https://societegenerale.africa/en/une-banque-innovante/yup-modele-bancaire-alternatif/
[325] https://www.ventures.societegenerale.com/en/news/news-detail/news/ventures/
[326] https://www.societegenerale.com/en/news/newsroom/working-closer-partnership-fintechs
[327] https://www.aldautomotive.com/about-ald-automotive/news/mobility-blog/article/designing-your-mobility-at-ald-automotives-mobility-design-center-in-the-netherlands
[328] https://groupe.boursorama.fr/espace-presse/detail,30,31.html?args=OteZ87yx5uyv5o_9dO7zU6HfZHGRI8gGLEyAeRaW9p_UIJdbVlLGbU9M4LXgPXMb3nQppOSjlRRchib%2AfJumTi38C7CnVUkpkedk0xclaCDNsH1fTfpFhGBQfrBPMwqa

Chinese bigtechs, and was one of the few banks to enter into several partnerships with telecommunication firms in Africa. For example, in 2016, Société Générale des Banques de Côte d'Ivoire (SGBCI) launched its mobile payment solution SOGEPAY in collaboration with telecommunications firm MTN Group[329], and in 2010 BFV- Société Générale (Société Générale's subsidiary in Madagascar) partnered with Telma (Telecom Malagasy) one of the largest telecommunications providers in Madagascar to launch the M Vola mobile money service in Madagascar[330]. Société Générale engaged in relatively few fintech-related partnerships with other banks and incumbents; the bank was one of the participants in the French online payments platform PayLib in 2013, 2 industry bodies (France Fintech in 2015 and the French Digital Asset Association, FD2A in 2017), and participated in the interest rates derivatives fintech solution CurveGlobal Limited in 2015. Société Générale participated in 15 blockchain consortia between 2015-19, 3 related to lending, and 3 related to shared know your customer utilities.

Open Innovation Modality

While Société Générale did not establish internal innovation labs, incubators and/or accelerators, it was prolific in establishing ones that are open to external participants. The bank established 9 innovation labs/incubators (2 in Paris in 2016 and in 2018, 1 in London in 2018, 1 in Luxembourg in 2018, 1 in Tunisia in 2017, 1 in Germany in 2017, 1 in Senegal in 2016, 1 in Casablanca, and 1 in the Czech Republic), and an accelerator launched in 2015 in India and Romania. The bank also participated in 3 consortium innovation labs, incubators, and/or accelerators across the world.

Open IT Infrastructure Modality

As well as an open-API platform, developer portal, and sandbox in compliance with PSD2, Société Générale also established a number of open IT initiatives to facilitate cocreation. The bank launched the Open Innovation Platform to facilitate collaboration with external fintechs along with an intrapreneurship programme launched in 2017 (internal Start Up Call)[331], and an internal platform (Startup Radar) that allow the bank's employees to identify experimental initiatives and recommend start-ups with whom the bank can collaborate[332].

[329] https://oxfordbusinessgroup.com/analysis/digital-overground-mobile-banking-continues-grow-popularity
[330] https://www.telecompaper.com/news/telma-launches-mobile-money-service-in-madagascar--732397
[331] https://www.societegenerale.com/en/societe-generale-group/strategy/innovation-and-digital
[332] https://www.finextra.com/newsarticle/30018/socgen-builds-startup-database

6.2.18 – Standard Chartered

Acquisition and Investment Modality

Standard Chartered made no fintech acquisitions. In 2018, Standard Charted launched an innovation unit called SC Ventures in Singapore to lead innovation across the bank. SC Ventures is composed of 4 units, the eXellerator innovation lab (initially launched as a separate innovation lab in 2016), a corporate venture capital arm called SC Ventures Innovation Investment along with a 100 million USD fintech fund, SC Ventures Internal Ventures which is a unit that overseas fintech initiatives partially or wholly owned by the bank, and SC Ventures Fintech Bridge (added in 2019) which seeks partnerships with external fintechs to SC Ventures[333]. Standard Chartered was one of the few banks of the 20 considered to establish an innovation unit that combines an innovation lab, with a corporate venture capital subsidiary and fintech fund, with a vehicle to create partnerships with fintech, and with a unit that establishes internal fintech subsidiaries. As well as the internal eXellerator innovation lab established in Singapore in 2016 (which was incorporated into SC Ventures in 2018), Standard Chartered also launched a number of other internal eXellerator innovation labs in Hong Kong and the UK in 2018, and 2 in Shanghai and 1 in Kenya in 2019. The bank also launched SC Studios, an innovation scouting outpost set-up in San Francisco in 2010, which was later integrated into the network of eXellerator innovation labs. In 2019, the bank also launched the aXess Academy to upskill the bank's developers in skills required for open banking.

The bank established 4 fintech subsidiaries and 1 fintech initiative comparatively late in 2018-19. In 2018, Standard Chartered launched an online only digital bank in the Ivory Coast, which it extended a year later to several other African countries including Nigeria, Kenya, and Uganda[334]. In 2019, the bank launched a virtual bank called Mox in Hong Kong[335]. Standard Chartered also launched a small and medium enterprise lending fintech subsidiary in 2019 called Solv, and banking-as-a-service fintech Nexus in 2019. Mox, Solv, and Nexus were incubated at SC Ventures. In 2019, the bank launched an artificial intelligence-powered personal banking chatbot for customers in Hong Kong. The bank made 5 lead-investments in fintechs between 2015-19, 2 of related to lending, including prominent fintech unicorn Symphony Communication Services which provides collaboration tools in 2019, Chinese fintech unicorn Dianrong which provides online marketplace lending in 2019, and payments fintech Momo in 2016.

[333] https://www.euromoney.com/article/b1b94tmx2z0y4f/private-equity-standard-chartered-wants-to-combine-venture-capital-with-internal-innovation
[334] https://av.sc.com/ng/content/docs/ng-standard-chartered-bank-launches-its-first-ever-digital.pdf
[335] https://mox.com/about-us/

Partnership Modality

Standard Chartered partnered with 6 fintechs between 2016-19, 2 of which relate to online/direct banking fintechs, including supply chain finance fintech Linklogis, and cash management fintech Socash. Standard Chartered partnered with other banks and incumbents on fintech initiatives 5 times between 2016-19, 2 times in relation to trade finance (the Trade Information Network in 2018, and the Trade Finance Distribution Initiative in 2019), and 2 times in relation to standards setting (the UK Financial Standards Authority's regulatory sandbox in 2016, and the Global Payments Steering Group in 2016 that seeks to establish Ripple payment transaction rules). Standard Chartered participated in a large number of blockchain consortia, 15 between 2015-19, 9 of which relate to trade finance use cases, and 3 to payments. Standard Chartered participated in the Monetary Authority of Singapore's pioneering interbank payments blockchain network Project Ubin in 2016, joined the Enterprise Ethereum Alliance in 2019, and was the only bank of the 20 considered to participate in a blockchain consortium built on Tencent's FISCO-BCOS blockchain technology[336].

Standard Chartered was early to partner with bigtech, especially Chinese bigtechs, and partnered with them extensively, beyond the usual payment solutions. Standard Chartered partnered with several bigtechs in payments, including with Apple Pay, Google Pay, and Samsung Pay in 2016, and with Alipay, and WeChat Pay in 2017. In 2017, Standard Chartered signed a general agreement with Alibaba's fintech affiliate Ant Financial Group to collaborate in the countries along China's "Belt and Road Initiative"[337]. In 2018, Standard Chartered and Alibaba partnered to launch a blockchain based cross-border remittance solution in Hong Kong (via AlipayHK) and the Philippines (via GCash), with Standard Chartered acting as the settlement bank for AlipayHK and GCash; the partnership was extended to Pakistan and Malaysia in 2019[338]. In 2017, Standard Chartered partnered with Tencent to launch an e-commerce solution for corporate clients in China which also integrates with WeChat Pay[339]. In 2018, Standard Chartered began collaborating with Huawei to develop internet of things (IoT) sensors that would trigger payments to corporates through the provision of real-time data on the movement of goods[340]. Standard Chartered was also one of the few banks considered to have entered into extensive partnerships with telecommunications firms in the payment subsector, especially in Africa. The bank partnered with several telecommunications

[336] https://www.ledgerinsights.com/standard-chartered-blockchain-supply-chain-finance-linklogis-china/
[337] https://www.reuters.com/article/us-stanchart-alibaba/stanchart-and-chinas-ant-financial-sign-belt-road-partnership-idUSKBN1EC14M
[338] https://www.sc.com/en/media/press-release/we-have-been-appointed-by-ant-financial-as-core-partner-bank-for-its-new-blockchain-cross-border-remittance-service/
[339] https://www.sc.com/en/media/press-release/weve-collaborated-with-tencent-fit-to-launch-a-new-e-commerce-solution-for-corporates/
[340] https://www.finextra.com/newsarticle/32763/standard-chartered-partners-huawei-on-iot-lending-projects

firms to integrate mobile money and mobile wallets to enable customers to make cashless payments to banked and unbanked beneficiaries, including with Indosat in Indonesia in 2015, MTN Uganda in Uganda in 2017, MTN in Tanzania in 2016, Easypaisa in Pakistan in 2015, Airtel in Ghana in 2015, Momo in Vietnam in 2015, bKash in Bangladesh in 2015, with M-Pesa and Tigo-Pesa in Tanzania in 2015, with Globe Telecom in the Philippines in 2014, with eTranzact in Nigeria in 2014, with Advanced mPay in Thailand in 2014, and with Safaricom's M-Pesa in Kenya in 2013.

Open Innovation Modality

Standard Chartered did not establish any innovation labs, incubators, and/or accelerators that were open to external fintechs, however in 2019, SC Ventures added a fourth division, SC Ventures Fintech Bridge to create links with external fintechs. SC Ventures Fintech Bridge connects start-ups, investors, and ecosystems to Standard Chartered and its corporate clients, as well as enabling fintechs to rapidly conduct proofs of concept with the bank. SC Ventures Fintech Bridge is present in the same geographies as SC Ventures, Singapore, Hong Kong, the UK, San Francisco, Shanghai and Kenya[341]. Standard Chartered also participated in 3 consortium innovation labs, incubators, and/or accelerators between 2010-17.

Open IT Infrastructure Modality

Standard Chartered launched its open-API store, developer portal and sandbox – aXess – relatively late in 2019, but when it did, it made open APIs available beyond Europe, where this was required by PSD2, to Asia, the Americas, Africa, and the Middle East[342]. That year, the bank also launched aXess Labs, an open community to experiment with cutting edge technologies. SC Ventures also launched a number of open IT initiatives including the Client Engagement & Co-Creation platform which enables Standard Chartered customers and staff to collaborate to cocreate new products and prototype new offerings. In 2018, SC Ventures also created a PoC sandbox to enable fintechs with whom it is partnering to run proofs of concepts with Standard Chartered using anonymized data within 2 weeks.

6.2.19 – UBS

Acquisition and Investment Modality

[341] https://www.sc.com/en/media/press-release/sc-ventures-launches-sc-ventures-fintech-bridge/
[342] https://www.sc.com/en/media/press-release/were-turbo-charging-our-open-banking-capabilities/

UBS made no fintech related acquisitions, established no fintech subsidiaries (it quickly sold off the only fintech subsidiary it did establish), did not launch a corporate venture capital subsidiary, did not launch a fintech fund, and made no lead investments in any fintechs. In 2018, UBS launched 1 fintech initiative, two animated digital assistants which it developed in collaboration with IBM and avatar biometrics company FaceMe. In 2017, UBS launched a robo-advisory subsidiary called SmartWealth, but sold it less than 1 year later to asset and wealth management fintech SigFig with whom UBS has a wide-ranging partnership[343].

UBS was one of only 3 banks from those considered to have set up its own internal Think Tank, UBS Y, which was launched in 2014[344]. UBS also launched 5 internal innovation labs relatively early on which focus on its key businesses, asset and wealth management, and investment banking: the UBS Wealth Innovation Lab launched in 2014 in Zurich which also has 2 innovation outposts in Tel Aviv and San Francisco, the EVOLVE - UBS Centre for Design Thinking & Innovation launched in Singapore in 2015, the UBS Strategic Development Lab focused on investment banking launched in Zurich in 2018, the Advisor Technology Research and Innovation Lab, an internal lab launched in 2016 in San Francisco in collaboration with SigFig, and, the UBS Innovation Spaces launched in 2014.

Partnership Modality

UBS entered into 10 fintech partnerships between 2014-18, 3 of which focused on asset and wealth management and 2 that focused on payments. This includes 2 Chinese fintechs, including Lufax, China's largest internet finance company, which is associated with the China Ping An Group conglomerate[345], and the asset and wealth management fintech SigFig with whom UBS has a wide-ranging collaboration. UBS entered into 3 partnerships with other banks and incumbents between 2014-15, including Swiss mobile payment solution Twint which was launched in 2014 and which was owned by SIX (26.5%), Postfinance (26.5%), a group of major Swiss banks including UBS and Credit Suisse (26.5%), and Worldline (20%)[346]. In terms of bigtech partnerships, UBS did not enter into partnerships with any of the major bigtechs (Apple, Google, Samsung, Alibaba, Tencent), however it did partner with Garmin Pay (Garmin), Fitbit Pay (Google), and SwatchPAY (Swatch), to enable UBS customers to make payments through wearable

[343] https://www.finextra.com/newsarticle/32587/ubs-closes-smartwealth-robo-advisor-sells-tech-to-sigfig
[344] https://ubs-y.com/who.html
[345] https://www.reuters.com/article/us-lufax-fundraising-idUSKBN1O20HG
[346] https://www.finews.com/news/english-news/31870-twint-six-worldline-mobile-payment-solution

devices. The bank also partnered with Amazon in 2016 to launch Ask UBS, a voice-activated service that gives users access to the investment insights of UBS's Chief Investment Officer House View[347].

UBS entered into 7 blockchain consortia, 2 of which related to payments. UBS was the only bank of the 20 considered to have originated *de novo* 2 blockchain consortia. In 2015, UBS in collaboration with technology firm Clearmatics began working on the Utility Settlement Coin (USC), an asset-backed digital cash instrument implemented on blockchain technology that can be used for interbank payments and international cross-border payments. In 2019, the project evolved into the firm Fnality International, UBS remained a shareholder and ecosystem leader, with participation extended to a consortium of banks who also became shareholders including: Santander, Barclays, Credit Suisse, ING, Lloyds Banking Group, Nasdaq, State Street, and Bank of New York Mellon[348]. In 2017, UBS launched the Massive Autonomous Distributed Reconciliation platform (MADREC) with participation from Barclays, Credit Suisse, KBC, SIX and Thomson Reuters. MADREC facilitates banks' ability to reconcile a wide range of data about their counterparties in response to regulatory changes associated with Markets in Financial Instruments Directive (MiFID) II[349].

Open Innovation Modality

UBS's innovation labs, incubators, and/or accelerators that are open to external fintechs, were less expansive than its internal innovation labs, incubators, accelerators, innovation outposts, and think tank, launching only 3 in the time period considered. UBS launched an external innovation lab focused on blockchain in London in 2015 at the Canary Wharf Group's Level39 accelerator space, a digital hub in Hong Kong in 2017, and, the UBS Future of Finance Challenge, an incubation challenge that the bank launched in 2014 and which runs every 2 years[350]. UBS also participated in 3 consortium innovation labs, incubators, and/or accelerators between 2010-15.

Open IT Infrastructure Modality

In 2019, UBS launched its open-API portal, developer toolkit, and sandbox. Other than this, it did not launch any other open IT infrastructure initiatives.

[347] https://www.pymnts.com/news/partnerships-acquisitions/2016/ubs-amazon-team-to-launch-ask-ubs/
[348] https://www.finextra.com/newsarticle/33921/big-banks-create-utility-settlement-coin-company
[349] https://www.coindesk.com/ubs-launch-live-ethereum-platform-barclays-credit-suisse
[350] https://www.ubs.com/microsites/future-of-finance-challenge/en.html

6.2.20 – UniCredit

Acquisition and Investment Modality

UniCredit made no fintech acquisitions, undertook no fintech initiatives, and established only 1 fintech subsidiary (the mobile only bank Buddybank which was launched in 2018). In 2016, UniCredit launched its corporate venture capital arm UniCredit EVO, along with 200 million EUR fintech fund. UniCredit was lead investor in relatively few fintechs (only 3 between 2018-19). In terms of internal innovation labs, incubators, and/or accelerators, the only one that UniCredit launched was for its German subsidiary HypoVereinsbank, the HVB Innovation Lab launched in Munich in 2016. UniCredit made 4 fintech-related divestments, including selling German direct bank Direkt Anlage Bank to BNP Paribas in 2014, divesting from its stake in online brokerage FinecoBank from 2014 onwards, German payments network Paydirekt in 2019, and the sale of UniCredit's e-money processing unit to SIA Group.

Partnership Modality

UniCredit entered into 6 fintech partnerships between 2015-17, 2 of which related to payments, and 2 that related to open banking. The bank only partnered with other banks and incumbents in one fintech initiative and participated in only 5 blockchain consortia between 2016-18. However, UniCredit partnered quite extensively with bigtechs, including with Apple Pay in 2017, with Google Pay in 2018, and Samsung Pay in 2019. In 2018, Buddybank partnered with Apple to allow users to interact with the bank via Apple Business Chat, and with Amazon to allow its customers in Austria to access banking services through Amazon Alexa.

UniCredit entered in a series of wide-ranging partnerships with Alibaba. Following a memorandum of understanding in 2014 between Alibaba Group and the Italian Government, Alibaba launched the E-Marco Polo e-shop on its Tmall Global platform in collaboration with UniCredit, Intesa Sanpaolo and several other Italian firms. In 2017, UniCredit partnered with Alipay. In 2018, UniCredit and Alibaba entered into a collaboration to support Italian exporters. As part of this collaboration, UniCredit launched the Easy Export platform facilitating clients' use of the Alibaba.com platform while having access to UniCredit's banking products and services, including supporting their internationalization[351].

[351] https://www.unicreditgroup.eu/en/press-media/press-releases/2018/unicredit-e-alibaba-com-insieme-a-sostegno-dell-export-italiano.html?intcid=INT-IG_CTA0019

Open Innovation Modality

UniCredit only established 1 innovation lab, incubator, and/or accelerator open to external fintechs, the UniCredit Start Lab accelerator launched in 2014 in Milan. The bank also only participated in 2 consortium innovation labs, incubators, and/or accelerators relatively late in 2018-19.

Open IT Infrastructure Modality

In 2019, UniCredit launched its open-API portal, developer toolkit, and sandbox. Other than this, it did not launch any other open IT infrastructure initiatives.

6.2.21 – Summary Table of Findings at the Case Level

Table 2 presents a tabulated summary of the findings of "Data Collection Activity 3: Longitudinal Study of Modalities of Banks' Strategies of Interdependence through Documents and Archival Databases" at the individual case level.

	Investment & Acquisition Modality	Partnership Modality	Open Innovation Modality	Open IT Infrastructure Modality
HSBC	- No acquisitions - No internal innovation labs, think tanks, incubators, or accelerators (one of only 3 banks) - 2014: corporate venture capital arm in London + corporate venture capital coverage group in San Francisco in 2017 - 2014: 200 million USD fintech fund - Direct banking subsidiaries: First Direct (1989), HSBCdirect (US), Kinetic (2019) - Payments subsidiary: PayME (2017, Hong Kong) - Fintech initiatives: 6 chatbots (2018-19) & digital social network (2017) - 7 lead investments (6 between 2017-19)	- 10 fintech partnerships (6 in 2017-19) - Early partnerships with Western bigtechs (2015-18) - Extensive partnerships with Chinese bigtechs (2018-19) including beyond payments (e.g., fintech alliance with Tencent) - Standards setting including as ecosystem leader (Innovate Finance 2014, FCA sandbox 2016, Fintech Collaboration Toolkit 2018, open-API standards in Hong Kong 2019) - Participation in 11 blockchain consortia, especially in trade finance - Early leadership in blockchain: landmark initiatives (Project Ubin 2015, Project Jasper 2016)	- 4 external innovation labs (trade finance Singapore 2015, Hong Kong 2016, data London & Toronto 2019) - Participated in several consortium innovation labs/ incubators/ accelerators	- Open API platform, developer toolkits & sandbox (2019) - Partnership with SWIFT to define open-API industry standards in Hong Kong
BNP Paribas	- Direct banking acquisitions: DAB in 2014, Compte Nickel in 2017 - Direct banking fintech subsidiaries: Hello Bank! In 2013, Consorsbank - 2 fintech initiatives, inc. personal banking chatbot in 2019 - Corporate VC: BNP Paribas Capital Partners in 2014, Opera Tech Ventures in 2018 which specializes in fintechs - 5 lead investments 2016-19, inc. unicorn Symphony (collaboration services), 10% in Caple BV (SME lending) - One of only 3 banks to have an internal think tank, L'Atelier BNP Paribas launched in 1978 (Paris, San Francisco, Shanghai) - Internal labs: Cash Management Fintech Lab (Europe 2017, Asia Pac 2019), BNP Paribas Design Factory Asia focused on wealth management (Singapore 2017)	- 17 fintech partnerships (11 in 2017-19), 3 in AWM, 3 in crowdfunding, 2 in blockchain - Late to partner with bigtech - Partnered with Tencent to allow Chinese corporate clients to execute FX transactions through WeChat - Partnered with other banks/incumbents, mostly in payments (PayLib in 2013, LyfPay in 2017, BLIK in 2015, Payconiq in 2018) - Participated in 17 blockchain consortia (2015-19), 4 related to trade finance	- Fintech acceleration programme with Plug and Play (US 2016, Paris 2017) - L'Atelier BNP Paribas launched fintech acceleration programme Fintech Boost (Paris 2016, US 2018) - 60 "We Are Innovation" (WAI) centres across France, 1 dedicated to fintech in 2016 - Participated in consortium innovation labs/ incubators/ accelerators globally	- Open API platform, developer toolkits & sandbox (2019) - 2 Open IT initiatives: BNP Paribas' Startup Engagement Kit (2017), OpenUp (2016) to facilitate collaboration between staff, customers, external parties
Crédit Agricole	- 1 acquisition of personal finance fintech WeSave in 2019 - 2 fintech subsidiaries (direct banks BforBank in 2010, Findio in 2015) - No corporate venture capital subsidiary - Small fintech fund (50m EUR) administered by external VC firm - 4 lead investments (2016-19), 2 in crowdfunding, 2 in in payments - Only bank to have its own internal university (IFCAM) - 2 internal innovation labs launched in 2017 and 2018	- 10 fintech partnerships (2014-19), 3 in payments - 6 partnerships with other banks/incumbents, 3 in payments including own initiative Kwixo in 2011 which was abandoned in favour of consortium initiative PayLib in 2014, and the blockchain standards setting initiative French Digital Asset Association (FD2A) - Late to partner with bigtech, limited partnerships - Participated in 11 blockchain consortia, 3 focused on a shared know your customer (KYC) utility, 2 on fund management	- Le Village by CA in 2014, network of 33 incubators/accelerators in France, Italy, and Luxembourg, covering fintechs and other industries, with innovation outposts in London, New York, Shanghai, and Tokyo - Launched fintech start-up studio, La Fabrique by CA in 2018 - Participated in only 1 consortium innovation lab, incubator/accelerator	- Early to embrace open IT platforms - Launched CA Store in 2012 for staff, customers, and start-ups to cocreate innovative solutions, later expanded to include open API store, developer portal, and sandbox

Santander	- 4 acquisitions (2016-19), 2 payments fintechs in Brazil (Superdigital, Getnet), UK SME banking fintech Ebury in 2019 - Several divestments - Corporate venture capital arm Santander InnoVentures launched in 2014 in London focused on fintech - 200 million EUR fintech fund (100m EUR 2014, 100m EUR 2016) - Prolific in lead investments (15% of all lead investments by the 20 banks) - 14 lead investments (2013-19), 4 in lending, 3 in payments - Several fintech subsidiaries, 2 direct banking subsidiaries, 2 payments subsidiaries (PagoFX, One Pay FX) - Several internal innovation labs/incubators/accelerators, Santander Centres of Digital Expertise in London (5,000 staff, 2018), Digital Investment Unit in 2018, blockchain lab in 2016 - In 2019, Santander announced 4-year, 20 billion EUR digital transformation strategy, part of it was to establish a dedicated fintech unit - the Santander Global Platform - to build and scale own fintech solutions which it can then provide to the Santander Group, customers, and external parties on a banking-as-a-service basis. The unit includes Santander's Banking-as-a-platform technology subsidiary Open Digital Services, Santander's fintech subsidiaries, and innovation labs	- 13 fintech partnerships (2014-19), 3 in lending, 2 in payments, 2 in blockchain - Several partnership cessations - Early to partner with bigtech (2015-18), including a few non-payments initiatives - 10 partnerships with other banks/incumbents, 4 in payments, 3 in standards setting (inc. Enterprise Ethereum Alliance, Alastria) - Participated in 11 blockchain consortia (2016-19), 3 focused on payments, 3 on trade finance, and 2 related to blockchain standards. All based on Hyperledger Fabric or Ethereum (Left R3 in 2016)	- Only 1 external accelerator in Brazil in 2017 - Participated in 6 consortium innovation lab, incubator/accelerator	- Launched open API store, developer portal, and sandbox in 2018; extended it beyond Europe (e.g., Mexico) - Idea crowdsourcing platform in 2014 for customers & staff to collaborate & cocreate innovative solutions
Deutsche Bank	- 1 acquisitions in 2018 of open banking fintech Quantiguous - 2 fintech subsidiaries including stand-alone fintech start-up factory Breaking Wave (2019) - 2 fintech initiatives (mobile payment solution in 2017, chatbot in 2018) - No corporate venture capital arm - Deutsche Bank Digi-Ventures Fund launched in 2017 - 4 lead-investments in fintechs (2016-19) - 2 internal innovation labs (Frankfurt in 2016, Shanghai in 2019)	- 7 fintech partnerships (2011-19) with well established fintechs that had partnered with other banks - 7 partnerships with other banks/incumbents (2015-19) mostly in payments; 16.67% stake in German payment platform Paydirekt along with other banks, Paydirekt lagging behind other payment solutions - Late to partner with bigtech, limited partnerships - Leveraged lead-investment in payment fintech Modo to offer Deutsche Bank customers access to Alipay, WeChat Pay, PayPal, & M-Pesa through Modo in 2018 - Leveraged partnership with fintech Symphony Communication Systems to offer Chinese corporate clients FX trading through WeChat in 2019 - Participated in only 7 blockchain consortia (2016-19), 2 payments, 2 shared-KYC	- External innovation lab Deutsche Bank Innovation Network (London & Berlin 2015, Palo Alto 2016, New York 2017, and Singapore in 2018 - Participated in 6 consortium innovation labs, incubators, and/or accelerators (2010-19)	- Launched open API store, developer portal, and sandbox - Deutsche Bank Pitch Portal in 2017 for fintechs to pitch ideas to different departments at Deutsche Bank
Société Générale	- 3 acquisitions in 2018: Treezor (payments), Fiduceo (personal finance), Lumo (crowdfunding) - Boursorama Banque key fintech subsidiary (direct bank) originally an online brokerage launched in 1995 - Internal Start-Up call project lead to 3 fintech subsidiaries: Prismea (direct bank for SMEs) in 2019, Forge (blockchain based capital markets solution) in 2018, Kwiper (wealth management) which was spun-off in 2018 - Fintech initiatives: YUP in 2017, agency banking model across	- 16 fintech partnerships (2010-19), 4 securities trading, 2 risk management, 2 crowdfunding, 2 SME banking, 2 payments - Late to partner with bigtech, but once it did, it expanded beyond payments - Most fintech partnerships via Boursorama Banque - Boursorama Banque, first bank in France to offer customers voice-command operated	- Prolific in establishing external innovation labs, incubators, and/or accelerators - 9 innovation labs/incubators (2 in Paris in 2016 & 2018, 1 in London in 2018, 1 in Luxembourg in 2018, 1 in Tunisia in 2017, 1 in Germany in 2017, 1 in Senegal in 2016, 1	- Launched open API store, developer portal, and sandbox - Intrapreneurship programme launched in 2017 (internal Start Up Call) - Open Innovation Platform to facilitate collaboration with external fintechs - Internal platform (Startup

	bank's network in Sub-Saharan Africa; extended to unbanked via partnership with fintech TagPay - Corporate venture capital subsidiary: SG Ventures in 2018 - Launched 150 million EUR innovation fund in 2019 - Only 2 lead investments (including TagPay in 2016) - No internal fintech innovation labs, incubators, and/or accelerators (vehicle leasing subsidiary ALD Automotive launched innovation lab in 2016)	banking via Google Assistant - No partnerships with Chinese fintechs - One of the few banks considered to have extensive partnerships with telecommunications firms especially in Africa - Relatively few partnerships with other banks/incumbents - Participated in 15 blockchain consortia (2015-19), 3 lending, 3 shared-KYC	in Casablanca, and 1 in the Czech Republic) - Accelerator launched in 2015 in India & Romania - Participated in 3 consortium innovation labs, incubators, and/or accelerators	Radar) for bank's employees to identify experimental initiatives & recommend start-ups to collaborate with
Groupe BPCE	- High number of acquisitions - 8 acquisitions (2015-19), inc. German digital-only bank Fidor (2016), 50.1% stake in digital-only bank Oney Bank (2019), 4 payments fintechs (2016-17), 1 crowdfunding fintech (2015), customer-loyalty fintech (2018) - Key fintech subsidiaries: Natixis Payments (over 20% market share of payments in France), S-Money (focused on innovative payment solutions) launched in 2011, and 3 crowdfunding subsidiaries - 4 payments fintechs acquired subsequently integrated into S-Money and Natixis Payments - No corporate venture capital arm - No fintech fund - Only 3 lead investments (2017-19) - Internal innovation programme in 2015 (the Spark Program) later expanded into internal innovation lab/incubator in Paris (the BIG Factory) in 2017 - Looking to divest from Fidor Bank due to alignment problems	- 12 fintech partnerships (2015-19), 4 related to payments (inc. first major European bank to partner with TransferWise in 2019), 2 related to crowdfunding - Limited but targeted partnerships with bigtech especially in payments e.g., S-Money partnership with Twitter to enable customers to make payments via Twitter, first bank in France to offer Samsung Pay in 2018 - 5 fintech-related partnerships with other banks/incumbents, 3 related to payments - Participated in 12 blockchain consortia (2015-19), 4 in lending, 3 relate to shared-KYC; participated through Natixis in 10/12 cases	- Innovation lab, incubator, and accelerator, 89C3, focused on both developing internal capabilities & partnering with external fintechs; 89C3 aims to mobilize 1,000 Groupe BPCE employees and open several acceleration centres in France and overseas - Caisse D'Epargne launched 2 regional incubators/accelerators in France in 2016 - Only participated in 2 consortium innovation labs, incubators, and/or accelerators	- Through 89C3, embraced open data & open-API approach beyond what was called for by PSD2 - Early to launch open-API portal, developer toolkits, and sandbox in 2017; supplemented with user experience (UX) charter & podcasts for developers - Includes Start-Up PASS to facilitate the way the bank works with start-ups, including a platform to digitalize many processes
Barclays	- 2 fintech acquisitions early on: customer loyalty fintech in 2012, payments fintech in 2014 - Early to establish payments focused fintech subsidiaries: Pingit in 2012, bPay (wearables payment solution) in 2015 which was incorporated into Pingit in 2019 - Corporate venture capital arm, Barclays UK Ventures (BUKV) launched in 2018 - Launched a 100 million GBP fund, Barclays Technology Fund, in 2015 - From 2018 allocated 10 million GBP/year to invest in each annual cohort of 10 fintechs to emerge from the bank's external accelerator - Lead investor in 9 fintechs (2017-19), 2 relate to fintechs providing loyalty schemes, 2 relate to SME lending fintechs - No internal innovation labs, incubators, and/or accelerators	- 15 fintech partnerships (2012-19), 4 focused on payments, 4 focused on risk management - Terminated partnership with cryptocurrency exchange Coinbase in 2019 - Reluctant to partner with bigtechs in payments (Barclays owns Barclaycard, the UK's largest credit card provider with a market share of 27%); limited/late bigtech partnerships - 7 partnerships with other banks/incumbents (2014-19), 4 relate to standards setting - Participated in 9 blockchain consortia (2015-19), 2 focus on trade finance, 2 focus on lending	- Early to launch innovation labs, incubators, and/or accelerators that were open to external fintechs - Did so in extensive and coordinated way, launching innovation labs that are linked to well-funded accelerators - Launched Rise, a fintech innovation lab with offices in London, New York, Tel Aviv, and Mumbai in 2015 - Partnered with Techstars (acceleration specialist) to launch Barclays Accelerator in London, New York, and Tel Aviv in 2014; separate accelerator in Cairo & Female Innovation Lab in New York in 2019 - Only participated in 2 consortium innovation labs/ incubators/ accelerators	- Open API platform, developer toolkits & sandbox (2018) - 2 open IT platforms: Barclaycard Ring Community to crowdsource innovative ideas focused on payments in 2012, Launchpad App for customers, staff, and third parties to collaborate and cocreate innovative ideas in 2015

Lloyds Banking Group	- No fintech acquisitions - No fintech initiatives - 1 fintech subsidiary (direct bank converted to an online only bank in 2005) - No corporate venture capital arm - No fintech fund - Only 1 lead-investment in fintech (10% stake in banking infrastructure fintech Thought Machine in 2018) - 2 internal innovation labs (Scottish Widows innovation lab in 2016, 500-employee Digital Tech Hub in Edinburgh in 2018)	- Only 4 fintech partnerships (2015-19), 2 related to payments - Only 2 bigtech partnerships - 5 partnerships with other banks/incumbents (3 related to standards setting) - Late to participate in blockchain consortia (2018-19) and only participated in 4 consortia, 3 of which related to interbank payments	- Only established 1 innovation lab open to external fintechs, the LBG Innovation Lab launched in 2015 - Only participated in 3 consortium innovation labs, incubators, and/or accelerators	- Launched open API platform, developer toolkits & sandbox - Launched Lloyds Banking Group Fintech Mentoring Scheme in 2016 (platform for fintech start-ups to seek mentoring from the bank's staff)
ING	- 3 fintech acquisitions (2015-18), customer loyalty fintech, payments fintech, and SME lending fintech - 1 fintech subsidiary, ING Direct, direct bank launched in 1997 and subsequently digitalized - Corporate venture capital arm ING Ventures launched in 2017 - 300 million EUR fund to invest in fintechs launched in 2017; 25 million EUR/year fund to accelerate internal fintech initiatives launched in 2013 - Launched the Think Forward Initiative in 2017 (supported by Deloitte, IBM, AWS, and the Center for Economic Policy Research), includes: the TFI Research Hub which conducts research on people's decision-making behaviours, the TFI Accelerator which translates the insights into technological innovations, and the TFI Community Hub which promotes the activities of the other 2 hubs - Run internal incubator, ING Innovation Bootcamp, since 2015; and internal accelerator, PACE Accelerator, since 2018 - Overrepresented in fintech spin-offs (9/11 of the spin-offs observed by the 20 banks); most spin-offs incubated/accelerated at ING's internal incubators and accelerators; 4 payments related; includes prominent fintech spin-offs like Payconiq launched in 2015 later becoming the prominent Benelux payment provider Bancontact Payconiq Company, corporate banking fintech Cobase in 2016, personal banking fintech Yolt in 2016, and, artificial intelligence-based bond trading solution Katana Labs in 2019 - 9 lead investments in fintechs (2015-19), 2 related to payments, 4 related to lending (inc. Hong Kong based unicorn WeLab)	- 13 fintech partnerships (2014-19): 4 crowdfunding fintechs, 2 payments fintechs, 2 blockchain fintechs, 2 personal finance fintechs & strategic partnership with fintech unicorn Kabbage - Late to partner with bigtechs in core geographic markets, early to partner with them in non-core geographic markets - Through acquisition of fintech Payvision was able to partner with Chinese bigtechs - 6 fintech-related partnerships with other banks/incumbents including 3 in payments, 1 standards setting (Dutch Blockchain Coalition in 2017) - Participated in 12 blockchain consortia (2017-19): 4 related to commodities, 2 related to lending, 2 related to trade finance - One of the few banks from those considered to have initiated and assumed the position of ecosystem leader in a blockchain network (commodities financing blockchain platform Komgo, launched in 2018 and incubated in ING's Innovation Bootcamp in 2016)	- Prominent in launching innovation labs, incubators, and accelerators that are open to external participation - Launched ING Labs in 2017 in Amsterdam, Brussels (initially launched in 2015), London, and Singapore - Launched series of incubators, ING Innovation Centers, in Germany, Turkey, and Poland in 2018 - Launched Fintech for Impact incubator in the Philippines in 2019 - Participated in 4 consortium innovation labs, incubators, and/or accelerators	- Launched open API platform, developer toolkits & sandbox in 2018 - Several open IT innovation platforms to facilitate collaboration/cocreation between ING staff, customers, and third parties: France in 2013, Turkey in 2014, Orange Sharing in 2015, and ING Touchpoint Platform in 2017 aimed at rapidly bringing cocreated innovative solutions to market - One of the few banks of the 20 considered to widely apply its own innovation methodology, PACE in 2016, later extended to the entire group through the ING one Way of Working (WoW) in 2017
Crédit Mutuel	- Large number of acquisitions: 9 between 2009-19 - 3 acquisitions of payments fintechs (Monext in 2009 which was a major player in the French electronic payment market, Mangopay in 2015, and Pumpkin in 2017); 3 acquisitions of direct/online banking fintechs (including a 50% stake in Banque Casino in 2011), and 2 crowdfunding fintechs (Leetchi in 2015, HelloAsso in 2017) - 9 fintech subsidiaries, 4 crowdfunding subsidiaries (2015-18), 3 related to direct/online banking (inc. Fortuneo Banque in 2009, and Arkéa Banking Services, a banking-as-a-platform service that provides a white-labelled banking platform to other firms, launched in 2010 by Crédit Mutuel Arkéa) - 2 venture capital subsidiaries inc. NewAlpha Asset Management in 2015 - NewAlpha launched fintech fund, NewAlpha Fintech, which it closed in 2017 with 56 million EUR	- 9 fintech partnerships (2014-19): 3 related to crowdfunding, 3 related to AWM, 2 related to personal finance - Often takes a significant non-lead investment in fintechs it partners with (30% of Linxo in 2017, 28% in Vivienne Investissement in 2016, 30% in Masuccession.fr) - Several bigtech partnerships, many of which were through its fintech subsidiaries Max and Fortuneo Banque - 5 partnerships with other banks/incumbents (2013-18), 4 focused on payments, including Lyf Pay (the result of the merger of BNP Paribas' Wa! and Credit Mutuel's Fivory wallets in 2016), and Monético International launched in 2013 in	- Comparatively late in establishing innovation labs, incubators, and/or accelerators open to external fintechs: 3 between 2016-18 - Only participated in 2 consortium innovation labs, incubators, and/or accelerators - Confined to France and often regional initiatives	- Launched open API platform, developer toolkits & sandbox - No other open IT infrastructure initiatives

	- Limited lead investments in fintechs: 5 between 2011-19, 2 of which relate to payments - 3 internal innovation labs/incubators launched between 2016-18 - Crédit Mutuel Arkéa is overrepresented compared to the other 4 regional groups (Crédit Mutuel is composed of 5 regional groups) in the acquisition and investment modality: 5/9 fintech acquisitions, 7/9 fintech subsidiaries, 2/5 lead investments, 1/3 internal innovation labs/incubators	partnership with Mouvement Desjardins - Only participated in 1 blockchain consortium in 2017 - the least of the 20 banks considered - Crédit Mutuel Arkéa overrepresented in the partnership (compared to the remaining 4 groups in Crédit Mutuel): 7/9 fintech partnerships, 5/5 bigtech partnerships, 1/1 blockchain consortia		
UBS	- No fintech related acquisitions - No fintech subsidiaries (1 robo-advisory fintech launched in 2017 sold off to fintech with whom it has a partnership, SigFig, less than a year later) - No corporate venture capital subsidiary - No fintech fund - No lead investments in any fintechs - 1 fintech initiative - Only one of 3 banks considered to have set up internal Think Tank, UBS Y, in 2014 - 5 internal innovation labs relatively early focused on key businesses (AWM & investment banking), including: Zurich in 2014 with 2 innovation outposts in Tel Aviv and San Francisco, Singapore in 2015, Zurich in 2018, San Francisco in 2016 in partnership with SigFig	- 10 fintech partnerships (2014-18): 3 focused on AWM, 2 focused on payments, including 2 Chinese fintechs (like Lufax, China's largest internet finance company), and SigFig with whom UBS has a wide ranging relationship - 3 partnerships with other banks/incumbents (2014-15), inc. Swiss payment solution Twint in 2014 - No partnerships with major bigtech (3 partnerships with wearables bigtech providers to enable payments through wearable devices) - Participated in 7 blockchain consortia, 2 for payments - Only bank of the 20 considered to have originated de novo 2 blockchain consortia: Fnality launched in 2015, and the Massive Autonomous Distributed Reconciliation platform (MADREC) in 2017	- Less expansive network of innovation labs, incubators, and/or accelerators that are open to external fintechs: blockchain lab in London in 2015, digital hub in Hong Kong in 2017, and UBS Future of Finance Challenge in 2014 - Only participated in 3 consortium innovation labs, incubators, and/or accelerators (2010-15)	- Launched open API platform, developer toolkits & sandbox in 2019 - No other open IT infrastructure initiatives
UniCredit	- No fintech related acquisitions - 1 fintech subsidiaries, mobile-only bank Buddybank in 2018 - No fintech initiatives - Corporate venture capital arm, UniCredit EVO in 2016 - 200 million EUR fintech fund in 2016 - Only 3 lead investments in fintechs (2018-19) - Only 1 internal innovation labs/ incubator/ accelerators (by German subsidiary HypoVereinsbank in 2016) - 4 fintech-related divestments	- 6 fintech partnerships (2015-17): 2 related to payments, 2 related to open banking - Only 1 partnership with other banks/incumbents - Participated in only 5 blockchain consortia between 2016-18 - Extensive partnerships with bigtechs, including wide-ranging partnerships with Alibaba	- Only 1 innovation lab, incubator, and/or accelerator open to external fintechs in Milan in 2014 - Only participated in 2 consortium innovation labs, incubators, and/or accelerators relatively late (2018-19)	- Launched open API platform, developer toolkits & sandbox in 2019 - No other open IT infrastructure initiatives
Intesa Sanpaolo	- No fintech related acquisitions - No internal innovation labs/ incubators/ accelerators - 5 fintech subsidiaries (2011-18), 3 relating to payments - 2 corporate venture capital arms, including Neva Finaventures in 2016 which is linked to the Intesa Sanpaolo Innovation Center - 30 million EUR fintech fund in 2016 - Only 3 lead investments in fintechs comparatively late (2018-19), though it acquired a large stake in each case (16.09% in payments fintech MatiPay in 2019, 16.7% of crowdfunding fintech Backtowork in 2019, 37.9% of personal finance fintech Oval Money in 2018)	- 6 fintech partnerships (2015-18) - 1 fintech related partnership with other banks/incumbents - Participated in 5 blockchain consortia (2017-19), 2 related to payments, and the Spunta Banca Project in 2018, an interbank settlement blockchain network headed by the Associazione Bancaria Italiana (ABI) - Comparatively late to partner with bigtechs in payments (2018-19)	- Launched the Intesa Sanpaolo Innovation Center in Turin in 2015, an innovation lab, incubator, and accelerator open to external fintechs, expanded to London in 2016, with 2 additional labs in 2018 (one focusing on the circular economy, and one on AI & neuroscience) - Participated in 4 consortium innovation labs, incubators, and/or accelerators (2014-18)	- Launched open API platform, developer toolkits & sandbox in 2019 - No other open IT infrastructure initiatives

Royal Bank of Scotland	- Several divestments including payment processing arm Worldpay Group in 2013 - 2 small fintech-related acquisitions relatively late - No fintech specific corporate venture capital firm - No fintech fund - Only 2 lead investments in fintechs, including payments unicorn Transferwise in 2018 - 5 fintech subsidiaries (2016-19), inc. digital only banks Bó & Mettle in 2019, payment service Tyl by Natwest in 2019, and unsecured lending platform Esme Loans in 2016 - 4 fintech initiatives (2016-19), including AI chatbot in 2018, and invoice lending solution in 2019 - 1 spin-off of fintech initiative, Emerald, a Clearing and Settlement Mechanism (CSM) based on blockchain in 2016 which RBS progressed as an open-source initiative - Several internal innovation labs, incubators, and/or accelerators (2 in London in 2015 and 2018, Edinburgh in 2016, and Dublin in 2018 - Innovation outpost early on in 2014 in San Francisco	- 11 fintech partnerships (2015-19), 6 related to lending - 5 fintech related partnerships with other banks/incumbents (2014-18), 3 related to standards setting - Limited partnerships with bigtech - Participated in 5 blockchain consortia (2016-19), 3 related to lending - One of few banks considered to originate de novo a blockchain platform, Emerald, later spun-off and open-sourced, subsequently becoming the technology underpinning Project GreenPay, an inter-bank payments network in Ireland launched in 2017 by a consortium of Irish banks	- Launched 2 innovation labs, incubators, and accelerators open to external fintechs in 2016 and 2018 - Participated in only 2 consortium fintech innovation labs, incubators, and/or accelerators (2010-18)	- Launched open API platform, developer toolkits & sandbox in 2018 - Launched 2 open innovation technological interfaces relatively on, including an online portal to crowdsource ideas in 2013
Credit Suisse	- 1 fintech acquisition, invoice lending fintech in 2017 - Only 1 fintech subsidiary (direct bank) late (2019) - One fintech initiative, an AI chatbot - One of only 3 banks considered to have own internal think tank (Credit Suisse Research Institute) in 2008 - 2 internal innovation labs/ incubators/ accelerators: CS Labs in London, San Francisco, & New York (2015) & Credit Suisse Singapore Innovation Hub (2014) - New-York-based corporate venture capital arm, Credit Suisse NEXT Investors in 2013 (team behind it investing in technology firms on behalf of the bank since 2000) - 404 million USD fintech fund in 2014 (includes 269 million USD worth of investments that the team behind Credit Suisse NEXT Investors had been making on behalf of Credit Suisse since 2000) - Second fund launched in 2018 with 261 million USD raised in mostly outside funding - Separate corporate venture capital arm launched in 2010 with 30 million CHF in investment funds for fintech - Only 5 lead investments in fintechs (2010-16), 2 related to risk management	- 8 fintech partnerships (2014-19), 3 related to AWM, 2 related to risk management - 2 fintech related partnerships with other banks/incumbents - Late to partner with bigtechs in payments (2019) - Partnered with bigtechs Apple and Tencent in 2018 in AWM for customers in Hong Kong and Singapore - Participated in 9 blockchain consortia (2016-19) mostly relating to securities trading and capital markets - One of the few banks considered to have originated de novo a blockchain consortium (syndicated lending initiative in 2016)	- Only launched 1 innovation lab, incubator, and accelerator open to external fintechs in 2014 - Participated in 3 consortium fintech innovation labs, incubators, and/or accelerators (2010-17), all of which were in Asia	- Launched open API platform, developer toolkits & sandbox in 2018 - No other open IT infrastructure initiatives

BBVA	- 5 acquisitions (2014-17), 2 direct banking fintechs (Simple in 2014, Holvi in 2017), payment fintech (Openpay in 2016), and design firm (Spring Studio in 2015) - 6 fintech subsidiaries (2014-18), including 2 direct banking (Wizzo in 2014, Azlo in 2018), payments subsidiary Tuyyo in 2017 - 2 fintech subsidiaries discontinued (direct banking subsidiary Denizen in 2018, lending subsidiary in 2017) - Large number of internal innovation labs, incubators, and/or accelerators comparatively early (San Francisco in 2011, Alabama in 2015, Texas in 2016, Madrid in 2019, BBVA Next Technologies in 2018 which employs 1,200 technology experts in Mexico & Spain, and BBVA New Digital Business, NDB (San Francisco, Madrid, & London in 2015) with the aim to disrupt the bank before others do - Early to establish corporate venture capital subsidiary (BBVA Ventures in 2013 in San Francisco), in 2016 BBVA incorporated BBVA Ventures into an independent corporate venture capital firm Propel Venture Partners - 100 million USD fintech fund in 2013 with BBVA Ventures, incorporated into Propel Venture Partners in 2016 and increased to 250 million USD - BBVA NDB also has own corporate venture capital arm - Invested in external innovation funds (e.g., 50 million USD in Chinese fund in 2018 to explore AI in China) - Lead-investor in 11 fintechs (2013-19), 2 payments related, 2 related to personal finance, 2 related to direct banking; inc. 39% in mobile only bank Atom Bank (2015), German digital banking-as-a-service fintech SolarisBank (2018), Brazilian direct bank Neon (2018), & payments fintech SumUp (2013) - Most fintech initiatives of 20 banks considered (9 between 2016-19): 3 chatbots (2012-17), payments (2017), big data (2016), open banking (2017) - Only bank of 20 considered to launch internal blockchain initiatives, inc. bond issuance initiative (2019), world's first syndicated lending blockchain initiative (2018), world's first corporate loan transaction on blockchain (2018) - BBVA originated these de novo blockchain networks as fintech initiatives built on internal blockchain network	- 10 fintech partnerships (2014-19) - 3 fintech-related partnerships with other banks/incumbents (2015-19), inc. payments (Bizum, 2016), and the International Association of Trusted Blockchain Applications (INATBA) in 2019 - 9 bigtech partnerships, 4 in payments, 4 in personal banking - Participated in 10 blockchain consortia (2016-19), 3 related to payments, 3 related to blockchain standards - Terminated participation in 3 prominent blockchain consortia after being part of the initial trial	- Early to establish innovation labs, incubators, and/or accelerators open to external fintechs - Annual fintech competition (2009); BBVA Innovation Centre in Spain, Mexico, the US in 2011, Colombia in 2013; incubator/accelerator in London (2018) in partnership with Anthemis Group; BBVA Open Innovation Acceleration Program (2019); open innovation programme (2009) which brings together several of BBVA's innovation labs/incubators/accelerators - Only participated in 1 consortium innovation lab, incubator, and/or accelerator	- One of only 3 banks of 20 considered to launch its open API store, developer portal, and sandbox in 2017 (1 year before PSD2), extended access beyond Europe to US and Mexico - 2 additional open IT platforms to foster collaboration between staff and external parties (2016 and 2018)
Standard Chartered	- No acquisitions made - In 2018, launched innovation unit (SC Ventures) in Singapore, composed of 4 units: a) eXellerator innovation lab (initially launched as separate unt in 2016) b) corporate venture capital arm (SC Ventures Innovation Investment) with 100 million USD fintech fund c) unit for internal fintechs (SC Ventures Internal Ventures) d) unit seeking partnerships with external fintechs (SC Ventures Fintech Bridge, added in 2019) - One of the few banks to incorporate external lab, internal lab, fintech fund, and corporate venture capital arm into one unit - Several other eXellerator innovation labs (Hong Kong & UK in 2018, 2 in Shanghai, 1 in Kenya in 2019)	- 6 fintech partnerships (2016-19), 2 related direct banking - 5 fintech-related partnerships with banks/incumbents (2016-19), 2 related to trade finance, 2 related to standards setting - Participated in large number of blockchain consortia (15 between 2015-19), 9 related to trade finance, 3 related to payments inc. Monetary Authority of Singapore's pioneering interbank initiative (Project Ubin) in 2016, and the only bank of the 20 considered to participate in consortium built on Tencent's FISCO-BCOS blockchain technology - Early to partner with bigtech, especially	- No innovation labs, incubators, and/or accelerators open to external fintechs, until SC Ventures Fintech Bridge in 2019 to create links between external fintechs and Standard Chartered's innovation unit SC Ventures; SC Ventures Fintech Bridge present in Singapore, Hong Kong, UK, San Francisco, Shanghai, & Kenya - Participated in 3 consortium innovation lab, incubator, and/or accelerator (2010-17)	- Late to launch its open API store, developer portal, and sandbox in 2019, but when it did, it extended access beyond Europe to Asia, the Americas, Africa, & the Middle East - Launched open community (aXess Labs) to experiment with cutting edge technologies in 2019 - In 2018, SC Ventures created PoC sandbox for fintech partners - SC Ventures create several other open-IT initiatives to help staff and customers collaborate to

	- Innovation outpost (SC Studios) in San Francisco in 2010 - In 2019 launched aXess Academy to upskill bank's developers in open banking skills - 4 fintech subsidiaries, 1 fintech initiative (late, 2018-19), inc. digital-only bank in several African countries (2018) and in Hong Kong (2019), SME lending (2019), banking-as-a-service (2019); 3/4 of fintech subsidiaries incubated at SC Ventures - 5 lead-investments in fintechs (2015-19), 2 of which relate to lending, inc. unicorn Symphony Communication Services (2019) & Chinese lending fintech unicorn Dianrong (2019)	Chinese bigtechs, broad partnerships; in 2017, signed general agreement with Alibaba's Ant Financial Group; in 2018-19, partnered with Alibaba on blockchain based cross-border remittance solution in Hong Kong, the Philippines, Pakistan, and Malaysia; in 2017 partnered with Tencent on e-commerce solution for corporate clients in China; in 2018, collaborated with Huawei on payments solution based on IoT sensors - One of few banks of those considered to partner with telecommunications firms in payments (Indonesia 2015, Uganda 2017, Tanzania 2016, Pakistan 2015, Ghana 2015, Vietnam 2015, Bangladesh 2015, Philippines 2014, Nigeria 2014, Thailand 2014, Kenya 2013)		cocreate innovative solutions (e.g., the Client Engagement & Co-Creation platform)
Rabobank	- 1 acquisition in 2012 of payment fintech MyOrder, sold in 2018 - Several divestments, fintech subsidiaries/initiative terminations (terminating payment solution in 2015 & cryptocurrency wallet in 2019) - 5 fintech subsidiaries, inc. digitalization of direct bank RaboDirect, SME lending platform in 2011, payment subsidiary in 2017 - 8 fintech initiatives (2015-19), 2 related to payments, 2 related to lending, inc. treasury & risk management fintech initiative TreasurUp in 2015 (accelerated in internal Moonshot accelerator), crowdfunding initiative Rabo & Crowd in 2018, P2P lending initiative Rabo & Co - 2 internal innovation labs/ incubators/ accelerators: Rabobank Moonshot Campaign in 2015, for Rabobank staff to accelerate innovative ideas, and internal Blockchain Acceleration Lab in 2016 - Late to establish corporate venture capital arm, Rabo Frontier Ventures in 2018 - Launched 60 million EUR fintech investment fund in 2018, expanded to 150 million EUR in 2019 - Only 1 fintech lead investment in 2019	- 11 fintech partnerships (2013-19), 6 related crowdfunding - Early to partner with crowdfunding fintechs, partnering with 2 as early as 2013 - 5 fintech-related partnerships with banks/incumbents - Few bigtech partnerships; late to partner with bigtechs - Participated in 9 blockchain consortia (2016-19), 3 related to payments, 2 related to trade finance, 2 related to commodities (inc. as primary banking partner in commodities trading blockchain platform Repo:NOW)	- No innovation labs, incubators, and/or accelerators open to external fintechs; only bank of 20 considered to have none - Participate in 8 consortium innovation labs, incubators, and/or accelerators (joint most out of 20 banks considered)	- Launched open API store, developer portal & sandbox in 2018 - Open innovation IT platform (Rabobank Innovate With Your Bank) in 2014 to facilitate collaboration between customers & staff to cocreate new products/services
Nordea	- 1 acquisition in 2019 of online-only bank Gjensidige Bank - No fintech subsidiaries - 3 fintech initiatives (2017-18), payment solution, AI-powered personal assistant, AI-powered robo-advisor; terminated a 4th fintech initiative (crowdfunding) in 2018, 2 years after creating it - 2 internal innovation labs, incubators, and/or accelerators: internal innovation lab/incubator (LC&Ix) in 2019, and an intrapreneurship programme (Nordea Runway) in 2018 for Nordea employees to incubate innovative ideas for 3 months - Corporate venture capital arm, Nordea Ventures, in 2017, along with a fintech fund - 4 lead investments in fintechs (2016-19)	- 10 fintech partnerships (2017-19), 2 related to payments, 2 related to personal finance - 7 fintech related partnerships with other banks/incumbents (2012-19), 5 related to payments (Swish in Sweden in 2012; Vipps in Norway in 2017; Siirto in Finland in 2016; P27 launched in 2017 exploring possibility of pan-Nordic payment infrastructure). In 2013, co-launched Swipp to compete with Danske Bank's MobilePay, after Swipp failed to take off, Nordea joined MobilePay in 2016. - 6 partnerships with bigtechs (2017-18), 5 related to payments, 1 to personal banking - Only joined 3 blockchain consortia (2016-18)	- Only established 1 innovation labs, incubators, and/or accelerators open to external fintechs for 2 years: Nordea Startup Accelerator in Helsinki & Stockholm (run for 2 years between 2015-16 before being terminated) - Participate in 6 consortium innovation labs, incubators, and/or accelerators (2010-19)	- Early to launch open-API store, developer portal and sandbox in 2017 - Launched open IT platform Nordea Next for customers to participate in idea-evaluation experiments in 2014

Table 2: Findings of Data Collection Activity 3 – Individual Case Level

6.3 – The Modalities of Banks' Strategies of Interdependence – Modality Level

6.3.1 – Acquisitions and Investments Modality

The acquisition and investments modality of banks' strategies of interdependence describes banks' attempts to invest in resources and capabilities to enable them to better engage in strategies of interdependence. This is manifested through several submodalities. Banks may seek to acquire fintechs or other relevant firms with the aim of integrating the targets' resources and capabilities into their own to enhance their ability to engage in strategies of interdependence. In many cases banks made lead investments in fintechs rather than outright acquisitions; this allowed banks to influence the fintech's growth and development both through committing capital and through contributing to the fintech's board and supporting its top management team. Banks launched fintech subsidiaries through which they developed resources and capabilities that are better suited to value cocreation with external resources and capabilities and are separated from the rest of the bank so as to be unencumbered by the banks' legacy technologies and ways of working. In some cases, banks integrated fintech acquisitions into their fintech subsidiaries. In other cases, banks spun-off their fintech subsidiaries preferring for them to grow as separate entities with whom they can partner with to derive relational rents. In some cases, having acquired or developed fintechs that did not continue to align with banks' strategies, some banks divested from them. In cases where banks did not deem it necessary to segregate fintech subsidiaries organizationally, they launched fintech initiatives that integrated with or ran alongside banks' existing products and services. Some banks established corporate venture capital subsidiaries and allocated specific fintech funds. In doing so they sought to develop the resources and capabilities that would enable them to better identify appropriate fintechs that they could acquire or take lead investments in. In a similar vein, banks launched internal open innovation initiatives (e.g., think tanks, internal innovation labs, internal incubators, and internal accelerators) to invest in their own workforce and facilitate the creation of new resources and capabilities that are adapted to strategies of interdependence through the entrepreneurial activities of their staff.

This modality and specifically the submodalities relating to the establishment of internal open innovation initiatives and venture capital subsidiaries relate to the open innovation modality, which is focused on open innovation with external stakeholders, and the open IT infrastructure modality, which is more

focused on the technological enablers of open innovation activities. Several banks integrated their internal open innovation initiatives with their external ones, often alongside their corporate venture capital subsidiaries, and in some cases with their open IT technological interfaces, to create integrated innovation units. The fintech divestment submodality also aligns with the partnership modality's partnership cessation submodality, in that both relate to banks' ability to recognize when to exit a specific strategy of interdependence that is no longer beneficial. This modality also relates more generally to the partnership modality, in that through investing in and acquiring resources and capabilities to facilitate the development of strategies of interdependence, banks are better able to enter into value cocreation initiatives with other stakeholders like bigtechs and fintechs.

The rest of Section 6.3.1 details key findings across the submodalities in the acquisition and investment modality.

Fintech acquisitions

The majority of the banks considered acquired fintechs, only 6 banks made no fintech acquisitions in the period considered (HSBC, Lloyds Banking Group, UBS, UniCredit, Intesa Sanpaolo, and Standard Chartered). The majority of fintech acquisitions were in the payments subsector, with direct/online banking, and crowdfunding being the second and third most prominent subsectors for fintech acquisitions respectively. Groupe BPCE, whose fintech subsidiary Natixis Payments, boasts over 20% market share of payments in France, accounted for 31% of payments-related fintech acquisitions. Three quarter of crowdfunding fintech acquisitions were conducted by cooperative banks (Groupe BPCE and Crédit Mutuel), this may be because crowdfunding aligns with the cooperative/mutualist philosophies of cooperative banks[352], thus these acquisitions can be considered resource deepening acquisitions (Sears, 2017). From a temporal perspective, three quarter of acquisitions were made between 2016 and 2019; a quarter were made in 2018 alone, the year that PSD2 and the Open Banking Standard came into effect, indicating a possible regulatory trigger.

Of the 44 fintech acquisitions between 2009 and 2019, 4 banks account for 59% of fintech acquisitions (Crédit Mutuel with 9 acquisitions, Groupe BPCE with 8, BBVA with 5, and Santander with 4). Two are

[352] https://www.crowdfundbetter.com/cooperatives-and-crowdfunding-a-natural-fit/

cooperative banks – Groupe BPCE and Crédit Mutuel. It has been noted that cooperative/mutual banks often have expansive and costly branch networks[353], are often composed of networks of autonomous local cooperatives[354][355], and usually lag in terms of technological innovation[356]. Thus, it may be that these cooperative banks are embarking on what Sears (2017) describes as "Strategic Renewal" through acquisition of resources and capabilities, especially ones that extend the acquirer's resources and capabilities into new markets. However, the absorptive capacity of the acquirer's resources and capabilities are important considerations, Groupe BPCE which acquired Fidor – a leading German digital banking fintech – in 2016, was looking to sell it only two years later due to concerns of it not fitting with the banks' strategy[357]. These banks' comparatively high number of fintech acquisition could also be indicative of an inclination to control resources and capabilities through traditional ownership and thus may represent a rejection of strategies of interdependence. On the other hand, the remaining two banks are considered technological leaders. Both Spanish banks, Santander and BBVA, are considered leaders in the digital transformation of banking[358][359][360], while Spain is considered one of the 3 leading European markets for digital-only banking[361]. In keeping with this, the two banks' acquisitions can be seen as strategies to enhance their existing resources and capabilities, for example BBVA acquired the digital studio Spring Studio in 2015 to accelerate its digitalization efforts.

Fintech Divestments

Several banks divested from fintech investments that they made which no longer aligned with their strategies of interdependence or which did not yield the results the banks had originally aimed for. For example, a number of banks divested from the German online payments service Paydirekt which was originally launched in 2015. Paydirekt was owned by a consortium of banks: 16.67% owned by Deutsche Bank, 16.67% owned by Commerzbank, and the rest owned by other major banks including Santander, Targo Bank (Crédit Mutuel), ING, HypoVereinsbank (UniCredit) and Consorsbank (BNP Paribas). By the end of 2019, Santander, Crédit Mutuel, ING, UniCredit, and BNP Paribas divested their stakes, selling

[353] https://www.spglobal.com/en/research-insights/articles/tech-disruption-in-retail-banking-german-banks-have-little-time-for-digital-catch-up
[354] https://neweconomics.org/uploads/files/051add837ec5b0ca02_s2m6bo0c0.pdf
[355] (Groupe BPCE is composed of Banque Populaire, Caisse D'Epargne, BRED Banque, Crédit Coopératif, Natixis, Banque Palatine, Crédit Foncier among others; while Crédit Mutuel is composed of Crédit Industriel et Commercial, Crédit Mutuel Arkéa, Crédit Mutuel Alliance Fédérale, Crédit Mutuel Maine-Anjou, Basse-Normandie, Crédit Mutuel Nord Europe, Crédit Mutuel Océan among others)
[356] https://www.imf.org/external/pubs/ft/wp/2007/wp07159.pdf
[357] https://www.spglobal.com/marketintelligence/en/news-insights/trending/qxxsm0ellmfvwdgqy64c-g2
[358] https://www.bbva.com/en/bbva-named-as-a-world-leader-in-incumbent-digital-strategy/
[359] https://www.finextra.com/blogposting/12805/digital-banking-transformation-bbva-vs-banco-santander
[360] https://www.d-rating.com/post/2019/12/09/digital-customer-experience-of-retail-banks-in-spain-part-2-digital-proposition
[361] https://newsroom.mastercard.com/eu/press-releases/digital-banking-has-become-part-of-europeans-everyday-life-new-study-from-mastercard-reveals/

them to Deutsche Bank and Commerzbank. The participants who divested their stakes believed that Paydirekt was too late in the market and was unable to compete with the likes of PayPal in Germany[362].

Several banks like BBVA, Santander, UBS, Rabobank, and UniCredit, also divested from fintech subsidiaries that they established or fintechs that they acquired when they deemed these to be no longer in line with their strategies of interdependence. For example, UBS divested from its robo-advisory service SmartWealth in 2018, which it sold to the fintech SigFig with whom UBS has a partnership. BBVA and Santander are well represented in both the fintech divestments submodality and in the partnership cessation submodality (from the partnership modality) possibly indicating an advanced and sophisticated managerial ability of knowing when initiatives and/or investments are not progressing well and acting quickly and in an agile way to terminate them ("fail fast and move on" or "fail fast and learn").

Establishment of Fintech Subsidiaries

With the exception of Nordea, all banks established fintech-related subsidiaries. The top 3 subsectors for fintech subsidiaries were, direct/online banking, followed by payments, followed by crowdfunding (the same as the top 3 subsectors for fintech acquisitions, albeit in a different order). From a temporal perspective, almost half of fintech subsidiaries were established between 2016 and 2019. A few banks established specialist fintech units that were mandated with creating diverse fintech solutions (e.g., the Santander Global Platform launched in 2019 as a consolidation of numerous Santander stand-alone fintech initiatives).

Direct/online banking was by far the most prominent subsector for fintech subsidiaries. Many of these direct/online banking subsidiaries were telephone or internet only subsidiaries that banks like HSBC, Santander, Société Générale, ING, and Rabobank had established decades ago and which they subsequently digitalized (e.g., HSBC's First Direct launched in 1989), others were newly launched ones (e.g., BNP Paribas' Hello Bank! in 2013), some originated through banks' internal open innovation initiatives (e.g., BBVA's Azlo launched in 2017 and incubated at the BBVA New Digital Business innovation lab). In terms of payments, Groupe BPCE and Barclays accounted for 33% of the payment

[362] https://translate.google.com/translate?hl=en&sl=de&u=https://www.handelsblatt.com/finanzen/banken-versicherungen/zahlungsverkehr-vier-sparkassen-ziehen-sich-bei-paydirekt-zurueck/24989166.html&prev=search&pto=aue

fintech subsidiaries that were established and were earlier than other banks in launching them. Much like Groupe BPCE plays a dominant role in the French payments landscape through Natixis Payments, Barclays plays a similarly prominent role in the British payments landscape through Barclaycard (UK's largest credit card provider with 27% market share). As for crowdfunding, cooperative banks were again overrepresented in this regard with Groupe BPCE and Crédit Mutuel accounting for 7 of the 8 crowdfunding fintech subsidiaries that were established.

Fintech Initiatives

The majority of banks launched fintech initiatives, with the exception of Groupe BPCE, Barclays, Lloyds Banking Group, UniCredit, and Intesa Sanpaolo. From a temporal perspective almost all fintech initiatives were launched between 2016 and 2019. BBVA, HSBC, and Rabobank accounted for half of the fintech initiatives that were observed. More than half of banks' fintech initiatives related to personal assistants or chatbots, that were often powered by artificial intelligence technology and which serve different purposes such as engagement with retail banking clients or wealth management robo-advisory. BBVA is the only bank of the 20 considered to have systematically launched many fintech initiatives based on an internal private blockchain platform (e.g., for syndicated lending, bond issuance, and corporate lending use-cases).

Fintech Spin-offs

ING accounted for almost all of the fintech spin-offs observed. ING systematically spun-off numerous fintech subsidiaries. This included 4 payments fintech spinoffs and several that became prominent such as the payment fintech Payconiq which operates across the Benelux and which was spun out in 2015, and the multi-bank treasury management fintech Cobase which was spun out in 2017.

Lead Investments

Collectively, the 20 banks made 96 lead investments in fintechs in the period considered, with UBS the only bank not to have made a single lead investment. The most active banks in terms of lead investments in fintechs were Santander, BBVA, Barclays, and ING. The least active banks were Lloyds Banking Group, Rabobank, Société Générale, the Royal Bank of Scotland, Groupe BPCE, UniCredit, Intesa

Sanpaolo, Crédit Agricole, Deutsche Bank, and Nordea. The more active banks typically had well established corporate venture capital subsidiaries and significant fintech funds, while the less active banks typically had less well established corporate venture capital subsidiaries and smaller fintech funds or no corporate venture capital subsidiary or fintech fund at all. From a temporal perspective, 83% of lead investments in fintechs were made between 2016 and 2019.

The most prominent subsector in terms of lead investments in fintechs was lending; Santander, ING, Standard Chartered, and Barclays accounted for the majority of lead investments in this subsector. The second most prominent subsector was payments; Santander, Crédit Mutuel, ING, and BBVA were the major lead-investors in this subsector. Intesa Sanpaolo was the only bank to systematically take significant equity stakes in all of its lead investments. Several banks made lead investments in leading fintechs (e.g., BBVA's accumulation of a 39% stake in the prominent direct/online banking fintech Atom Bank).

Corporate Venture Capital Subsidiaries and Fintech Funds

Most banks established corporate venture capital subsidiaries. The exceptions were Crédit Agricole, Deutsche Bank, Groupe BPCE, Lloyds Banking Group, and UBS, who also had a low number of lead investments in fintechs. A few of the banks that did not establish their own corporate venture capital subsidiaries, but which did commit fintech funds, delegated the administration of fintech funds to third party external venture capital firms (e.g., Crédit Agricole who delegated the administration of its fintech fund in 2017 to Breega Capital). A third of corporate venture capital arms and fintech funds were established early (between 2013 and 2015); banks that established corporate venture capital arms early like Santander, BBVA, Barclays, and ING were overrepresented in terms of lead investments in fintechs.

Several banks like Santander, BBVA, Barclays, Credit Suisse, Standard Chartered, UniCredit, ING, and HSBC, launched corporate venture capital arms that were integrated with well-funded fintech funds and supported by their own internal and external innovation labs, incubators, and/or accelerators. For example, Santander launched its corporate venture capital arm Santander InnoVentures in 2014 alongside a 200 million USD fund (100 million USD launched in 2014 and topped up with an additional 100 million USD in 2016); BBVA launched two corporate venture capital subsidiaries, Propel Venture Partners (launched as BBVA Ventures in 2013 and renamed in 2016) and BBVA New Digital Business launched in 2015,

alongside the 100 million USD BBVA Ventures I fund launched in 2013 and increased to 250 million USD in 2016 which is supported by BBVA New Digital Business (BBVA's innovation lab, incubator, and accelerator that it launched in 2015); ING launched its corporate venture capital arm ING Ventures in 2017 along with a 300 million EUR fund called ING Ventures Fund I to invest in fintechs, as well as a 25 million EUR a year fund to fund internal fintech acceleration in 2013; and, Barclays launched its corporate venture capital arm Barclays UK Ventures in 2018, with a 100 million GBP Barclays Technology fund to invest in UK fintech start-ups, along with 10 million GBP per cohort fund for its Barclays Accelerator.

Internal Open Innovation Initiatives (Internal Innovation Labs, Think Tanks, Incubators, Accelerators, and Innovation Outposts)

The majority of banks launched internal open innovation initiatives, except for HSBC, Barclays, and Intesa Sanpaolo who were the only banks not to have established internal open innovation initiatives, preferring to exclusively launch ones open to external participants instead. UniCredit and Société Générale established limited internal open innovation initiatives. UBS, Credit Suisse, and BNP Paribas were the only banks to have established think tanks (e.g., UBS Y launched in 2014 and the Credit Suisse Research Institute launched in 2008). UBS established an extensive network of internal open innovation initiatives. Along with its think tank, UBS also established 4 internal innovation labs – one focused on wealth management established in Zurich in 2014, another in Zurich focused on investment banking launched in 2018, one for design thinking and innovation in Singapore launched in 2015, and an Advisor Technology Research and Innovation lab launched in San Francisco in 2016 – as well as innovation outposts in Tel Aviv and San Francisco. Other banks with extensive networks of internal open innovation initiatives include Santander, Credit Suisse, and BNP Paribas.

Several banks, like BBVA, Standard Chartered, and Rabobank, also launched a series of integrated internal and external open innovation initiatives (e.g., Standard Chartered launched its innovation lab/incubator/accelerator eXellerator in 2016 with offices in Singapore, Hong Kong, 2 in Shanghai, London, and Kenya, along with an outpost in San Francisco, all of which were incorporated alongside its corporate venture capital arm, fintech funds, and external fintech partnership unit under the SC Ventures umbrella in 2018). Three banks – UBS, the Royal Bank of Scotland, and Standard Chartered – launched

innovation outposts to help them access cutting edge technological innovation in technology hotspots like San Francisco (e.g., the Royal Bank of Scotland launched its RBS Silicon Valley Solutions outpost in San Francisco in 2014).

6.3.2 – Partnership Modality

The partnership modality of banks' strategies of interdependence describes the ways in which banks sought to cocreate value through the combination of their resources and capabilities with those of external stakeholders. This includes several submodalities including partnerships with fintechs, partnerships with bigtechs, partnerships with other banks and incumbent financial services firms, and participation in blockchain based multi-sided networks, as well as any partnership cessations. This modality not only caters for banks' participation in cocreation efforts but also banks' origination and leadership of partnerships at the multi-firm level (e.g., launching national payments networks) and at the network level (e.g., originating *de novo* blockchain consortia).

This modality relates to the acquisition and investment modality in that many of the resources and capabilities that banks need to employ strategies of interdependence through which they can partner with others to cocreate value are developed through the submodalities within the investment and acquisition modality such as establishing fintech subsidiaries, acquiring fintechs, and establishing open innovation initiatives. Moreover, there are thematic links between this modality's partnership cessation submodality and the fintech divestment submodality from the investment and acquisition modality, which relate to banks' ability to exit non-performing or non-aligned strategies of interdependence in an agile way. The partnership modality also relates to the open innovation modality and the open IT infrastructure modality, in that the open innovation modality describes the open innovation initiatives that banks engage in that are open to external stakeholders and which can act as the vehicle through which partnerships are subsequently established, while the open IT infrastructure modality describes banks' adoption of many of the technological enablers (e.g., open APIs) that facilitate value cocreation with partners.

The rest of Section 6.3.2 details key findings across the submodalities in the partnership modality.

Partnerships with and Non-lead Investments in Fintechs

The most active banks in terms of partnerships with fintechs (which were often accompanied by banks making small non-lead investments in the fintech) were BNP Paribas, Société Générale, Barclays, Santander, ING and Groupe BPCE, while the least active banks were Lloyds Banking Group, UniCredit, and Intesa Sanpaolo. From a temporal perspective, around two thirds of fintech partnerships were between 2016-19. BBVA, ING, and UBS were comparatively early to partner with fintechs, while Nordea, Standard Chartered, HSBC, and Crédit Agricole were comparatively late in their fintech partnerships. Several fintechs found consensus among a broad range of banks, particularly the enterprise blockchain fintech R3, collaboration solutions provider Symphony, blockchain-based payments network Ripple, risk management fintech AcadiaSoft, and bond trading fintech Neptune Networks.

The most prominent subsectors that are represented in banks' partnership with fintechs were payments, crowdfunding, lending, trading, blockchain, asset and wealth management, and risk management. Groupe BPCE and Barclays have the most payments related fintech partnerships. This is consistent with Groupe BPCE and Barclays' overrepresentation in payments-related activities under the acquisitions and investments modality. A cooperative bank – Rabobank – was again overrepresented in terms of crowdfunding-related activities, in this case partnerships with crowdfunding focused fintechs. The Royal Bank of Scotland and Santander were overrepresented in lending related fintech partnerships; Société Générale was more focused on trading fintechs; BNP Paribas, Santander, and ING were focused on blockchain related fintech partnerships; UBS, Credit Suisse, Crédit Mutuel, and BNP Paribas were overrepresented in partnerships with asset and wealth management related fintechs; and, Barclays, HSBC, BNP Paribas, Credit Suisse, and Société Générale were overrepresented in partnering with fintechs focused on risk management.

Bigtech Partnerships

Three quarter of bigtech partnerships relate to the payments subsector. The most active banks in terms of bigtech partnerships were HSBC, Standard Chartered, Santander, BBVA, ING, and Société Générale, while the least active were Lloyds Banking Group, Crédit Agricole, Royal Bank of Scotland, UBS, and Rabobank. From a temporal perspective, the majority of bigtech partnerships were between 2018 and

2019. The banks which were early to partner with bigtechs were Barclays, Standard Chartered, BBVA, Société Générale, HSBC, ING, and Santander (most of these banks were also comparatively more active in partnering with bigtechs), while the banks that were late to partner with bigtechs were Crédit Agricole, Deutsche Bank, Credit Suisse, Rabobank, Intesa Sanpaolo, and UBS. The most prominent bigtechs with whom banks partnered were – in order – Apple Pay (Apple), Google Pay (Google), Samsung Pay (Samsung), Alipay (Alipay), Garmin Pay (Garmin), Fitbit Pay (Google), and WeChat Pay (Tencent). UBS was the only bank not to have partnerships with at least one of either Apple Pay, Google Pay, Samsung Pay, Alipay, and WeChat Pay, while fellow Swiss bank Credit Suisse partnered with Apple Pay and Samsung Pay only in 2019. Credit Suisse and UBS along with several other Swiss banks partnered on a Swiss payment network called Twint that competes with these bigtech payment solutions.

The most prominent banks in terms of the scope of their bigtech partnerships were HSBC and Standard Chartered. Both banks, which derive large parts of their revenues from the Chinese and Asia Pacific markets, were overrepresented in their partnerships with Chinese bigtechs. HSBC partnered with Alipay and WeChat Pay in payments, with Tencent in two different personal finance initiatives and one corporate banking initiative. Standard Chartered partnered with Alipay, WeChat Pay, and Huawei in payments, with Tencent in corporate banking, with Alibaba on blockchain partnerships as well as a general partnership agreement with Alibaba. HSBC and Standard Chartered's partnerships with Chinese bigtechs are wider ranging than the collaboration observed between the 20 banks with non-Chinese bigtechs. Société Générale and Standard Chartered were the only banks to have entered into wide ranging partnerships with telecommunications firms in the payment subsector, especially in emerging markets and particularly in Africa, where telecommunication firms have penetrated more deeply into payments.

Partnerships with Other Banks and Incumbents

Just over a third of fintech related partnerships with other banks and incumbents relate to the payments subsector, while a quarter related to regulatory/standards/industry bodies, and about 10% relate to trade finance. From a temporal perspective, the majority of these partnerships were between 2016-19, however this was not uniform across subsectors, the majority of these partnerships in the payments subsector were entered into early on, while the majority of such partnerships that relate to standards setting and trade finance were entered into later. The most active banks in terms of fintech related partnerships with other

banks and incumbents were HSBC, Santander, Deutsche Bank, Barclays, ING, and Nordea; Barclays was early to enter into such partnerships, while Deutsche Bank was comparatively late in doing so. The least active banks were UniCredit, Intesa Sanpaolo, Credit Suisse, UBS, and BBVA.

Within the payments subsector, many of the initiatives that banks and incumbents partnered on relate to the establishment of national payments networks such as PayM in the UK, PayLib and Lyf Pay in France, Blik in Poland, Payconiq in the Benelux, Bizum in Spain, and Twint in Switzerland. For example, in 2014, several banks in the UK including HSBC, Santander, Barclays, Lloyds Banking Group, and RBS, partnered with the Payments Council (now known as Payments UK) to launch the national payments platform PayM. Within this subsector, Nordea, BNP Paribas, Santander, and Crédit Mutuel were particularly active, while Standard Chartered, Intesa Sanpaolo, and UniCredit did not enter into any payments related partnerships with other banks or incumbents.

Within the standards setting/regulatory/industry body segment the UK figures prominently (e.g., the British Standards Institute's Fintech Collaboration Toolkit launched in 2018, the Financial Conduct Authority's Regulatory Sandbox launched in 2016, and the industry body Innovate Finance launched in 2014). UK banks – especially HSBC and Barclays – are also overrepresented in this segment. HSBC in particular has taken the lead in these activities; for example, in 2019, HSBC partnered with SWIFT to define a common industry standard for open-APIs in Hong Kong, and in 2016, HSBC was one of only two banks to participate in the UK Financial Conduct Authority's first regulatory sandbox cohort. This approach is also reflected in the blockchain consortia that HSBC participated in, for example, in 2016, HSBC was one of only five non-Singaporean banks to participate in Project Ubin, the Monetary Authority of Singapore's pioneering project to conduct inter-bank payments on blockchain, and the only non-Canadian bank to participate in Project Jasper, a similar project launched by the Bank of Canada in 2016. BNP Paribas, Crédit Agricole, Deutsche Bank, UBS, Credit Suisse, and Nordea did not participate in any regulatory or standards setting partnerships with other banks and incumbents.

In terms of trade finance related partnerships with other banks and incumbents, HSBC, Deutsche Bank, and Standard Chartered were the most active. HSBC, Deutsche Bank, and Standard Chartered are 3 of the top 4 European trade finance banks.

Partnership Cessations

Around two thirds of partnership cessations relate to banks terminating their participation in blockchain consortia. From a temporal perspective, the great majority of partnership cessations were between 2015 and 2017. Santander and BBVA figured most prominently in terms of partnership cessations, just as they did in fintech divestments (from the acquisition and investment modality) indicating an advanced managerial capability of knowing when to exit strategies of interdependence that are no longer well aligned, as well as the managerial ability to execute these exits in an agile way. All of BBVA's partnership cessations relate to blockchain consortia (Contour/Voltron, Marco Polo, and Corda KYC), and all in 2017. Santander's partnership cessations were more diverse (e.g., the R3 blockchain consortium in 2016, a joint innovation lab the bank launched with the fintech Monitise in 2015, and a joint accelerator launched with Plug and Play in 2016).

Blockchain Consortia

All banks either joined or sometimes originated blockchain consortia, the most prominent use cases were trade finance, payments, lending, know your customer, blockchain standards setting, and commodities. From a temporal perspective, more than three quarters of participation in blockchain consortia was between 2017 and 2019. The use cases that banks participated in comparatively earlier were interbank payments and blockchain standards, while the use cases that banks participated in comparatively later were commodities and payments. ING, Lloyds Banking Group, and Intesa Sanpaolo's participation in blockchain consortia were all comparatively late. While ING was one of the most prominent banks in terms of blockchain consortia participation, and even originated *de novo* a blockchain consortium, all its activity in this regard was comparatively late between 2017 and 2019. On the other hand, HSBC was relatively early to participate in blockchain consortia (almost half of HSBC's participation in blockchain consortia were between 2015 and 2016). The most active banks in terms of participation in blockchain consortia were Paribas, Société Générale, Standard Chartered, Groupe BPCE, and ING, while the least active were Crédit Mutuel, Nordea, and Lloyds Banking Group. In terms of underlying blockchain technology, the overwhelming majority of participation was either on Ethereum, R3, and Hyperledger. Hyperledger was prominent in trade finance and payments use cases, R3 in trade finance, lending, interbank payments, and shared KYC use cases, and Ethereum in payments and commodities use cases.

Banks also coalesced around a number of key blockchain consortia, the most prominent of which include the trade finance blockchain networks we.trade and Marco Polo, Finastra's blockchain based lending initiative Fusion LenderComm, the blockchain based payment networks Bank-to-Bank Transfers (launched by SWIFT), Interbank Information Network (championed by JP Morgan), and Fnality International (championed by UBS), the commodities trading platform Komgo, and the shared KYC utility Corda KYC.

Within the trade finance use case, the most prominent participants are Standard Chartered, BNP Paribas, and HSBC. These 3 banks were also prominent when it came to trade finance initiatives in the "partnerships with other banks and incumbents" submodality. These banks are prominent in global transaction banking (trade finance and cash management); HSBC, BNP Paribas, and Standard Chartered are the 2nd, 5th, and 7th banks globally in terms of transaction banking (1st, 2nd, 4th, at the European level) based on 2018 numbers[363]. Deutsche Bank, the 3rd most prominent European Bank in transaction banking (based on 2018 numbers), is however underrepresented in this usecase.

Within the lending use case, the most prominent participants are Groupe BPCE, Société Générale, and the Royal Bank of Scotland. Within the payments use case, the most prominent participants are Santander, Lloyds Banking Group, BBVA, Standard Chartered, and Rabobank. Groupe BPCE did not participate in any payment related blockchain consortia, while Barclays only participated in one, despite both banks dominating other payment-related fintech partnership submodalities. Within the commodities use case, ING is by far the most active bank of the 20 considered. Within the shared know your customer (KYC) use case, the most prominent participants were Société Générale, Crédit Agricole, and Groupe BPCE. Within the interbank payments use case, HSBC represents a quarter of participation including participation in the Monetary Authority of Singapore's Project Ubin, and the Bank of Canada's Project Jasper. Within the blockchain standards use case, BBVA and Santander were the most active; thus, while BBVA was the bank that left the most blockchain consortia, it was also the one to have participated the most in blockchain standards setting activities.

This submodality is arguably the best for demonstrating banks' strategically important managerial capability of originating *de novo* networks/platforms, and the strategically important managerial capability

[363] https://www.spglobal.com/marketintelligence/en/news-insights/trending/cvexYicR8tbPJVoW4LrS-g2

of acting as ecosystem leader. UBS, Credit Suisse, ING, and the Royal Bank of Scotland acted as ecosystem leaders to originate *de novo* blockchain consortia. For example, in 2015, UBS began working on the concept of the Utility Settlement Coin (USC) for international cross-border payments built on Ethereum. In 2019, UBS along with a consortium of banks created Fnality International to commercialize the initiative; 6 of the 20 banks (including UBS) have backed Fnality International. In 2017, UBS launched the Massive Autonomous Distributed Reconciliation (MADREC) platform which was built on Ethereum to facilitate banks' compliance activities in response to the Markets in Financial Instruments Directive (MiFID) II regulation that went live in the EU in January 2018 (Credit Suisse and Barclays also backed MADREC). UBS was the only bank of the 20 considered to originate 2 *de novo* two blockchain consortia. Another example is ING, which has been particularly active in commodities related blockchain use cases, and which originated the commodities financing blockchain platform Komgo. Komgo was originated in ING's Innovation Bootcamp in 2016 and, after 2 proofs of concepts in 2017 and 2018, was commercialized in 2018, receiving the backing of 7 of the 20 banks considered in this study.

6.3.3 – Open Innovation Modality

The open innovation modality of banks' strategies of interdependence describes the ways in which banks seek to cocreate value with external stakeholders through alignment mechanisms that facilitate the interaction and comingling between banks' resources and capabilities and those of external stakeholders. These alignment mechanisms include innovation labs, incubators, and/or accelerators that banks originate and which they subsequently invite partners, such as fintechs, to join. These alignment mechanisms also include consortium innovation labs, incubators, and/or accelerators that a group of banks and other incumbents jointly launch, and which is subsequently open to participation from fintechs.

This modality aligns closely with the partnership modality, since a lot of the partnerships that banks enter into were initiated through open innovation initiatives (e.g., banks often subsequently partner with fintechs that were initially incubated or accelerated at banks' innovation labs, incubators, and/or accelerators). This modality also aligns with the acquisition and investment modality, especially the submodalities relating to internal open innovation initiatives, corporate venture capital arms, and fintech funds, since banks' attempts to modernize their internal resources and capabilities to make them more suitable for strategies of interdependence through these submodalities, subsequently enable banks to better enter into open

innovation initiatives with external stakeholders. In several cases, banks combined their external open innovation initiatives with their internal ones – at times even with their corporate venture capital arm, fintech funds, and fintech subsidiaries – to create integrated open innovation units. In a similar vein, this modality also relates to the open IT infrastructure modality, in that the open IT infrastructure modality describes the technological mechanisms – such as open APIs – through which banks seek to realize their open innovation endeavours; in a few cases, banks also combined their open-API platforms into their integrated open innovation units.

The rest of Section 6.3.3 details key findings across the submodalities in the open innovation modality.

Establishment of Banks' Own External Innovation Labs, Incubators, and/or Accelerators

Banks that launched extensive networks of external innovation labs, incubators, and accelerators include HSBC, Société Générale, Barclays, ING, and BBVA. For example, ING launched an innovation lab in 2016, a series of innovation labs/incubators in 2018 in Turkey, Poland, and Germany, an innovation lab/incubator in 2015, an incubator in 2019, 2 incubators/accelerators in the Netherlands and Belgium in 2016, an accelerator in 2016, and a series of innovation labs, incubators and accelerators launched in 2017 in Amsterdam, Brussels, London, and Singapore; while Barclays launched 2 networks of innovation labs (2 in New York, London, Tel Aviv, Mumbai) and 2 networks of accelerators (London, Tel Aviv, New York, Cairo). Several of these banks (HSBC, Barclays, and Société Générale) that launched extensive external open innovation initiatives, did not launch any internal open innovation initiatives (or launched very few, limited ones). On the other hand, several banks, like Santander, UniCredit, Nordea, and Credit Suisse, had relatively limited activity in terms of establishing external open innovation initiatives. However, Santander, Nordea, and Credit Suisse launched several internal open innovation initiatives, while UniCredit stands out as having a limited number of both internal and external open innovation initiatives. The only bank not to establish external open innovation initiatives was Rabobank (however, it was early to launch internal ones such as the Rabobank Mooonshot Campaign in 2015 and the Blockchain Acceleration Lab in 2016).

From a temporal perspective very few external open innovation initiatives were launched before 2013 (over 90% were launched after 2014). BBVA therefore stands out in this regard as it launched the majority

of its external open innovation initiatives before 2013, some as early as 2009 and 2011. BBVA launched a series of innovation labs in Madrid, the USA, and Mexico in 2011 and in Colombia in 2013, an innovation lab/incubator in 2009, an incubator/accelerator in London in 2018, an accelerator in Madrid in 2019, and an open innovation program in 2009. BBVA was also early to launch its internal open innovation initiatives although they were not as early as BBVA's external ones. BNP Paribas, Barclays, and ING also launched their external open innovation initiatives relatively early. On the other hand, HSBC and Société Générale launched the majority of their external open innovation initiatives comparatively late. Several banks launched the majority of their internal open innovation initiatives after first launching external ones including BNP Paribas, Crédit Agricole, Deutsche Bank, Lloyds Banking Group, BBVA, and Nordea. Conversely, Standard Chartered launched its internal open innovation initiatives much earlier than its external ones, only launching external ones as late as 2019.

Participation in Others' External Innovation Labs, Incubators, and/or Accelerators

All banks participated in consortium open innovation initiatives. Several consortium innovation labs, incubators, and accelerators are well represented by the 20 banks, including Accenture's FinTech Innovation Lab launched in 2010 in London, New York, and Hong Kong, TechQuartier & FintechEurope launched in 2018 in Frankfurt, and The Floor Hub launched in Tel Aviv in 2016 and in Hong Kong in 2018. For example, 16 out of the 20 banks considered participated in the FinTech Innovation Lab across its locations in London, New York, and Hong Kong. From a temporal perspective, at an aggregate level, consortium open innovation initiatives were initiated earlier than both external and internal open innovation initiatives. Rabobank, Santander, and Nordea were comparatively early to participate in consortium open innovation initiatives; these 3 banks, which also had no or limited external open innovation initiatives, were overrepresented in terms of participation in consortium open innovation initiatives. HSBC, which has no internal open innovation initiatives, was also overrepresented in terms of participation in consortia open innovation initiatives (in fact HSBC had the joint highest participation in consortium open innovation initiatives of the 20 banks considered). On the other hand, despite its expansive network of both internal and external open innovation initiatives, BBVA only participated in 1 consortium open innovation initiative – the least of the 20 banks considered – indicating an inclination to be the focal firm or originator of open innovation initiatives.

6.3.4 – Open IT Infrastructure Modality

The open IT infrastructure modality describes the technological initiatives that banks undertook to facilitate their strategies of interdependence. This modality is composed of two submodalities. The first describes the open API portals, developer kits, and sandboxes that banks launched to facilitate value cocreation with external stakeholders from a technological perspective. Regulations like PSD2 and the Open Banking Standards, which came into effect in 2018, were important triggers for this submodality. However, many banks embraced open banking beyond the minimum requirements of regulators and extended their open API portals, developer kits, and sandboxes beyond Europe and beyond the requirements mandated by regulation. The second submodality deals with the exclusively technological interfaces that banks launched to facilitate the collaboration of banks' staff, customers, and external stakeholders to cocreate new solutions and services.

This modality relates to the previous 3 modalities as it provides the technological enablement for strategies of interdependence to be implemented. For example, this modality facilitates from a technological perspective the value cocreation that banks seek through their engagement with external resources and capabilities through partnerships (partnership modality) and open innovation initiatives (open innovation modality). This modality also relates to the acquisition and investment modality in that it also facilitates technologically banks' attempts to evolve their resources and capabilities to make them better suited for strategies of interdependence (e.g., through creating fintech subsidiaries and fintech initiatives which need to have open technological architectures in order for them to facilitate value cocreation with external stakeholders and consequently contribute to banks' strategies of interdependence).

The rest of Section 6.3.4 details key findings across the submodalities in the open IT infrastructure modality.

Establishment of Open API Portals, Developer Kits, and Sandboxes

All banks established open API portals, developer kits, and sandboxes, compelled by regulatory forces (PSD2 and Open Banking Standard). However, 3 banks (BBVA, Groupe BPCE, and Nordea) were early proponents of open APIs launching their open API portals in 2017, a year before PSD2 and the Open

Banking Standard came into effect. While some banks may have opened their APIs just enough to satisfy PSD2 and Open Banking regulations, several banks like Crédit Agricole, Groupe BPCE, BBVA, Santander, HSBC, and Standard Chartered, embraced open APIs further. For example, Groupe BPCE, incorporated their open API portal, developer kit, and sandbox into a wider ranging open innovation technological platform called 89C3, which includes a user experience (UX) charter; BBVA extended its open API portal, developer kit, and sandbox beyond Europe to its operations in the US and Mexico; in 2019, HSBC partnered with SWIFT to define a common industry standard for open-APIs in Hong Kong.

Open Innovation Technological Interfaces for Staff, External Developers, and Customers to Co-Innovate

All banks established open innovation technological platforms for staff, customers, and external parties to collaborate and co-innovate, except for HSBC, Crédit Mutuel, UBS, UniCredit, and Intesa Sanpaolo. From a temporal perspective, these open innovation technological platforms were launched earlier than other open innovation initiatives (almost two thirds were launched in or before 2014). ING, Barclays, the Royal Bank of Scotland, Lloyds Banking Group, Santander, Rabobank, and Nordea were comparatively early in launching open innovation technological platforms, while Standard Chartered was comparatively late in doing so. As well as being an early adopter of open innovation technological platforms, ING also launched the most, and was one of the few banks of the 20 considered to have launched and adopted innovation methodologies (Way of Working (WoW) in 2016 and PACE in 2017) to – among other things – support the way its staff co-innovate with external stakeholders.

6.4 – Taxonomy of Banks' Strategies of Interdependence

Having presented the findings from Data Collection Activity 3 and Data Interpretation Activity 2 at the individual case level (in Section 6.2) and at the modality level (in Section 6.3), this section presents the taxonomy of banks' strategies of interdependence, which was formulated through the process described in Section 4.3.1.3. Section 6.4.1 starts by highlighting key combinations of characteristics (modalities and submodalities) to form the dimensions that in turn combine to form the individual taxa of the taxonomy. Section 6.4.2 presents the taxonomy and elaborates on its 8 individual taxa.

6.4.1 – Key Relationships and Combinations of Individual Characteristics

There is an observed relationship between the "Establishment of internal innovation labs, think tanks, incubators, accelerators, and/or innovation outposts (Acquisitions and investments modality)", the "Establishment of banks' own external innovation labs, incubators, accelerators and/or innovation outposts (Open innovation ecosystems modality)", and the "Participation in others' external innovation labs, incubators, and/or accelerators (Open innovation ecosystems modality)". Some banks only established internal open innovation initiatives (e.g., innovation labs, incubators, accelerators) while participating in many consortium open innovation initiatives. Several banks only established external open innovation initiatives. Several banks launched both internal and external open innovation initiatives. One bank did not launch either internal or external open innovation initiatives (or launched very limited ones) while participating in very few consortium open innovation initiatives. One bank integrated its internal open innovation initiative with another submodality ("Establishment of fintech subsidiaries (Acquisitions and investments modality)") to form an innovation unit. 2 banks launched well integrated internal and external open innovation initiatives that were also integrated with other submodalities ("Establishment of corporate venture capital subsidiary and fintech funds (Acquisitions and investments modality"), while participating in very few consortium open innovation initiatives. These open innovation submodalities also combined with the two submodalities under the Open IT Infrastructure modality "Establishment of open-API portals, developer kits, and sandboxes", and "Open innovation technological interfaces for staff, external developers, and customers to co-innovate". For example, the 2 banks that had integrated external and internal open innovation initiatives, corporate venture capital arms, and fintech funds, also both embraced open-APIs beyond the requirements of PSD2 and the Open Banking Standard.

Several banks did not establish a corporate venture capital arm or a fintech fund ("Establishment of corporate venture capital subsidiary and fintech funds" (Acquisitions and investments modality)) and had no or very few lead-investments in fintechs ("Lead investments in fintechs (Acquisitions and investments modality")); most of those banks also had no or low numbers of fintech acquisitions ("Acquisition of fintech or fintech related firms" (Acquisition and investments modality")), established a low or moderate number of fintech subsidiaries ("Establishment of fintech subsidiaries" (Acquisition and investment modality")), and launched no or a low number of fintech initiatives ("Establishment of fintech initiatives" (Acquisition and investment modality")). Some banks were early to establish corporate venture capital

arms and fintech funds, they also had a high number of lead investments in fintechs. A few banks were late to launch a corporate venture capital arm and fintech fund, all had a low number of lead investments in fintechs. The following submodalities from the Acquisition and investment modality were also tightly linked: "Acquisition of fintech or fintech related firms", "Establishment of fintech subsidiaries", and "Establishment of fintech initiatives". A large number of banks had no or a low number of fintech acquisitions, no or a low number of fintech initiatives, and low to moderate numbers of fintech subsidiaries. Two banks had a high number of fintech acquisitions and a high number of fintech subsidiaries. Only one bank was significantly represented under the "Spin-off of fintech subsidiaries" submodality, it also had a low number of fintech acquisitions, a low to moderate number of fintech subsidiaries, and a high number of fintech initiatives. There is also a link between "Divestments" (Acquisition and investments modality) modality and "Partnership Cessations" (Partnerships modality); two banks were overrepresented in both these submodalities.

The following submodalities within the Partnership modality are also linked: "Partnerships or non-lead investments in fintechs", "Partnerships with bigtech or telecommunication firms", "Partnerships with other financial institutions", and "Consortium initiatives, especially blockchain consortia". For example, 9 of the banks had low to moderate numbers of partnerships with bigtechs, low to moderate numbers of fintech related partnerships with other banks, low to moderate partnerships or non-lead investments in fintechs, and low to moderate participation in blockchain consortia; 2 of these banks also originated *de novo* blockchain consortia. 2 banks had a high number of bigtech partnerships, a high number of fintech related partnerships with other banks, high participation in blockchain consortia, and a low to moderate number of fintech partnerships or non-lead investments in fintechs; 1 of these banks also originated *de novo* a blockchain consortia.

6.4.2 – Taxonomy of Banks' Strategies of Interdependence

Having presented the relationships between certain characteristics (modalities and submodalities) in Section 6.4.1, this section presents the taxonomy of banks' strategies of interdependence. By identifying relationships between characteristics, combinations of characteristics – or dimensions – were established, following the taxonomy generation process described in Section 4.3.1.3. After 4 iterations – the fourth iteration being the final detailed taxonomy – (see Appendix 11) the dimensions were combined to form 8

taxa. Diagram 7 presents a detailed taxonomy. Diagram 8 presents a high-level taxonomy. The rest of Section 6.4.2 is split into 8 sub-sections which go into more detail regarding each individual taxon.

Diagram 7: Detailed Taxonomy of Banks's Strategies of Interdependence

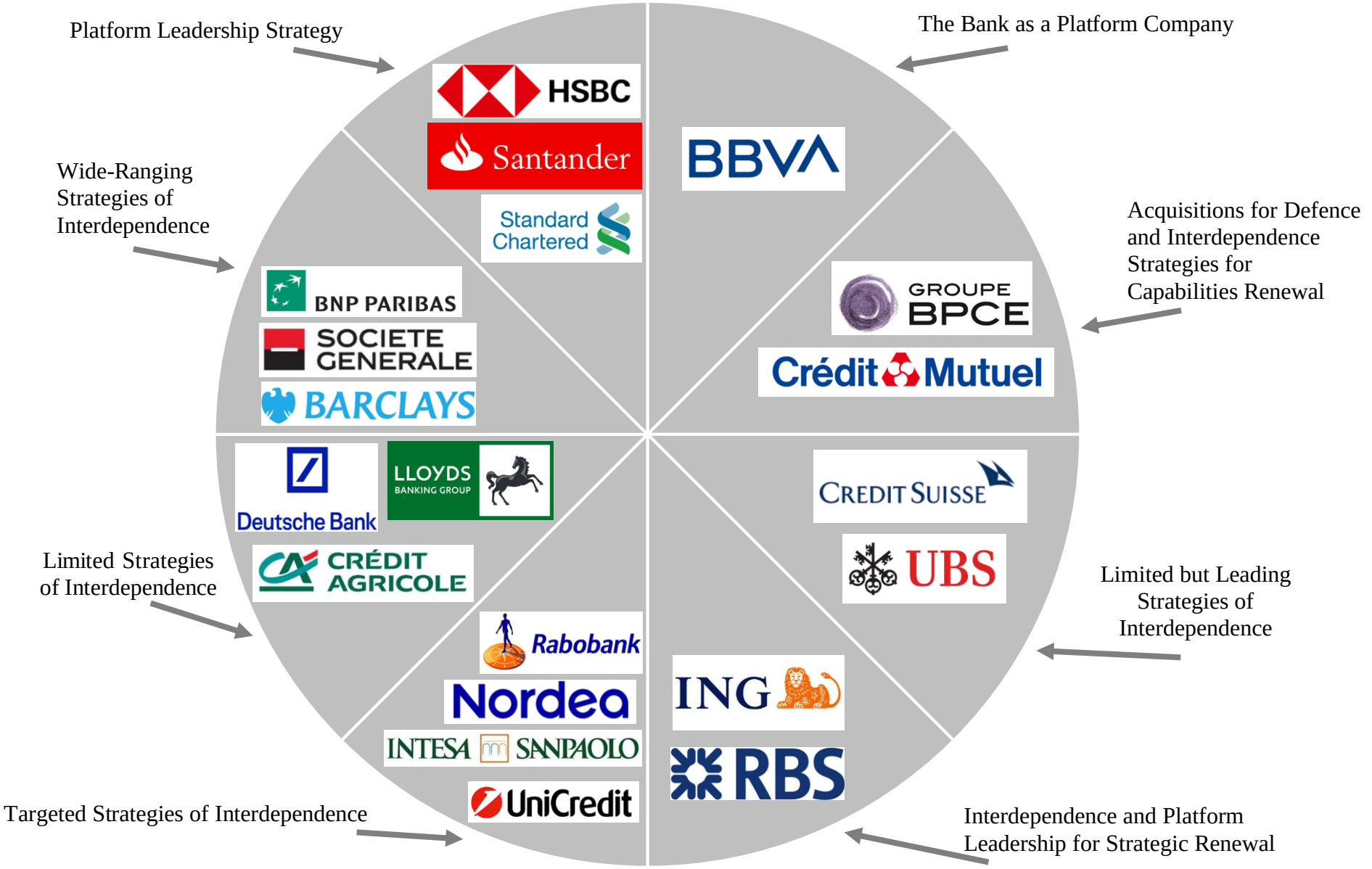

Diagram 8: High-Level Taxonomy of Banks's Strategies of Interdependence

6.4.2.1 – The Bank as a Platform Company

This taxon describes banks that have embraced the most wide-ranging and sophisticated strategies of interdependence to the point where they are evolving into platform companies. Only one bank of the 20 considered – BBVA – fits in this taxon. Francisco González, BBVA's Chairman & CEO articulated this strategy effectively when he announced at the 2018 Mobile World Congress that "*BBVA will be a software company in the future*"[364].

Banks in this taxon were early to establish both internal and external innovation labs, incubators, and/or accelerators to develop their resources and capabilities and draw on externally developed resources and capabilities. They were also early to launch an internal corporate venture capital arm along with a well-funded fintech-focused fund to invest in (and potentially influence) relevant external resources and capabilities. These banks also embraced open-APIs early and beyond the basic requirements of PSD2 and the Open Banking Standard in order to facilitate technologically their collaboration with external resources and capabilities. Banks in this taxon were also early to recognize the importance of creating integrated units that brough together internal and external innovation labs, incubators, and/or accelerators along with their corporate venture capital arms and fintech funds. BBVA was early to launch a wide array of internal and external innovation labs, incubators, and accelerators in Spain, the UK, the US, Mexico, and Colombia, (e.g., it launched an open innovation program along with an incubator/accelerator in 2009, external innovation labs in Madrid, the US and Mexico in 2011 and in Colombia in 2013, as well as an internal incubator/accelerator in San Francisco in 2011). BBVA was quite early in launching its corporate venture capital arm (in 2013) and allocated one of the largest fintech funds (250 million USD) out of the 20 banks considered, which is higher than that of much larger banks like HSBC and Santander. BBVA was also early to embrace open-APIs and launched its open-API portal, developer toolkit, and sandbox in 2017 (before most of the other 20 banks, and before the deadlines set by PSD2 and the Open Banking Standard) and championed open-APIs in the US and Mexico (beyond the geographic scope of PSD2 and the Open Banking Standard). In 2015, BBVA launched an integrated unit – BBVA New Digital Business – with offices in San Francisco, Europe, and Asia aimed at disrupting BBVA before others do. BBVA New Digital Business includes an internal and external innovation lab/incubator/accelerator where the

[364] https://www.bbva.com/en/francisco-gonzalez-the-future-of-banking-is-decided-in-places-like-this-one/

bank can either build its own fintech ventures or partner with external ones, and a venture capital arm to invest in or acquire external fintechs.

These capabilities (innovation labs, open-APIs, corporate venture capital arms, etc.) enable banks in this taxon to make a high number of lead investments in innovative fintech start-ups early on, enter into a large number of partnership and/or non-lead investments in fintech start-ups early on, and to partner with a large number of diverse bigtechs early on, and in different subsectors. These capabilities also allow banks in this taxon to begin launching innovative fintech initiatives and to establish fintech subsidiaries early on to better engage with and serve their customers. Banks in this taxon undertook a moderate number of targeted acquisitions aimed at enhancing their existing resources and capabilities; they were also adept at terminating or divesting from any initiatives that did not prove fruitful in an agile way thus accounting for comparatively higher numbers of partnership cessations and divestments. BBVA made 11 lead investments in fintechs between 2013-19, including a 39% stake that it accumulated in mobile only bank Atom Bank, partnered with or made non-lead investments in 10 fintechs between 2014-19, and was early to partner with bigtechs, entering into 9 bigtech partnerships as early as 2015, with several bigtechs (including Apple, Alibaba, Google, Facebook, and Samsung) in the payments and personal banking subsectors. BBVA launched more fintech initiatives than any of the other 20 banks considered and did so as early as 2012, while launching 6 fintech subsidiaries between 2014-18. BBVA made 5 targeted acquisitions between 2014-17 to boost its resources and capabilities, for example it acquired the San Francisco-based user experience and design company Spring Studio in 2015, and 2 direct banking fintechs in 2014 and 2017.

While banks in this taxon were early to embrace open-innovation with externally held/controlled resources and capabilities, they were nevertheless aware of the risks associated with platform strategies, for example the risk of ceding control or losing spill-over rents to external parties. Hence, banks in this taxon were more likely to take maintain a platform leadership role in any platforms they originated, and adopted a measured approach to joining platforms originated and led by others. Banks in this taxon originated blockchain consortia, while joining a moderate number of blockchain consortia originated by others, they had a low number of fintech-related partnerships with other banks, and participated in few consortium innovation labs, incubators, and/or accelerators. While BBVA was early to establish a wide array of internal and external innovation labs, incubators, and/or accelerators, it only participated in one

consortium innovation lab, incubator, and/or accelerator (the joint lowest of the 20 banks considered). Similarly, while BBVA partnered extensively with bigtechs, it was more reluctant to partner with other banks and financial institutions on fintech initiatives, only entering into 3 such partnerships, 2 of which related to standards setting or the establishment of a country-wide payments platform, both of which align with the aim of maintaining a level of control and/or leadership in a platform. BBVA joined a moderate number of blockchain consortia, a third of which related to blockchain standards. The bank was also one of the few of the 20 considered to have originated a number of *de novo* blockchain platforms, though unlike the few other banks that did, BBVA was the only one to limit these blockchain initiatives – several of which were European firsts or global firsts – to internal platforms that it leads and controls using a hybrid architecture of both in-house, private blockchain technology and a public blockchain.

6.4.2.2 – Platform Leadership Strategy

This taxon describes banks that have adopted advanced and sophisticated platformization strategies, though in a way that was not as transformative as banks in the "The Bank as a Platform Company" taxon. 3 of the banks considered fall into this taxon – HSBC, Santander, and Standard Chartered – though there are nuances in each of their approaches.

Banks in this taxon had a high number of partnerships with bigtechs, all had corporate venture capital arms and well-funded fintech funds, established a low to moderate number of fintech subsidiaries and a low to moderate number of open innovation technological interfaces, and embraced open-APIs beyond the requirements of PSD2 and the Open Banking Standard. They either a) entered into a high number of fintech related partnerships with other banks and financial institutions, and participated in a high number of consortium innovation labs, incubators, and/or accelerators, while having a low to moderate participation in blockchain consortia, or, b) entered into a low to moderate number of fintech related partnerships with other banks and financial institutions, participated in few consortium innovation labs, incubators, and/or accelerators, and participated in a large number of blockchain consortia. They also either had a) no fintech acquisitions, a low to moderate number of lead investments in fintechs, and a low to moderate number of non-lead investments or partnerships with fintechs, or b) a moderate number of fintech acquisitions, a high number of lead investments in fintechs, and a high number of non-lead investments or partnerships with fintechs, but also a propensity to cease partnerships once they were no

longer deemed beneficial. Banks in this taxon have all embraced open innovation, though this manifested itself in different ways: a) a wide ranging network of only external innovation labs, incubators, and/or accelerators combined with a large number of internal fintech initiatives, or, b) a large network of internal innovation labs, incubators, and/or accelerators – some of which are integrated with fintech subsidiaries into an internal innovation unit – combined with a low to moderate number of external innovation labs, incubators, and/or accelerators, and a low number of internal fintech initiatives, or c) a low number of internal fintech initiatives combined with an integrated network of internal and external innovation labs, incubators, and/or accelerators, corporate venture capital arm, and fintech fund (though launched much later than the similarly extensive, integrated units that figure in the "The Bank as a Platform Company" taxon).

The 3 banks embraced open innovation, though in different ways. For example, HSBC focused its open innovation initiatives purely externally to tap into externally held/controlled resources and capabilities through establishing an extensive network of innovation labs, incubators, and accelerators as well as participating in a large number of consortium innovation labs, incubators, and accelerators, while launching a low to moderate number of fintech subsidiaries. On the other hand, Santander established a wide network of internal innovation labs, incubators, and accelerators, while launching very few external ones preferring to participate in a large number of consortium innovation labs, incubators, and accelerators. Santander also launched a large number of fintech initiatives and a low to moderate number of fintech subsidiaries. Additionally, in 2019 Santander integrated some of its internal innovation labs/incubators/accelerators and some of its fintech subsidiaries into an innovation unit called the Santander Global Platform. Standard Chartered also launched an integrated unit in 2018 called SC Ventures that comprised internal and external innovation labs/incubators/accelerators, a corporate venture capital arm and a well-funded fintech fund, which was similar to the approach adopted by banks in the "The Bank as a Platform Company" taxon, though initiated much later. While all 3 banks adopted extensive open innovation initiatives, they were not as early to do so as banks in the "The Bank as a Platform Company" taxon. All three banks also embraced open-APIs beyond the regulatory requirements of PSD2 and the Open Banking Standard, for example Santander and Standard Chartered did not limit their open-APIs to Europe making them available across their global geographies, while HSBC collaborated with SWIFT in 2019 to define a common industry standard for open-APIs in Hong Kong. All 3 banks launched prominent venture capital arms and well-funded fintech funds, HSBC's Strategic

Innovation Investments along with a 200 million USD fund in 2014, Santander's InnoVentures along with a 200 million USD fund in 2014, and Standard Chartered's SC Ventures along with a 100 million USD fund in 2018.

All three banks partnered extensively with bigtechs early on. HSBC and Standard Chartered, which derive a significant proportion of their revenues from China and the Asia Pacific region, partnered extensively with Chinese bigtechs. For example, HSBC was the first non-Chinese bank to offer digital credit cards that integrated with WeChat Pay and Alipay in 2019, and Standard Chartered partnered with Alibaba in 2018 on several blockchain based cross-border remittance solutions. HSBC and Santander had a large number of fintech related partnerships with other banks and incumbents especially relating to standards setting activities, while participating in a low to moderate number of blockchain consortia, while for Standard Chartered it was the other way round. For example Santander partnered with 27 other Spanish banks, the Bank of Spain, and the Spanish government to launch the Spanish mobile payments platform Bizum in 2017 and was part of the Global Payments Steering Group launched in 2016 to formalize standards that govern transactions using Ripple, HSBC participated and in some cases led a significant number of standards setting initiatives including Innovate Finance, the UK Financial Conduct Authority's first regulatory sandbox, the British Standards Institute's Fintech Collaboration Toolkit, and the Trade Finance Distribution Initiative, while Standard Chartered participated in the joint second highest number of blockchain consortia between 2015-19. HSBC and Standard Chartered made no fintech acquisitions, and made a low to moderate number of lead investments in fintechs, and a low to moderate number of non-lead investments or partnerships with fintechs, while Santander made a moderate number of fintech acquisitions (including a 50.1% stake in Ebury in 2019), and made the highest number of lead investments in fintechs out of the 20 banks considered including in prominent fintechs such as Ripple, and a high number of non-lead investments or partnerships with fintechs, though Santander was prolific in divesting from any fintechs that no longer aligned with its strategy or ceasing partnerships with them.

6.4.2.3 – Wide-Ranging Strategies of Interdependence

Banks in this taxon adopted strategies that embraced interdependence in a wide-ranging way, though not as extensively as those in the "Platform Leadership Strategy" taxon, and in a less transformative way as

those in “The Bank as a Platform Company” taxon. 3 banks figure in this taxon: BNP Paribas, Société Générale, and Barclays, though there are nuances in their approaches.

Banks in this taxon had a low number of fintech acquisitions, a low number of fintech initiatives, a low to moderate number of fintech subsidiaries, a low to moderate number of fintech related partnerships with other banks and incumbents, participated in a low number of consortium open innovation initiatives, and adopted open-APIs but not beyond the requirements of PSD2 and the Open Banking Standard. These banks all established corporate venture capital arms and fintech funds, entered into a large number of partnerships and/or non-lead investments in fintechs, and launched a moderate to high number of open innovation technological interfaces. Banks in this taxon either launched a combination of internal and external open innovation initiatives (innovation labs, incubators, and/or accelerators) or only external ones. Banks in this taxon also either a) made a large number of lead investments in fintechs and participated in a low to moderate number of blockchain consortia, or b) made a low to moderate number of lead investments in fintechs and participated in a high number of blockchain consortia.

BNP Paribas made a few targeted fintech acquisitions and launched a moderate number of fintech subsidiaries focused on boosting its direct/online banking capabilities including launching Hello Bank! in 2013 and acquiring Compte Nickel in 2017. Société Générale also made a few fintech acquisitions in 2018 and has a moderate number of fintech subsidiaries like Boursorama Banque, and fintech initiatives such as the mobile money solution YUP launched in 2017. Barclays made a couple of fintechs acquisitions relatively early while launching the payments focused fintech subsidiary Pingit in 2012. All three banks launched corporate venture capital arms and fintech funds, like Société Générale Ventures launched in 2018 along with a 150 million EUR fund in 2019, and Barclays UK Ventures launched in 2018 along with a 10 million GBP fund allocated to each annual cohort that graduates from the Barclays Accelerator, however these corporate venture capital arms and fintech funds were launched later than those by the banks in the “Platform Leadership Strategy” and the “The Bank as a Platform Company” taxa. All 3 banks had low to moderate number of fintech related partnerships with other banks and incumbents while partnering extensively with fintechs. Although the 3 banks only embraced open-APIs to the extent required by PSD2 and the Open Banking Standard, they did launch a large number of open IT technological interfaces, such as Société Générale’s Open Innovation Platform that facilitates collaboration with fintech start-ups, the Barclaycard Ring Community launched in 2012 to crowdsource

payments-related innovative ideas, and BNP Paribas' OpenUp platform launched in 2016 which facilitates collaboration between start-ups and BNP Paribas' internal teams.

In terms of open innovation approach, both Société Générale and Barclays adopted an exclusively external approach, both establishing a wide network of external innovation labs, incubators, and accelerators, while participating in a relatively low number of consortium open innovation initiatives. For example, Société Générale launched 9 innovation labs/incubators between 2016-18 and an accelerator in 2015, while Barclays was early to launch extensive networks of innovation labs that were linked to well-funded accelerators in innovation hotspots such as the Barclays Accelerator launched in 2014 and the Rise innovation labs launched in 2015 in London, New York, Tel Aviv, and Mumbai. On the other hand, between 2016-18 BNP Paribas, which is one of the few banks of the 20 considered to have its own internal think tank – L'Atelier BNP Paribas – launched a network of internal and external innovation labs, incubators, and accelerators in France and the US which also collaborate with its internal think tank. BNP Paribas also participated in a low number of consortium open innovation initiatives.

Société Générale and BNP Paribas had a low to moderate number of lead investments in fintechs. BNP Paribas only made 5 lead investments including in the prominent fintech unicorn Symphony Communication Services, while Société Générale only made 2 lead investments in fintechs. Both banks, participated in a large number of blockchain consortia. BNP Paribas participated in 17 blockchain consortia (the highest number of the 20 banks considered), while Société Générale participated in 15 (the joint second highest number of the 20 banks considered). On the other hand, Barclays made a large number of lead investments in fintechs (the joint third highest of the 20 considered), while participating in a moderate number of blockchain consortia. None of the 3 banks in this taxon originated or took leadership positions in any blockchain consortia. Barclays and BNP Paribas entered into low to moderate numbers of bigtech partnerships, Barclays was hesitant to partner with bigtechs given Barclaycard's dominance of the UK payments sector, while BNP Paribas was late to partner with bigtechs. On the other hand, while Société Générale was late to partner with bigtechs, once it did it, did so extensively especially through its direct bank Boursorama Banque; the bank also partnered extensively with telecommunications firms especially in African countries where Société Générale has wide ranging banking operations and where there is widespread adoption of mobile money.

6.4.2.4 – Targeted Strategies of Interdependence

Banks in this taxon adopted less wide-ranging strategies of interdependence than those in the "Wide-Ranging Strategies of Interdependence" taxon, preferring to engage with externally owned or controlled resources and capabilities in a more targeted way. 4 banks figure in this taxon, Rabobank, Nordea, Intesa Sanpaolo, and UniCredit.

Banks in this taxon made no or a low number of fintech acquisitions, established a low to moderate number of fintech subsidiaries, entered into a low to moderate number of fintech related partnerships with other banks and incumbents, entered into low to moderate number of bigtech partnerships, and participated in a low to moderate number of blockchain consortia. These banks all launched corporate venture capital arms and fintech funds but made a low to moderate number of lead investments in fintechs. They also only adopted open-APIs to the extent required by PSD2 and the Open Banking Standard while launching no or few open technological interfaces. In terms of open innovation initiatives, these banks either a) only established internal open innovation initiatives (e.g., innovation labs, incubators, and/or accelerators) while participating in a high number of consortium open innovation initiatives, or, b) only established external open innovation initiatives while participating in a low number of consortium open innovation initiatives. Banks in this taxon also either a) launched a high number of fintech initiatives and entered into a high number of partnerships or non-lead investments in fintechs, or, b) launched no or few fintech initiatives and entered into a low to moderate number of partnerships or non-lead investments in fintechs.

Both Intesa Sanpaolo and UniCredit made no fintech acquisitions while launching a low but targeted, number of fintech subsidiaries and initiatives, such as Intesa Sanpaolo's XME Pay Digital Wallet launched in 2018, and UniCredit's mobile only bank Buddybank launched in 2018. Both banks established no (or very limited) internal innovation labs, incubators, and/or accelerators, while establishing external ones such as UniCredit's Start Lab accelerator launched in 2014 and the Intesa Sanpaolo Innovation Center in 2015. UniCredit and Intesa Sanpaolo both launched corporate venture capital arms – UniCredit EVO and Intesa Sanpaolo's Neva Finaventures both launched in 2016 – along with fintech funds, though they made few lead investments (though in Intesa Sanpaolo's case it took noticeably large stakes in all its lead investments such as its 37.9% stake in personal finance fintech Oval Money in 2018). Nordea and Rabobank each only made 1 fintech acquisition; Nordea established no fintech subsidiaries and launched

few fintech initiatives while Rabobank established a moderate umber of fintech subsidiaries such as payment subsidiary SurePay launched in 2017, and launched a high number of fintech initiatives including ones that were accelerated in Rabobank's internal Moonshot acceleration programme. Rabobank was the only bank of the 20 considered not to establish any external open innovation initiatives while Nordea only launched one short-lived one between 2015-16. However, both banks established internal open innovation initiatives such as Rabobank's internal Moonshot acceleration programme launched in 2015 and its internal Blockchain Acceleration Lab launched a year later, and Nordea's LC&Ix internal innovation lab and incubator launched in 2019; both also participated in a large number of consortium open innovation initiatives (Rabobank participated in the joint highest number of consortium open innovation initiatives of the 20 banks considered). Like UniCredit and Intesa Sanpaolo, both Nordea and Rabobank launched corporate venture capital arms and fintech funds (Nordea Ventures launched in 2017 and Rabobank's Rabo Frontier Ventures launched in 2018), and like UniCredit and Intesa Sanpaolo, both Nordea and Rabobank made few lead investments in fintechs. However, unlike UniCredit, Intesa Sanpaolo, and Nordea, Rabobank entered into a large number of partnerships with fintechs, the majority of which relate to crowdfunding which aligns with Rabobank's mutualist ideology.

UniCredit entered into a number of targeted bigtech partnerships such as its wide-ranging partnership with Alibaba in 2017-18 following the memorandum of understanding between Alibaba and the Italian Government in 2014. Intesa Sanpaolo entered into a moderate number of targeted partnerships with other banks and incumbents like its participation in the International Association for Trusted Blockchain Applications (INATBA) standards setting body in 2019. Rabobank participated in a moderate number of blockchain consortia including being the primary banking partner in the commodities trading platform Repo:NOW. Nordea entered into a moderate number of partnerships with other banks and incumbents targeted at establishing national payments networks in the Nordic countries in which it operates.

6.4.2.5 – Limited Strategies of Interdependence

This taxon described banks that undertook very limited strategies of interdependence. Of the 20 banks considered, banks in this taxon were the least engaged in strategies of interdependence. 3 banks fell into this taxon: Deutsche Bank, Lloyds Banking Group, and Crédit Agricole.

Banks in this taxon established internal and external open innovation initiatives (e.g., innovation labs, incubators, and accelerators) while participating in few consortium open innovation initiatives. They established no corporate venture capital arms, no fintech funds, made few lead investments in fintechs, and entered into a low to moderate number of partnerships or non-lead investments in fintechs. These banks made no or few fintech acquisitions, established a low to moderate number of fintech subsidiaries, launched no or few fintech initiatives, entered into few fintech related partnerships with other banks and incumbents, entered into few partnerships with bigtechs, and participated in a low to moderate number of blockchain consortia. Most banks in this taxon embraced open-APIs only to the extent required by PSD2 and the Open Banking Standard while launched no or few open innovation technological interfaces.

Some of Crédit Agricole's limited strategies of interdependence included its establishment of 2 direct banking subsidiaries (BforBank in 2010 and Findio in 2015), its collaboration with other financial services incumbents to create the French Association for the Management of CryptoCurrencies (Association Française pour la Gestion des Cybermonnaies – AFGC), later renamed French Digital Asset Association (FD2A), its establishment of Le Village by CA (a network of 33 incubators/accelerators) in 2014 and La Fabrique by CA (a fintech start-up studio) launched in 2018, and its early embracing of open IT technological interfaces. Some of Deutsche Bank's limited strategies of interdependence included its establishment of its start-up factory – Breaking Wave – in 2019, internal innovation labs in Frankfurt in 2016 and Shanghai in 2019, its partnership with Commerzbank and other banks in 2015 to launch the German payments platform Paydirekt, its partnership with leading fintech Symphony Communication Services in 2019 to allow Deutsche Bank's Chinese corporate clients to conduct FX trading through WeChat, and its establishment of a network of innovation labs open to external parties – the Deutsche Bank Innovation Network – launched in 2015 in London and Berlin with additional labs subsequently opened in Palo Alto, New York, and Singapore. Some of Lloyds Banking Group's limited strategies of interdependence included its 10% stake in banking infrastructure fintech Thought Machine, the establishment of 2 internal innovation labs in 2016 and 2019 including its 500-employee strong Digital Tech Hub launched in Edinburgh in 2019, an innovation lab open to external fintechs – the LBG Innovation Lab – launched in 2015, and the launch in 2016 of the Lloyds Banking Group Fintech Mentoring Scheme through which fintech start-ups can receive mentoring from Lloyds Banking Group staff.

6.4.2.6 – Acquisitions for Defence and Interdependence Strategies for Capabilities Renewal

Banks in this taxon embarked on strategies of interdependence aimed at renewing their internal resources and capabilities, while undertaking a large number of fintech acquisitions. 2 banks fall into this taxon: Groupe BPCE and Crédit Mutuel.

Banks in this taxon made a high number of fintech acquisitions, established a high number of fintech subsidiaries, and established both internal and external open innovation initiatives (e.g., innovation, labs, incubators, and/or accelerators). These banks also had moderate number of fintech related partnerships with other banks and incumbents, entered into a moderate number of bigtech partnerships, participated in a low to moderate number of consortium open innovation initiatives, launched no or few fintech initiatives, entered into a moderate to high number of partnerships or non-lead investments in fintechs, and made no or few lead investments in fintechs. They also either a) launched a corporate venture capital arm and fintech fund, participated in a low to moderate number of blockchain consortia, adopted open-APIs only to the extend required by PSD2 and the Open Banking Standard, and launched no or few open innovation technological interfaces, or, b) did not launch a corporate venture capital arm and fintech fund, participated in a high number of blockchain consortia, adopted open-APIs beyond the extend required by PSD2 and the Open Banking Standard, and launched a moderate to high number of open innovation technological interfaces.

Both banks that fall into this taxon are cooperative banks. Cooperative banks are often made up of a wide network of autonomous local cooperatives, and vast, regional branch networks, and as such are often technological laggards compared to conventional banks. Crédit Mutuel made 9 fintech related acquisitions, while Groupe BPCE made 8, which is by far the highest of the 20 banks considered (the 2 banks represent 39% of all fintech related acquisitions made by the 20 banks considered). This points to an attempt by the 2 cooperatives to embark on strategic renewal through the acquisition of resources and capabilities that can extend their existing resources and capabilities. However, given their position as technological laggards, these banks' acquisitions for strategic renewal are countered by their (comparatively limited) ability to absorb these resources and capabilities as exemplified by Groupe BPCE's inability to integrate the leading German digital banking fintech Fidor after acquiring it in 2016.

Moreover, while a moderate number of acquisitions (e.g., as with BBVA and Santander) can help enhance the acquirer's internal resources and capabilities, a very high number of acquisitions is indicative of an inclination to bring resources and capabilities into the organization through conventional routes of ownership and control thus rejecting to an extent the notion of cocreating value with external resources and capabilities that are not owned and controlled and by extension rejecting interdependence as a strategy. This approach is also demonstrated by the high number of fintech subsidiaries that both banks launched (both banks account for 24% of fintech subsidiaries established by the 20 banks considered). Groupe BPCE, which has an over 20% share of the payments market in France, focused on payments fintech subsidiaries through its payments subsidiaries Natixis Payments and S-Money; most of the banks' acquisitions were of payments related fintechs which it subsequently integrated into Natixis Payments or S-Money. Crédit Mutuel established 9 fintech subsidiaries, the majority of which were focused on crowdfunding and direct banking. In keeping with their tendency to prefer controlling or owning resources and capabilities, the two banks participated in few consortium open innovation initiatives, made few lead investments in fintechs, entered in comparatively limited fintech related partnerships with other banks and incumbents, and entered into comparatively limited bigtech partnerships. However, the 2 banks did enter into a moderate to high number of partnerships or non-lead investments with fintechs, often focused on their key businesses (e.g., half of Groupe BPCE's fintech partnerships were in the payments subsector). Yet, even in these fintech partnerships banks in this taxon often took significant stakes (non-lead investments) in the fintechs they partnered with, such as Crédit Mutuel's 30% stake in personal banking fintech Linxo, its 28% stake in asset and wealth management fintech Vivienne Investissement, and its 30% stake in asset and wealth management fintech Masuccession.fr.

Both banks launched internal open innovation initiatives (e.g., The Square by Crédit Mutuel Arkea in 2016, and Groupe BPCE's Spark Program launched in 2015 which evolved into the BIG Factory innovation lab and incubator), as well as ones open to external participants (e.g., Groupe BPCE's 89C3 innovation lab, incubator, and accelerator launched in 2017, and several regional innovation labs and incubators launched by Crédit Mutuel between 2016 and 2019). Groupe BPCE did not establish a corporate venture capital arm or a fintech fund, while Crédit Mutuel has a corporate venture capital arm (NewAlpha Asset Management) and a comparatively small fintech fund (56 million EUR) which it closed in 2017. Crédit Mutuel only adopted open-APIs to the extend required by PSD2 and the Open Banking Standard and did not launch any open IT infrastructure initiatives, while Group BPCE embraced open-

APIs further, adopting it a year before it was mandated by PSD2 and the Open Banking Standard and going beyond the minimum requirements (e.g., including a user experience (UX) charter) and launching open IT infrastructure initiatives (e.g., Start-Up PASS which facilitates the way the bank works with start-ups). Groupe BPCE participated in a large number of blockchain consortia, though in more than three quarters of the cases this was done through Groupe BPCE's investment banking arm Natixis, on the other hand Crédit Mutuel participated in only 1 blockchain consortium (the least of the 20 banks considered).

6.4.2.7 – Limited but Leading Strategies of Interdependence

This taxon describes banks that while undertaking limited strategies of interdependence often did so as ecosystem or platform leaders. These banks often directed these strategies toward the renewal of their internal resources and capabilities. The banks that figure in this taxon are UBS and Credit Suisse.

Banks in this taxon launched internal and external open innovation initiatives (e.g., innovation labs, incubators, and accelerators), while participating in a low to moderate number of consortium open innovation initiatives; they were also some of the few banks of those considered to establish internal think tanks. These banks only adopted open-APIs to the extent required by PSD2 and the Open Banking Standard, established no open IT infrastructure initiatives, entered into a low number of fintech related partnerships with other banks and incumbents, partnered with a low to moderate number of bigtechs, launched a low number of internal fintech initiatives, and partnered with few fintechs. They also participated in a low to moderate number of blockchain consortia, however they were prominent in originating and/or leading *de novo* blockchain consortia (in some cases originating and leading several consortia) something that very few of the banks considered undertook. Banks in this taxon also either a) established a corporate venture capital arm and fintech fund, had a low number of lead investments in fintechs, made a low number of fintech acquisitions, and established a low number of fintech subsidiaries, or b) established no corporate venture capital arm and fintech fund, made no lead investments in fintechs, made no fintech acquisitions, and launched no fintech subsidiaries.

UBS and Credit Suisse were 2 of only 3 banks of the 20 considered to launch internal think tanks (UBS Y launched in 2014 and the Credit Suisse Research Institute launched in 2008). They were also early to establish internal open innovation initiatives, for example Credit Suisse's Singapore Innovation Hub in

2014, and its CS Labs launched in 3 cities in 2015 focused on several technologies (machine learning & artificial intelligence in San Francisco, cloud machine learning in London, and machine learning in trading services in New York), and UBS's 5 internal open innovation initiatives including UBS Wealth Innovation Lab launched in 2014 in Zurich with innovation outposts in Tel Aviv and San Francisco and EVOLVE - UBS Centre for Design Thinking & Innovation launched in Singapore in 2015. UBS and Credit Suisse were also early to launch open innovation initiatives that were open to external participants, though these were significantly less extensive than their internal open innovation initiatives. For example, UBS launched 3 external open innovation initiatives including a blockchain innovation lab in London in 2015 and a digital hub in Hong Kong in 2017, while Credit Suisse only launched one, the Credit Suisse Private Innovation Circle in 2014.

UBS and Credit Suisse were some of the few banks of those considered to originate and lead *de novo* blockchain consortia, with UBS in fact originating 2. In 2015, UBS launched an asset-backed digital cash instrument implemented on blockchain technology used for interbank and international cross-border payments called the Utility Settlement Coin (USC). In 2019, this initiative became the fintech firm Fnality International, with UBS as shareholder and ecosystem leader. Several global banks and financial institutions joined Fnality International including Santander, Credit Suisse, Nasdaq, Barclays, and the Bank of New York Mellon. In 2017, UBS launched the Massive Autonomous Distributed Reconciliation platform (MADREC) with participation from Barclays, Credit Suisse, KBC, SIX and Thomson Reuters, to facilitate banks' counterparty data reconciliation in response to MiFID II (Markets in Financial Instruments Directive II) regulatory changes. Credit Suisse originated a *de novo* syndicated lending blockchain consortium in 2016.

Both banks were selective in how they partnered and collaborated with externally owned and/or controlled resources and capabilities. For example, UBS was one of the few banks of those considered not to partner with any of the major bigtechs (Google, Apple, Samsung, Alibaba, Tencent) while Credit Suisse was late to partner with bigtechs (2018-19). Both banks partnered with a low number of other banks and incumbents in fintech related initiatives, usually national payments networks through which the banks had a significant ownership stake and influence (e.g., the Swiss mobile payment solution Twint launched in 2014 in which UBS and Credit Suisse had a combined 26.5% stake). UBS entered into a wide-ranging partnership with asset and wealth management fintech SigFig (e.g., collaborating with SigFig to establish

an innovation lab in San Francisco in 2016, selling a short-lived roboadvisory fintech subsidiary to SigFig). UBS and Credit Suisse only adopted open-APIs to the extent required by PSD2 and the Open Banking Standard and did not launch any open IT infrastructure initiatives. While Credit Suisse – unlike UBS – has a well-established corporate venture capital arm (Credit Suisse NEXT Investors) it made comparatively few lead investments in fintechs, entered into a moderate number of partnerships or non-lead investments in fintechs, and only made 1 fintech acquisition in 2017.

6.4.2.8 – Interdependence and Platform Leadership for Strategic Renewal

This taxon describes banks that embraced interdependence and in some cases were platform leaders with them aim of strategic renewal. These banks are likely ones that have attempted to adopt strategies of interdependence to turn around their fortunes after being afflicted with negative shocks. The banks that figure in this taxon are ING and the Royal Bank of Scotland. Both banks were particularly badly affected by the 2008 GFC (ING received a 10 billion EUR bailout from the Dutch government and had to divest from many of its operations including its insurance business and many of its international banking businesses; in 2009 the Royal Bank of Scotland announced the largest annual loss in British corporate history and had to be bailed out by the UK government which ended up owning 84% of the bank).

Banks in this taxon launched both internal and external open innovation initiatives (e.g., innovation labs, incubators, and/or accelerators), participated in a low to moderate number of consortium open innovation initiatives, adopted open-APIs to the extent required by PSD2 and the Open Banking Standard, launched a moderate to high number of open IT infrastructure initiatives, made a low number of fintech acquisitions, launched a high number of fintech initiatives, established few fintech subsidiaries, entered into few fintech-related fintech partnerships with other banks and incumbents, and entered into a high number of partnerships or non-lead investments in fintechs. These banks also were some of the few of those considered to originate *de novo* blockchain consortia. These banks also either a) did not establish a corporate venture capital fund and fintech fund, made a low number of lead investments in fintechs, participated in a low to moderate number of blockchain consortia, entered into few bigtech partnerships, and launched a moderate number of fintech spin-offs, or, b) established a corporate venture capital fund and fintech fund, made a high number of lead investments in fintechs, participated in a high number of

blockchain consortia, entered into a high number of bigtech partnerships, and launched a high number of fintech spin-offs.

Both banks launched a series of internal and external open innovation initiatives. ING launched its Think Forward Initiative in 2016 which has both an internal open innovation component and an external one, ING has also been running its ING Innovation Bootcamp internal incubator since 2015, which it later supplemented in 2018 through its internal PACE Accelerator, the bank also launched several purely external initiatives including the ING Labs in Brussels in 2015 and later extended to Amsterdam, London, and Singapore in 2017. The Royal Bank of Scotland launched several internal open innovation initiatives such as the RBS Digital Studio in London in 2015, the Open Experience (OX) innovation lab/incubator launched in Edinburgh in 2016, and an innovation outpost – RBS Silicon Valley Solutions – in 2014 in San Francisco, as well as several external ones like the Rocketspace London hub launched in 2016. Both banks only embraced open-APIs to the extent required by PSD2 and the Open Banking Standard, though they were early to launch several open IT infrastructure initiatives, such as the Royal Bank of Scotland's Ideas Bank portal launched in 2013 to crowdsource ideas for future product launches, while ING launched several open IT platforms to foster collaboration between ING staff and external parties such as the ING Web Café launched in France in 2013 and ING Turuncu Destek launched in Turkey in 2014.

Both ING and the Royal Bank of Scotland made a limited number of fintech acquisitions. ING only had 1 fintech subsidiary (its direct bank ING Direct), while the Royal Bank of Scotland established a moderate number of fintech subsidiaries relatively late (2018-19) such as digital only banks Bó and Mettle and merchant acquiring payment service Tyl by Natwest. Both banks also launched a high number of fintech initiatives, though unlike the other banks considered, banks in this taxon were prominent in spinning-off their internal fintech initiatives/subsidiaries into stand-alone fintechs that they nevertheless maintained a relationship with, in fact ING and the Royal Bank of Scotland account for 91% of the fintech spin-offs observed among the 20 banks considered. In 2016, the Royal Bank of Scotland built the Emerald platform – a Clearing and Settlement Mechanism (CSM) based on the Ethereum blockchain – which it later spun-off and continued to develop as an open-source initiative. However, ING stood out as the bank to have spun-off the most fintechs, accounting for 82% of fintech spin-offs among the banks considered. Most of the fintechs ING spun-off were originated in its internal open innovation initiatives and include prominent fintechs such as payment fintech Payconiq spun-off in 2015 which received wide backing from other

banks in the Benelux region, corporate banking fintech Cobase spun-off in 2016, and personal banking fintech Yolt spun-off in 2016.

ING and the Royal Bank of Scotland entered into a low to moderate number of fintech partnerships with other banks and incumbents (e.g., ING's participation in the Dutch Blockchain Coalition in 2017, and the Royal Bank of Scotland's participation in the British Standards Authority's Fintech Collaboration Toolkit in 2018), while entering into a high number of partnerships with fintechs including with prominent fintech unicorns such as ING's strategic partnership with Kabbage. In terms of bigtech partnerships, ING was late to partner with bigtechs in its core geographic markets, while partnering with them much earlier in its non-core geographic markets, on the other hand the Royal Bank of Scotland's bigtech partnerships were comparatively limited. ING launched its corporate venture capital arm ING Ventures along one of the largest fintech funds (300 million EUR) in 2017 as well as a separate 25 million EUR annual fund it launched in 2013 allocated to internal initiatives, and made a large number of lead investments in fintechs including in Hong Kong based fintech unicorn WeLab. On the other hand, the Royal Bank of Scotland did not establish a corporate venture capital arm or a fintech fund, and made very few lead investments in fintechs, though – like ING – one of its lead investments was in a leading fintech unicorn (Transferwise).

The Royal Bank of Scotland participated in comparatively few blockchain consortia, though it was one of the few banks considered to originate *de novo* a blockchain consortium, the Emerald platform which it later open-sourced and which became the underlying technology of Project GreenPay, an inter-bank payments network in Ireland launched in 2017 by a consortium of banks including the Royal Bank of Scotland's Irish subsidiary. ING participated in a large number of blockchain consortia, especially in the commodities space. ING was also one of the few banks of the 20 considered to originate *de novo* a blockchain consortium, the commodities financing platform Komgo incubated at ING's Innovation Bootcamp in 2016 and launched in 2018.

6.5 – Second Order Findings

Having presented the first order findings in Sections 6.2, and 6.3, culminating in the taxonomy of banks' strategies of interdependence in Section 6.4, this section reinterprets and abstracts them to generate second order findings. Section 6.5.1 commences by confronting this study's proposed adaptation of the RBV with

the first order empirical findings in a systematic way to validate empirically the proposed adaptation. Section 6.5.2 confronts the taxonomy of banks' strategies of interdependence with the proposed adaptation of the RBV in a more holistic way, this higher level of abstraction results in a meta-taxonomy of strategies of interdependence. While the taxonomy of banks' strategies of interdependence in Section 6.4 provides more granularity (8 taxons) and is thus useful for academics and practitioners focused on the banking sector or more specifically the European banking sector, the meta-taxonomy of strategies of interdependence, which has a higher level of abstraction (3 taxons) can be useful for academics and practitioners considering strategies of interdependence in broader contexts. Section 6.5 goes a step further by confronting the meta-taxonomy of strategies of interdependence with the contextual categorization presented in Section 5. In doing this, academics and practitioners considering the meta-taxonomy of strategies of interdependence will benefit from a contextual dimension to better understand the type of firm that typically fall into each meta-taxon in terms of financial performance, business segmentation, and geographic segmentation.

6.5.1 – Confronting the Proposed Adapted RBV with this Study's Empirical Findings

This study's theoretical framework proposes an RBV that is better adapted to interdependence in the platform economy age by a) considering externally owned or controlled resources and capabilities and their potential for generating longer lasting relational rents, and, b) consider temporary competitive advantage as a component of sustained competitive advantage. This adaptation is achieved by incorporating the following considerations from the networks, platforms, and ecosystems perspectives and from the coopetition and hypercompetition literatures:

1. network size, characteristics, conduct, and mutli-sidedness as strategic resources, and their management as a strategic capability
2. value cocreation across ecosystems and understanding how network externalities drive relational rents as a strategic capability
3. ecosystem leadership and/or ecosystem origination as a strategic capability
4. coopetition as a strategic capability
5. knowing when to platformize as a strategic capability
6. technological modularity, standards, and protocols as strategic resources, and their management as a strategic capability

To capture these considerations that need to be incorporated into the RBV, I identified 4 modalities and several sub-modalities of banks' strategic responses to interdependence, which I then collected empirically for the top 20 banks in Europe for the time boundary 2008-19. This ultimately led to the creation of a taxonomy of banks' strategies of interdependence. This section will demonstrate how these proposed adaptations to the RBV are empirically validated and supported by this study's findings.

6.5.1.1 – Empirical Support for Network Size/Characteristics/Conduct/Multi-Sidedness as a Strategic Resource and their Management as a Strategic Capability

The 20 banks considered all collaborated with other banks and incumbents to establish fintech-related networks especially in the payments subsector (e.g., 5 of the banks considered collaborated with other incumbents to launch the national payments system PayM in the UK in 2014, 5 of the banks considered collaborated with other incumbents to launch the national payments system PayLib in France in 2013). Network size and network overlap density were key reason for several banks to divest from or leave the German payments system Paydirekt which was unable to garner a large enough network to compete with more established providers in Germany such as PayPal.

Network size and characteristics were also key reasons for why all 20 banks participated in the dominant payments networks established by bigtech such as Apple Pay, Google Pay, and Samsung Pay. For example, though Barclays – with its 27% market share of the UK credit card market – was reluctant to partner with bigtechs, it could not ignore the dominant network size of prominent bigtech payment solutions eventually partnering with Apple Pay in 2016 and Alipay in 2019. Standard Chartered, which derives a large proportion of its revenues from the Asia Pacific and Chinese markets, participated in the prominent Chinese bigtech-led fintech networks that dominate the market such as Ant Financial's (an Alibaba affiliate) payment network Alipay. Standard Chartered joined the Alipay network in 2016 and developed a non-opportunistic relationship and strong network ties with Ant Financial, which developed into a general agreement to collaborate in countries along China's Belt and Road Initiative in 2017, and later into collaboration on several blockchain-based remittance networks in Hong Kong, the Philippines, Malaysia, and Pakistan in 2018. Recognizing the prominence of telecommunications companies in the payments subsector in Sub-Saharan Africa through the provision of mobile money, Société Générale

which has a wide network of subsidiaries in the region, was early to participate in telecommunication company-led mobile money networks such as its partnership with Telma (the largest telecommunications firm in Madagascar to allow the Malagasy population to transfer money using Telma Mobile phones). UBS, which partnered with several other Swiss incumbents to form the Swiss payment network Twint that competes with bigtech-led payment solutions, was the only bank not to have partnered with the major bigtech payments solutions like Apple Pay, Google Pay, Samsung Pay, and Alipay which is an example of network embeddedness.

All 20 banks participated in blockchain networks, which represent a very good example of multi-sided networks since blockchain networks reduce information asymmetry between participants, charge membership or transaction costs, and limit the ability of participants to set prices bilaterally. Most of the participation in blockchain networks were based on 3 dominant blockchain technology networks (R3, Ethereum, and Hyperledger). Several individual blockchain networks also received wide backing from banks, such as we.trade and Marco Polo, owing to their network size and structures.

6.5.1.2 – Empirical Support for Value Cocreation Across Ecosystems and Understanding How Network Externalities Drive Relational Rents as a Strategic Capability

The findings demonstrate that the 20 banks did recognize the importance of aligning and coordinating with various external stakeholders to cocreate network externalities-generating value propositions that none could have created in isolation. All 20 banks collaborated with each other or other incumbents, with bigtechs, or with fintechs to establish value propositions that would have otherwise been impossible to establish unilaterally, including national payments platforms (e.g., PayM in the UK, PayLib and Lyf Pay in France, and Payconiq in the Benelux countries), trade finance blockchain platforms (e.g., we.trade, Marco Polo), interbank settlement blockchain platforms (e.g., Fnality International, the Interbank Information Network), commodities trading blockchain platforms (e.g., Komgo), and FX trading platforms (e.g., Deutsche Bank's collaboration with fintech unicorn Symphony to allow its Chinese corporate banking clients to process FX trades through Chinese bigtech Tencent's WeChat application). The banks also recognize complementor heterogeneity and the relative importance of certain influential complementors, a point that is often neglected in academic literature according to McIntyre & Srinivasan

(2017). For example, a significant proportion of the 20 banks considered partnered with certain prominent fintechs including 14 of the banks that partnered with enterprise blockchain fintech R3, 8 which partnered with collaboration solutions provider Symphony, and 14 which partnered with bond trading fintech Neptune Networks. All banks also adopted open innovation initiatives to varying degrees as a mechanism through which they could either a) refresh their internal resources and capabilities to make them more adept to value cocreation with external stakeholders (e.g., through internal innovation labs, think tanks, incubators, accelerators, innovation outposts), and b) directly facilitate value cocreation with external stakeholders (e.g., through external or consortium innovation labs, incubators, and/or accelerators, or through open IT technological interfaces and open-APIs).

As observed by Gawer & Cusumano (2002) focal firms cocreating value with complementors and other stakeholders cannot only rely on established coordination mechanisms like long-term contracts and equity stakes, they need to consider other orchestration strategies as well. This is supported empirically through the different mechanisms the 20 banks used to engage with complementors and other stakeholders in their value cocreation initiatives such as, spinning-off fintech subsidiaries (e.g., ING's fintech spin-offs like Payconiq in 2015, and Cobase in 2017, with whom it subsequently maintained partnerships), lead-investments which involve mentorship and support along with acquiring an equity stake, establishing industry bodies (e.g., Innovate Finance), blockchain consortia (e.g., Royal Bank of Scotland's interbank payments blockchain platform Emerald which the bank later open sourced), open innovation initiatives such as innovation labs, incubators, and accelerators that are open to external fintechs either launched by individual banks or consortia of banks (and which are sometimes joint initiatives between banks and fintechs such as the innovation lab established in San Francisco by UBS in 2016 in partnership with roboadvisory fintech Sigfig), open IT infrastructures such as open-APIs, and open innovation technological interfaces where bank employees and external fintechs can collaborate to cocreate new value propositions.

6.5.1.3 – Empirical Support for Ecosystem Leadership and/or Ecosystem Origination as a Strategic Capability

As noted by McIntyre & Srinivasan (2017) and Gawer (2014), firms that can originate *de novo* ecosystems, or assume leadership positions in existing ones can influence the generation, distribution, and

internalization of network externalities to their benefit. These focal firms need to develop a unique set of capabilities such as aligning ecosystem partners including ones from diverse industries, and setting ecosystem standards, as well as ones that are specific to *de novo* ecosystem origination such as being a cognitive referent that shapes meaning and reduces ambiguity for others, and orchestrating processes of collective discovery. This study's findings provide empirical examples of how banks have assumed ecosystem leadership roles and originated *de novo* ecosystems, such as in the origination of blockchain consortia, the launching of open innovation initiatives, and standards-setting initiatives.

UBS originated two *de novo* blockchain networks and maintained a position as ecosystem leader in both. In 2019, UBS launched Fnality International, an international blockchain-based cross-border payments network it began working on in 2015. In launching Fnality, UBS managed to align 14 ecosystem partners including 5 of the other 19 banks considered in this study. In 2017, recognizing the changes that the impending Markets in Financial Instruments Directive (MiFID) II would have on banks, UBS acted as a cognitive referent to reduce ambiguity for other banks contending with MiFID II by originating *de novo* the Massive Autonomous Distributed Reconciliation (MADREC) platform to facilitate banks' compliance to the new directive. ING also originated *de novo* the commodities financial blockchain platform Komgo in 2018. ING began by orchestrating a process of collective discovery by incubating the platform at its 2016 ING Innovation Bootcamp and conducting 2 subsequent proofs of concepts in 2017 and 2018 before launching the platform. ING also had to align ecosystem partners from diverse industries such as banking, oil and gas, and commodities trading. BBVA originated several *de novo* blockchain platforms, though unlike other blockchain *de novo* origination cases, BBVA maintained comparatively tighter control of its platforms.

HSBC took a standards-setting approach to platform leadership, for example in 2019, the bank partnered with SWIFT to define a common industry standard for open-APIs in Hong Kong. 19 out of the 20 banks considered launched open innovation initiatives (e.g., innovation labs, incubators, and/or accelerators) that were open to external stakeholders whereby value could be cocreated. These open innovation initiatives – including prominent example such as the BBVA Innovation Centre in Spain, Mexico, the US, and Colombia, and Barclay's Rise fintech innovation labs in London, New York, Tel Aviv, and Mumbai and its Barclays Accelerator in London, New York, and Tel Aviv – allowed banks to align diverse ecosystem partners and orchestrate processes of collective discovery through which value can be cocreated and

network externalities can be generated, as well as allowing banks to control and distribute the resultant network externalities.

6.5.1.4 – Empirical Support for Coopetition as a Strategic Capability

Coopetition describes the "win-win" relationship which allows a firm to combine its resources and capabilities with those of external firms to cocreate value that they would not otherwise be able to generate independently and which both firms can benefit from (Brandenburger & Nalebuff, 1996). Firms seeking to adopt coopetitive relationships need to have a unique set of managerial capabilities including the ability to understand and manage the competing forces inherent in coopetition, knowing when to create organizational separation between the competitive and cooperative components of the overall strategy of coopetition, establishing appropriate governance structures, and determining what resources and capabilities are committed to coopetitive strategies (Czakon, et al., 2020; Gnyawali, et al., 2016, Fernandez, et al., 2014). Recently, academics have started to consider network coopetition (rather than dyadic coopetition) including Czakon, et al. (2020) and Czakon & Czernek (2016) who considered coopetition in network settings highlighting the differences between these and traditional dyadic coopetitive relationships, Ritala, et al. (2014) who considered the technological platforms that mediate network coopetition, Sanou, et al. (2016) who found that firms in central positions in a coopetitive network derive greater benefits, and Yani & Nemeh (2014) who found that network coopetition was better suited for radical (rather than incremental) innovation. Thus, for an RBV that is adapted for incorporating externally owned or controlled resources and capabilities, coopetition at the dyadic and network levels is a strategically important capability that should be considered. This study's findings provide empirical support for the incorporation of coopetition as a strategic capability.

The collaboration between banks and bigtechs like Apple and Alibaba in the payments subsector through applications like Apple Pay and Alipay can be described as examples of dyadic coopetition as the majority of banks have their own payment platforms including prominent ones like Barclays' Barclaycard. Banks also coopetated at the multi-firm level to launch national payments network that benefit the participating banks but which none could have launched unilaterally, these include PayM in the UK (backed by HSBC, Santander, Barclays, Lloyds Banking Group, and the Royal Bank of Scotland), PayLib in France (backed

by BNP Paribas, Crédit Agricole, Crédit Mutuel, Groupe BPCE, and Société Générale), and Twint in Switzerland (backed by UBS and Credit Suisse).

The establishment of innovation labs, incubators, and accelerators open to external stakeholders also exemplifies coopetition at different levels: at the dyadic level (e.g., the Advisor Technology Research and Innovation Lab launched by UBS and the fintech SigFig in San Francisco in 2016), at the multi-firm level (e.g., ING's Think Forward Initiative initiated by ING, Amazon Web Services, Deloitte, IBM, Dell Technologies, and the Centre for Economic Policy Research), and at the network level (e.g., the FinTech Innovation Lab co-founded by the Partnership Fund for New York City and Accenture based in London, New York, and Asia Pacific with participation from a wide network of partners in each region). All 20 banks participated, and in some cases originated, blockchain consortia, which are good examples of network coopetition.

Most banks established fintech subsidiaries composed of resources and capabilities that differed from those of the parent firm's resources and capabilities (e.g., more agile, not committed to legacy technological infrastructures); several banks engaged in coopetative initiatives with external stakeholders through these fintech subsidiaries. For example, Société Générale coopetated with bigtechs like Google and Samsung on payments initiatives through its fintech subsidiary Boursorama Banque, Groupe BPCE coopetated with several fintechs through its fintech subsidiaries (e.g., with Ripple through its fintech subsidiary Fidor Bank, and with CopSonic through its fintech subsidiary Natixis Payment Solutions), and Crédit Mutuel who partnered with bigtechs like Google and Samsung through its fintech subsidiary Fortuneo Banque. A significant proportion of the 20 banks considered established open IT infrastructure through which they cooperated with external stakeholders such as ING's ING Touchpoint Platform and its Orange Sharing platform. In several cases had to make strategic decisions regarding the way in which they committed resources and capabilities to cooperative initiatives, for example BNP Paribas and Santander abandoned the German national payments platform Paydirekt that they were coopetating with other banks on when the platform did not produce the expected network externalities, while UBS and Credit Suisse preferred coopetating with each other and other financial services incumbents to launch the Swiss payments network Twint over coopetating with bigtechs on competing payments solutions.

These findings demonstrate that banks have coopetate prolifically to cocreate value with externally held or controlled resources and capabilities. The findings also demonstrate that banks engaged in dyadic coopetition in incremental innovation initiatives such as those relating to payments but engaged in network coopetition in radical innovation initiatives such as those relating to blockchain technology which supports Yani & Nemeh's (2014) observations. Banks – like ING, UBS, and Credit Suisse – which originated *de novo* blockchain platforms are examples of firms adopting central positions in coopetitive networks in line with Sanou, et al.'s (2016) observation. The findings also demonstrate that many coopetative initiatives with external stakeholders were initiated through banks' fintech subsidiaries which support Czakon, et al. (2020), Gnyawali, et al. (2016), and, Fernandez, et al.'s (2014) observation about the capabilities required for coopetative strategies like the need for organization separation and establishing the appropriate governance structures. The Open IT infrastructure initiatives and the blockchain consortia that banks engaged in to coopetate with external stakeholders supports Ritala, et al.'s (2014) observations on the technological platforms that mediate the coopetition of participants in network contexts. The findings also demonstrate how banks assessed the potential value that can be generated from coopetative strategies (e.g., BNP Paribas and Santander abandoning Paydirekt) and how they determined what resources and capabilities are committed to coopetative strategies (e.g., UBS and Credit Suisse's coopetition to launch Twint, and the coopetative engagements some banks launched through their fintech subsidiaries), support the Czakon, et al. (2020) and Chiambaretto, et al.'s (2016) observation of the managerial ability of firms to assess the potential value of coopetative relationships as a strategic capability, and Czakon, et al.'s (2020) observation that the ability of firms to determine what resources and capabilities are committed to coopetative engagements should also be considered a strategic capability.

6.5.1.5 – Empirical Support for Considering Firms' Ability of Knowing when to Platformize as a Strategic Capability

Exposing a firm's resources and capabilities including intellectual property to others through platformization strategies involves risks including the potential loss of competitive advantage and outbound spillover rents. Gawer & Cusumano (2008) advise that a focal firm should only adopt a platform strategy when the proposed platform performs a function that is core (i.e., when the overall system cannot operate without it) to a wider ecosystem while solving business problems for many firms and users in an industry. Alexy, et al. (2018) observed that a firm can obtain competitive advantage through strategic

openness whereby it opens up a resource when the firm has superior, idiosyncratic capabilities, and proprietary complementarities that allow the firm to better leverage the newly opened resource. The firm's competitive advantage is increased if rival firms adopt the newly opened resource widely substituting it for their own. Alexy, et al. (2018) also observed that larger firms obtain further competitive advantages through strategic openness through cross-subsidization and greater reduction of fixed-costs. The findings provide empirical support for the consideration of firms' ability to know when and when not to platformize or open up its resources as strategically important capabilities.

The national payment platforms that the banks collaborated to launch (e.g., PayM, PayLib, Payconiq, Twint) are good examples of banks deciding to adopt platform strategies since the resultant payment platforms perform a core function for a wide ecosystem (banks, retailers, retail customers) while solving problems for many firms (the participating banks seeking better payment solutions). The numerous blockchain consortia that banks participated in or originated are also good examples of bank deciding to adopt platform strategies, for example trade finance blockchain platforms like we.trade and Marco Polo perform a core function for a wide ecosystem (banks, corporates) while solving problems for many firms (the onerous, lengthy, and often paper-based traditional trade finance process that both banks and corporates struggle with). However, banks were also aware of the risks of platformization, for example BBVA ceased its participation in several blockchain consortia (e.g., Contour/Voltron, Marco Polo) while originating a large number of pioneering *de* novo blockchain platforms that had tighter participation from mostly non-banking participants, while UBS had a comparatively limited participation in platforms it was the only bank of the 20 considered to originate *de novo* 2 blockchain consortia (MADREC and Fnality International), both of which fulfilled core functions for a wide ecosystem. ING was the only bank of the 20 considered to consistently spin-off its fintech subsidiaries (e.g., Payconiq, Cobase, Yolt, Katana Labs) with whom it subsequently maintained partnerships. The Royal Bank of Scotland's Northern Irish subsidiary Ulster Bank developed its Emerald blockchain platform for inter-bank payments, which it later open-sourced. The Emerald platform was later adopted by a consortium of Irish banks (including Ulster Bank) in their inter-bank payment platform Project GreenPay.

6.5.1.6 – Empirical Support for the Consideration of Technological Modularity, Standards, and Protocols as Strategic Resources, and their Management as a Strategic Capability

Modularity is a strategically important firm resource since it: a) enables simultaneous but autonomous innovation required for value cocreation, b) reduces substitutability since complementors are likely to migrate to more flexible modular platforms, c) prevents asset erosion since by modularizing legacy assets they can be integrated with newer technologies thereby reducing their substitutability and/or imitability. Control over the technological standards and protocols of a platform allows focal firms to coordinate value generation. A firm's managerial ability to create, enforce, and develop technological standards and protocols and its ability to modularize, are strategically important capabilities as they allow the firm to control and govern value cocreation as well as the generation, distribution, and internalization of network externalities and relational rents and to limit outbound spillover rents. This study's findings provide empirical support for the consideration of technological modularity, standards and protocols as strategic resources, and for the consideration of their management as a strategic capability.

The majority of the 20 banks established fintech subsidiaries that were not dependent on or linked to the parent banks' technology infrastructures and which enabled them to cocreate value by integrating with the resources and capabilities of fintechs and bigtechs (e.g., Société Générale cooperation with Google and Samsung via its fintech subsidiary Boursorama Banque, Groupe BPCE cooperation with Ripple via its fintech subsidiary Fidor Bank). Some bank's fintech subsidiaries like Santander's Santander Global Platform was mandated to provide payments and other financial service functions through a software-as-a-service model which it extended to the Santander group of banks, customers, and third parties and external developers.

All banks participated in blockchain consortia which is a good example of a modular platform through which value can be cocreated by an ecosystem of participants. Some banks adopted leadership roles in launching *de novo* blockchain platforms (e.g., UBS' Fnality International, the Royal Bank of Scotland's Emerald platform) through which they can have more control of these platforms' standards and protocols. Several banks sought to control protocols and standards for blockchain consortia (e.g., BBVA and Santander's participation in Alastria, the Spanish non-profit launched in 2017 to promote blockchain

technology; several banks including UniCredit, Standard Chartered, and Santander collaborated to launch the Global Payments Steering Group (GPSG) in 2016 to oversee the creation and maintenance of Ripple payment transaction rules, and formalized standards for Ripple related activity), for trade finance initiatives (e.g., a group of banks including Crédit Agricole, Deutsche Bank, HSBC, ING, Lloyds Banking Group, Rabobank, Standard Chartered, and Groupe BPCE, collaborated in 2019 to launch the Trade Finance Distribution (TFD) Initiative to drive standardisation in trade finance through promoting common data standards and definitions), and APIs (e.g., HSBC's partnership with SWIFT in 2019 to define a common industry standard for open-APIs in Hong Kong).

All banks established open API portals, developer kits, and sandboxes, and while many only did this to the extent required by PSD2 and Open Banking Standards regulation, many others embraced open banking beyond regulatory requirements. For example, BBVA extended their open-APIs to the US and Mexico, Santander extended theirs to Mexico, Standard Chartered extended theirs to Africa, the Americas, Europe, Asia, and the Middle East, Groupe BPCE integrated their open API portal, developer toolkit, sandbox, and user experience charter into a wide-ranging open innovation technological platform called 89C3 to facilitate value cocreation with other stakeholders. Several banks launched open IT infrastructure initiatives that were based on modular architecture, for example ING launched the ING Touchpoint Platform in 2017 which allows ING employees to collaborate with third parties cocreate new value propositions and bring them to market quickly by ensuring architectural modularity.

6.5.1.7 – Empirical Support for the Consideration of Temporary Competitive Advantage as a Component of Sustained Competitive Advantage in an RBV Adapted for Interdependence

As D'Aveni (2010) observed, in hypercompetitive environments, factor markets evolve rapidly through radical innovation and Schumpeterian creative destruction; as such, the value, uniqueness, tradability, and imitability of resources and capabilities are not always long lasting. In such an environment, firms can mobilize their resources and capabilities in ways to obtain temporary competitive advantage, while seeking to replace them with more relevant ones should they become obsolete. Thus, the ability for firms to mobilize resources and capabilities towards temporary competitive advantage is a strategically important capability, and firms should take temporary competitive advantage into account as part of their

overall strategies for sustained competitive advantage (especially in hypercompetitive advantage). This study's findings support the inclusion of temporary competitive advantage into firms' overall strategies of sustained competitive advantage.

Almost all the banks considered established internal innovation labs, think tanks, incubators, accelerators, and innovation outposts, and almost all banks established innovation labs, incubators, and accelerators that were open to the participation of external stakeholders. Through these internal and external open innovation initiatives, banks were able to experiment with innovative emerging technologies and better understand the value of new, emerging strategically important resources and capabilities. They were also consequently able to renew some of their existing resources and capabilities or – as Le Breton-Miller & Miller (2015) observed – preserve their existing resources and capabilities by extending their life, guarding against the erosion of their value, and discovering new contexts to sustain or enhance their value. Through these open innovation initiatives, banks were able to launch fintech initiatives that in several cases provided them with temporary competitive advantage, but which contributed to banks' sustained competitive advantage by upgrading and renewing the banks' resources and capabilities. For example, ING launched a number of fintechs at its ING Labs such as Yolt and Cobase creating a temporary competitive advantage, then subsequently spun-off these initiatives thus creating sustained competitive advantage through their ongoing partnership with these spun-off fintechs and through the renewing of its resources and capabilities in the process of creating these fintechs. BBVA incubated several fintech initiatives at its BBVA New Digital Business innovation lab/incubator/accelerator, which it later launched as fintech subsidiaries, some like Azlo and Covault were maintained and became sources of sustained competitive advantage, while others like Denizen and Trust-u, were wound-down within 18 months providing BBVA temporary competitive advantage, while also contributing to sustained competitive advantage by ameliorating BBVA's managerial ability to assess the value and scalability of fintech initiatives.

Banks' participation in blockchain consortia also exemplifies how they sought temporary competitive advantage as well as longer term strategies of sustained competitive advantage. For example, the majority of banks did not initially commit to a specific blockchain technology and instead participated widely across technologies such as Ethereum, R3, and Hyperledger Fabric. The banks also initially participated widely in blockchain consortia including competing ones for the same use cases. Many banks participated

concurrently in major trade finance-focused blockchain consortia such as we.trade, Marco Polo, and Voltron (later renamed Contour), gaining temporary competitive advantage by renewing resources and capabilities related to trade finance. Many banks later abandoned participation in certain consortia in favour of others, for example Intesa Sanpaolo, the Royal Bank of Scotland, and BBVA terminated their participation in Voltron while BBVA and Barclays terminated their participation in Marco Polo. Several banks concurrently participated in competing funds management blockchain consortia Iznes and FundsDLT, though some banks later abandoned one over the other, such as Groupe BPCE which abandoned Iznes in favour of FundsDLT. Most banks partnered widely with fintechs, often taking equity stakes in them, which allowed them to gain temporary competitive advantage by updating their resources and capabilities by exposing them to fintechs' new and innovative resources and capabilities. In some cases, these partnerships developed into ones from which banks could derive sustained competitive advantage from (e.g., Deutsche Bank's collaboration with and investment in fintech Symphony Communication Services in 2014, which later allowed Deutsche Bank to offer FX trading services to its Chinese corporate clients through WeChat via Deutsche Bank's collaboration with Symphony), in other cases, after providing banks with temporary competitive advantage partnerships were discontinued (e.g., Santander invested in and partnered with mobile banking fintech Monitise in 2014 which later failed). In some cases, the fintech subsidiaries that banks launched and later discontinued also demonstrate how banks derived temporary competitive advantage before adapting their strategy toward sustained competitive advantage, for example in 2017 UBS launched robo-advisor fintech subsidiary SmartWealth, after finding limited potential for it, it sold it to fintech Sigfig in 2018 which UBS is invested in and has a partnership with, however in doing so UBS only sold the technology platform to SigFig while keeping SmartWealth's customers.

6.5.2 – Confronting the Proposed Adapted RBV with the Taxonomy of Banks' Strategies of Interdependence

Section 6.5.1 provided extensive empirical support for this study's proposed adaptation to the RBV. Each component of the proposed adaptation, and each consideration from other perspectives that needs to be integrated into the RBV to effectuate the proposed adaptation is supported empirically by findings across all modalities and submodalities. This section also confronts the proposed adaptations to the RBV to this study's first order findings but does so at a more holistic level.

6.5.2.1 – Embracing External Resources and Capabilities

3 taxa embraced external resources and capabilities in sophisticated and wide-ranging strategies of interdependence: "the Bank as a Platform Company" taxon, the "Platform Leadership Strategy" taxon, and the "Wide-Ranging Strategies of Interdependence" taxon. The banks in these 3 taxa exemplify how value cocreation with external resources and capabilities can form a fundamental part of firms' strategies for sustained competitive advantage.

Banks in the "the Bank as a Platform Company" taxon engaged with external resources and capabilities in the most sophisticated way, seeking to transform their business models towards better facilitating value cocreation with external resources and capabilities. Banks in this taxon were early to launch wide networks of internal and external open innovation initiatives, integrated with a corporate venture capital arm and a large well-funded fintech fund, they were also early to collaborate and coopetate with bigtechs, and invested in and partnered extensively with fintechs. Unlike banks in other taxons, banks in this taxon were early to bring together internal and external innovation labs, incubators, and accelerators along with a corporate venture capital arm and a fintech fund in an integrated unit, while the majority of banks in other taxa did not integrate their open innovation capabilities. Banks in this taxon, established a high number of fintech subsidiaries through which they could develop resources and capabilities that were better adapted to value cocreation in the platform economy. Moreover, banks in this taxon have advanced managerial abilities when it comes to knowing when and when not to platformize, advanced managerial abilities related to assessing the value and rent-generation potential of networks, and an openness to adopting strategies of temporary competitive advantage as part of overall strategies of sustained competitive advantage. For example, banks in this taxon participated in a moderate number of blockchain consortia, participated in very few consortium open innovation initiatives, and had a comparatively high number of partnership cessations. Banks in the taxon were some of the few to originate and lead *de novo* ecosystems, but unlike the few other banks that originated *de novo* ecosystems, banks in this taxon maintained tighter control of these ecosystems. Banks in this taxon also embraced technological modularity (e.g., Open-APIs) beyond the regulatory requirements and had advanced capabilities in managing modular resources.

Banks in the "Platform Leadership Strategy" taxon also adopted sophisticated wide-ranging strategies through which they cocreated value with external resources and capabilities though did not go as far as

those in “the Bank as a Platform Company” taxon which adopted more fundamentally transformational strategies. Banks in this taxon established resources and capabilities to facilitate value cocreation through collaborative and coopetitive initiatives. For example, banks in this taxon launched open innovation initiatives like innovation labs, incubators, and accelerators though they tended to focus more on either internal or external open innovation initiatives rather than taking the balanced approach that banks in “the Bank as a Platform Company” taxon. Moreover, banks in this taxon did not transform their open innovation initiatives into integrated units (e.g., with their corporate venture capital arms, fintech funds) or if they did, were comparatively late to do so, as opposed to banks from “the Bank as a Platform Company” taxon who were early to integrate their open innovation resources and capabilities. Banks in this taxon also established fintech subsidiaries though less extensively than banks in “the Bank as a Platform Company” taxon. Banks in this taxon, like those in “the Bank as a Platform Company” taxon participated in multi-sided networks, for example participating in blockchain consortia, including in competing platforms to gain temporary competitive advantage. However, unlike the banks in “the Bank as a Platform Company” taxon, banks in this taxon did not have the necessary capabilities to originate *de novo* blockchain platforms. Banks in this taxon have capabilities to enable them to coopetated broadly with fintechs and bigtechs to cocreate value, though not as widely as those in “the Bank as a Platform Company” taxon. Banks in this taxon also developed capabilities that enable them to embrace modularity (e.g., Open-APIs) beyond the minimum regulatory requirements.

Banks in the “Wide-Ranging Strategies of Interdependence” taxon also developed resources and capabilities that enabled them to cocreate value with externally owned or controlled resources and capabilities, albeit in a less sophisticated way than those in “the Bank as a Platform Company” and the “Platform Leadership Strategy” taxa. Banks in this taxon established open innovation capabilities and fintech subsidiaries though in a way that was either less expansive or less integrated than banks in “the Bank as a Platform Company” and the “Platform Leadership Strategy” taxa. Banks in this taxon established less fintech subsidiaries than those in “the Bank as a Platform Company” and the “Platform Leadership Strategy” taxa. Banks in this taxon developed managerial capabilities to coopetate and collaborate with bigtechs, fintechs, and other financial services incumbents to cocreate value, however less extensively than those in “the Bank as a Platform Company” and the “Platform Leadership Strategy” taxa. Banks in this taxon developed the managerial capabilities to participate in multi-sided networks and ecosystems to derive network externalities, as exemplified by their participation in numerous blockchain

consortia, however unlike banks in "the Bank as a Platform Company" they did not develop the managerial capability to originate *de novo* platforms. Banks in this taxon recognized modularity as a strategic capability, as exemplified by their adoption of Open-APIs in line with regulatory requirements, but unlike banks in "the Bank as a Platform Company" and the "Platform Leadership Strategy" taxa they did not develop their capabilities to embrace modularity beyond the minimum regulatory requirements.

It can be observed from these 3 taxa, that the managerial abilities of: knowing when and when not to platformize, originating and leading *de novo* multi-sided platforms rather than simply participating in them, cocreating value as part of a more fundamental business-model evolution rather than as part of targeted interdependence related initiatives, assessing the rent potential of open innovation or coopetative initiatives and thus knowing if and when to terminate them, adopting technological modularity beyond minimum regulatory requirements, and engaging in initiatives that generate temporary competitive advantage as part of broader strategies for sustained competitive advantage, are all strategically significant resources and capabilities that are hallmarks of firms that adopt sophisticated and wide-ranging strategies of interdependence.

6.5.2.2 – Limited and Tactical Approach to External Resources and Capabilities

The "Limited but Leading Strategies of Interdependence", "Targeted Strategies of Interdependence", and "Limited Strategies of Interdependence" taxa represent the banks that took a narrower, less transformational, and more targeted approach to value cocreation with external resources and capabilities.

Banks in the "Limited Strategies of Interdependence" taxon developed limited strategic capabilities related to the cocreation of value with external resources and capabilities. For example, they established few fintech subsidiaries, few fintech related partnerships with other incumbents, few bigtech partnerships, and few fintech partnerships. These banks also did not seek to renew their resources and capabilities through the acquisition of fintechs. They did however establish open innovation initiatives but – unlike banks in "the Bank as a Platform Company" and the "Platform Leadership Strategy" taxa – they did not do so in an integrated way. Banks in this taxon also did not demonstrate any significant strategic capabilities related to the leadership or origination of ecosystems, or any significant strategic capabilities related to participating in multi-sided networks as exemplified by these banks' low participation in

blockchain consortia. Most banks in this taxon did not demonstrate advanced strategic capabilities related to technological modularity, for example, most banks only adopted open-APIs to the minimum requirements required by regulators.

Banks in the "Targeted Strategies of Interdependence" taxon developed more advanced managerial abilities to cocreate value with external resources and capabilities than the banks in the "Limited Strategies of Interdependence" taxon. However, these managerial abilities were much less sophisticated than those of banks in "the Bank as a Platform Company", "Platform Leadership Strategy", and "Wide-Ranging Strategies of Interdependence" taxa; moreover, these managerial abilities were marshalled to cocreate value in a much narrower and targeted way. Like banks in the "Limited Strategies of Interdependence" taxon, banks in this taxon, developed limited strategic capabilities related to the cocreation of value with external resources and capabilities, for example they established few fintech subsidiaries, few fintech related partnerships with other incumbents, and few bigtech partnerships, however they did coopetate/collaborate with fintechs more than banks in the "Limited Strategies of Interdependence". Like banks in the "Limited Strategies of Interdependence" taxon, banks in this taxon also did not seek to renew their resources and capabilities through the acquisition of fintechs, did not demonstrate any significant strategic capabilities related to the leadership/origination of ecosystems or to the participation in multi-sided networks, and did not demonstrate advanced strategic capabilities related to technological modularity. Banks in this taxon developed open innovation related capabilities to facilitate value cocreation but not in the integrated way that banks from the "the Bank as a Platform Company" and the "Platform Leadership Strategy" taxa did, however unlike banks in the "Limited Strategies of Interdependence" taxon banks in this taxon did establish funding and investment capabilities that would allow them to invest and better collaborate with external resources and capabilities (e.g., banks in this taxon established corporate venture capital arms and fintech funds, while banks in the "Limited Strategies of Interdependence" taxon did not).

Banks in the "Limited but Leading Strategies of Interdependence" taxon also adopted narrow strategies of interdependence, however unlike banks in the "Targeted Strategies of Interdependence", and "Limited Strategies of Interdependence" taxa, they developed resources and capabilities that enabled them to take more leading roles in the cocreation initiatives they embarked on. Like the banks in the "Targeted Strategies of Interdependence", and "Limited Strategies of Interdependence" taxa, banks in this taxon did

not demonstrate significant managerial abilities related to coopetating or collaborating with other stakeholders to cocreate value as evidenced by their low partnerships with bigtechs, fintechs, and other incumbents, they did not seek to renew their resources and capabilities through fintech acquisitions, and did not have advanced managerial abilities related to technological modularity as exemplified by their limited adoption of open-APIs. However, unlike banks in the "Targeted Strategies of Interdependence", and "Limited Strategies of Interdependence" taxa, banks in this taxon established more sophisticated open innovation capabilities, for example, these banks established internal open innovation initiatives, external open innovation initiatives, and were some of the few banks considered to establish internal think tanks. These advanced open innovation related capabilities allowed banks in this taxon to develop sophisticated capabilities related to ecosystems and multi-sided networks including platform leadership and platform origination capabilities, as exemplified by these bank' leadership and origination of *de novo* blockchain consortia (one of these banks was the only one of the 20 considered to originate and lead 2 *de novo* blockchain consortia). The origination of these multi-sided networks also exemplifies these banks' managerial capability of knowing when to platformize, albeit as part of a narrower, targeted strategy of interdependence.

6.5.2.3 – Strategic Renewal through Value Cocreation with External Resources and Capabilities

Banks in the "Acquisitions for Defence and Interdependence Strategies for Capabilities Renewal" and "Interdependence and Platform Leadership for Strategic Renewal" taxa, sought to cocreate value with external resources and capabilities as part of broader strategies to renew their capabilities.

Banks in the "Acquisitions for Defence and Interdependence Strategies for Capabilities Renewal" taxon made a very high number of fintech acquisitions and established a high number of fintech subsidiaries which suggests a systematic attempt by these banks to renew their internal resources and capabilities to make them better adapted to value cocreation with external resources and capabilities in the platform economy age. These banks developed capabilities related to value cocreation, coopetition, participation in multi-sided networks, temporary competitive advantage, and technological modularity that were more expansive than banks in the "Limited but Leading Strategies of Interdependence", "Targeted Strategies of Interdependence", and "Limited Strategies of Interdependence" taxa, but less expansive than those in "the

Bank as a Platform Company", "Platform Leadership Strategy", and "Wide-Ranging Strategies of Interdependence" taxa. However, these banks did not demonstrate any significant capabilities related to platform leadership or platform origination unlike banks in the "Limited but Leading Strategies of Interdependence", "the Bank as a Platform Company", and "Platform Leadership Strategy" taxa.

Banks in the "Interdependence and Platform Leadership for Strategic Renewal" taxon sought to renew their resources and capabilities to make them better adapted to engaging with external resources and capabilities to cocreate value. In renewing their resources and capabilities, banks in this taxon developed their capabilities further than those in the "Acquisitions for Defence and Interdependence Strategies for Capabilities Renewal" taxon, but not as far as those in "the Bank as a Platform Company", "Platform Leadership Strategy", and "Wide-Ranging Strategies of Interdependence" taxa. Banks in this taxon did not seek to renew their capabilities through fintech acquisitions or the establishment of large numbers of fintech subsidiaries, they did however develop open innovation capabilities, coopetition and collaboration capabilities (as exemplified by their high number of partnerships with fintechs and bigtechs), and were some of the few banks of those considered to develop capabilities related to the leadership and origination of *de novo* multi-sided platforms (as exemplified by their origination and leadership of *de novo* blockchain consortia). Banks in this taxon were the only ones of those considered to systematically spin-off fintech subsidiaries/initiatives, which indicate that these banks have developed capabilities related to understanding how to effectively engage in initiatives that produce temporary competitive advantage, as well as capabilities related to assessing the value of fintech initiatives and knowing when it is more valuable to spin them off and when it is not, and if it is advantageous to spin them off, the related ability to subsequently partner with them to continue to derive relational rents.

6.5.2.4 – Towards a Meta-taxonomy of Strategies of Interdependence

Having demonstrated empirical support for the proposed adaptations to the RBV in Section 6.5, Sections 6.5.2.1, 6.5.2.2, and 6.5.2.3 considered the empirical support of the proposed adaptations from a more holistic perspective by considering the 8 taxa in the taxonomy of banks' strategies of interdependence that emerged from this study's findings. In doing so a meta-taxonomy of strategies of interdependence comes to light (Diagram 9). This taxonomy is composed of 3 taxa. The first taxon describes firms that embrace broad strategies of interdependence and cocreate value with a wide range of external resources and

capabilities as detailed in Section 6.5.2.1. The second taxon describes firms that embrace narrow strategies of interdependence and cocreate value with targeted external resources and capabilities as detailed in Section 6.5.2.2. The third taxon describes firms that adopt strategies of interdependence and cocreate value with external resources and capabilities for the purpose of renewing their internal capabilities or their overall strategies as detailed in Section 6.5.2.3.

The taxonomy of banks' strategies of interdependence is useful for practitioners and academics considering the banking context as it provides a higher level of granularity. However, the meta-taxonomy abstracts these strategies of interdependence to a higher level, making it useful for practitioners and academics considering strategies of interdependence and how firms cocreate value with external resources and capabilities in broader contexts.

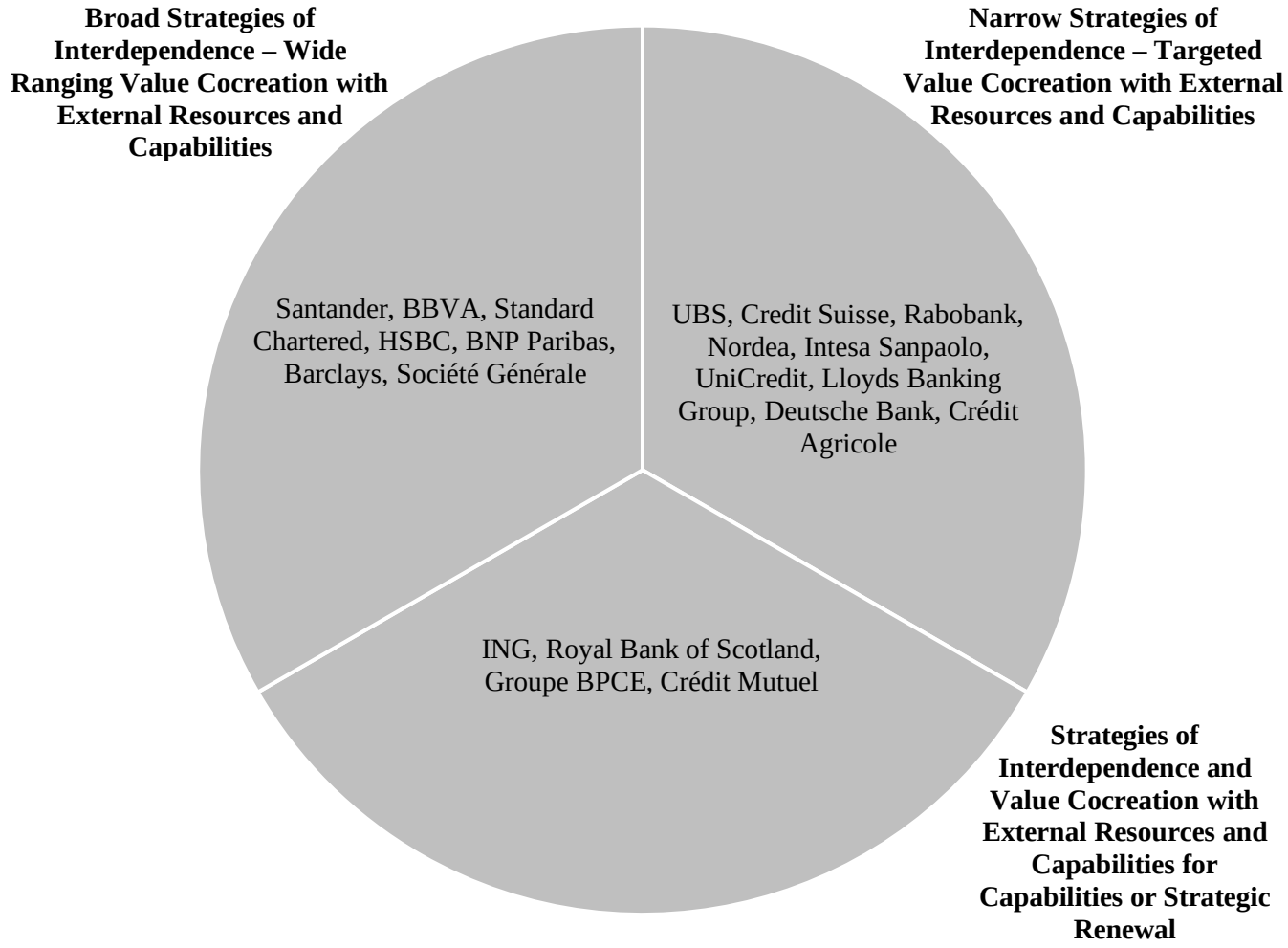

Diagram 9: Meta-taxonomy of Strategies of Interdependence

The meta-taxonomy of strategies of interdependence emerged through confronting this study's theoretical framework and the proposed adaptation to the RBV with this study's findings and specifically the taxonomy of banks' strategies of interdependence. The following section goes a step further and confronts the meta-taxonomy with the contextual considerations presented in Section 5. This provides an added level of contextualization to the meta-taxonomy, which allows practitioners and academics considering the meta-taxonomy to draw relationships between the financial situation of a firm and its strategies of interdependence, thereby increasing the utility of the meta-taxonomy.

6.5.3 – Incorporating Contextual Considerations into the Meta-taxonomy

This section incorporates the contextual categorization from Section 5 into the meta-taxonomy. In doing so it provides a contextual element to the different meta-taxons in the meta-taxonomy of strategies of interdependence.

6.5.3.1 – Broad Strategies of Interdependence for International, Diversified Firms

The first meta-taxon describes broad strategies of interdependence with firms that figure in this meta-taxon adopting wide ranging value cocreation strategies with external resources and capabilities. The banks from this study that fall in this meta-taxon are Santander, BBVA, Standard Chartered, HSBC, BNP Paribas, Barclays, Société Générale. Recalling the categorization of banks based on financial performance and geographic and business segmentation from the contextual presentation in Section 5, 5 of the banks that figure in this meta-taxon – Santander, HSBC, BNP Paribas, Barclays, and Société Générale – are 5 out of the 6 banks that fall in the category "Global Giants". While Standard Chartered is considered a "Specialized Bank" in the contextual categorization, this is predominantly because the bank is focused on corporate, commercial, and institutional banking, however, it can also be argued that Standard Chartered can be considered a global bank given it relies on diverse geographies for its revenues including China and Asia Pacific (around 70% of revenues), Middle East & Africa (16-19%), Europe & the Americas (10-15%). The same is true for BBVA, which although not as large as the other banks in this meta-taxon nevertheless derives its revenues from diverse business operations and diverse geographies, especially the Americas. BBVA and Santander, which both figure in this meta-taxon, also fall in the contextual category "Spanish Banks". These Spanish banks were leaders in and early adopters of digital transformation.

The global giants are large, diversified, and international banks. Since these banks derive their revenue from diverse businesses (e.g., corporate banking, retail banking, private banking and wealth management, investment banking) and diverse geographies, they are unlikely to be able to own all the resources and capabilities necessary for value creation in an environment of rapidly evolving technological, regulatory, consumer behaviour, and competitive forces. These banks are therefore more likely to adopt broad strategies of interdependence through which they can seek to cocreate value with these various external resources and capabilities and consequently derive relational rents and sustained competitive advantage as well as renewing their own internal resources and capabilities. Moreover, global banks that are leaders in digitalization are more likely to have the internal strategic capabilities to facilitate broad strategies of interdependence and value cocreation with external resources and capabilities. This can also be true for large, global firms, and especially those that undertook significant efforts to digitalize their businesses, who unable to own all the strategically important resources and capabilities that emerge and evolve in their milieu, can instead seek to adopt strategies of interdependence through which they can cocreate value with them that generate mutually beneficial relational rents. Through these strategies of interdependence, the internal resources and capabilities of these large, global firms can also be continuously renewed.

6.5.3.2 – Narrow Strategies of Interdependence for Regional, Specialized Firms

The second meta-taxon describes narrow strategies of interdependence, firms that fall in this meta-taxon adopted limited and targeted value cocreation strategies with external resources and capabilities. The banks from this study that fall in this meta-taxon are UBS, Credit Suisse, Rabobank, Nordea, Intesa Sanpaolo, UniCredit, Lloyds Banking Group, Deutsche Bank, and Crédit Agricole. These banks fall into several of the contextual categories from Section 5. UBS and Credit Suisse fall into the "Specialized Banks" category as both banks specialize in private banking and wealth management. Both banks became more specialized in the period considered by reducing their focus on investment banking in favour of private banking and wealth management. Intesa Sanpaolo and Nordea fall into the "Regional Banks" category with Intesa Sanpaolo relying on Italy for over three-quarters of its revenue and Nordea relying on the Nordic region for over 90% of its revenues. Both banks also became more focused during the period considered, Intesa Sanpaolo from a business function perspective (more focused on asset management, insurance, and private banking) while Nordea exited several non-core geographic markets, like Russia and the Baltic region. Rabobank and Crédit Agricole both fall in the "Cooperative Banks" category, Crédit

Agricole derives half of its revenue from France while relying on its European operations for around 40% of its remaining revenue, Rabobank is a conservatively run Dutch mutual bank that is particularly focused on the food and agriculture sector and which relies on the Netherlands for around two-thirds of its revenue. Lloyds Banking Group and UniCredit both figure in the "Troubled Banks" category. Lloyds Banking Group, which required a government bailout in the aftermath of the GFC has always relied on the UK for over 90% of its revenue and never ventured significantly into investment banking preferring to focus on retail banking, corporate banking, and wealth management. UniCredit, which also required a government bailout, derived the majority of its revenues from its Italian, German, Austrian, and Central and East European operations. The only bank in this meta-taxon from the "Global Giants" category is Deutsche Bank, which though still an international and diversified bank, became more German and less international in the period considered, growing its dependence on its domestic market from 25% to 41% of revenue between 2009 and 2019.

Although the banks in this meta-taxon fall into several categories of the contextual categorization, a common theme is evident among them. The 9 banks in this meta-taxon all remained regional banks (e.g., Lloyds Banking Group, Intesa Sanpaolo, Rabobank) or became more regionally focused during the period considered (e.g., Deutsche Bank, Nordea), and specialized in certain segments (e.g., UBS, Credit Suisse, Rabobank, Lloyds Banking Group) or became even more specialized during the period considered (e.g., UBS, Credit Suisse). Additionally, banks in this meta-taxon were more likely to have experienced comparatively higher financial troubles during the period considered (e.g., UniCredit, Lloyds Banking Group). These banks with their narrower geographic and business segment focus are likely to experience the rapidly evolving technological, regulatory, consumer behaviour, and competitive forces in a less wide-ranging way than the large, global, diversified banks. As such, they are less likely to need to interact with as wide a range of external resources and capabilities to cocreate value as the large, global, diversified banks, and can be more selective in their strategies of interdependence. For example, these banks may have such deep specialism in certain areas that they avoid strategies of interdependence so as not to lose outbound spillover rents. If they do deem strategies of interdependence to be beneficial, banks in this meta-taxon can adopt targeted value cocreation strategies with external resources and capabilities that align with a narrow business function or geographic area. In certain cases, owing to their poor financial performance, banks in this meta-taxon would not have been able to renew or develop their internal resources and capabilities sufficiently to enable them to cocreate value with external resources and

capabilities in strategies of interdependence as the bulk of their financial resources and strategic focus would have been cantered on redressing their financial situation. This could also be applicable more generally for regional and specialized firms or firms that have become more regional and specialized due to financial troubles. For such firms, value cocreation with external resources and capabilities can be advantageous in narrow, targeted situations. Such firms may also not have been able to develop the necessary resources and capabilities – due to adverse financial conditions or the nature of their businesses – to adopt wide strategies of interdependence. In certain cases, especially for highly specialized firms, strategies of interdependence may be disadvantageous as it exposes them to higher outbound spillover rent, and they would therefore seek leadership or greater control of any strategy of interdependence they adopt.

6.5.3.3 – Strategies of Interdependence for Strategic Renewal for Recovering Firms and Capabilities Renewal for Federated Firms

The third meta-taxon describes strategies of interdependence for strategic renewal and the renewal of resources and capabilities. The banks from this study that fall into this meta-taxon are ING, the Royal Bank of Scotland, Groupe BPCE, and Crédit Mutuel. These banks fall into two categories from the contextual categorization from Section 5. ING and the Royal Bank of Scotland fall in the "Troubled Banks" contextual category. The Royal Bank of Scotland was arguably the worst performing bank of the 20 considered and had to be bailed out by the UK government which eventually owned 84% of the bank by 2009; thereafter the Royal Bank of Scotland divested from many of its international operations and from certain business functions becoming a more British bank that is focused on retail and commercial banking. ING also had to be bailed out by the Dutch government in the aftermath of the GFC and thereafter had to divest from several of its business functions such as its insurance business and from several of its international businesses. Thus, like the Royal Bank of Scotland, ING also became a less international and less diversified bank. The remaining banks, Groupe BPCE and Crédit Mutuel, fall into the contextual category of "Cooperative Banks". Both banks have highly federated organizational structures and are comparative technological laggards. Groupe BPCE was created in 2009 from the merger of two major French cooperative banks – Caisse d'Epargne and Banque Populaire – who also co-own the investment bank Natixis, while Crédit Mutuel is composed of 5 federal cooperative banks, 19 federations, and several subsidiaries.

Several banks that saw significant declines as a result of the GFC, like ING and the Royal Bank of Scotland, employed strategies of interdependence to cocreate value with external resources and capabilities as a path to strategic renewal. This strategic renewal enables these banks to grow new revenue streams from the relational rents generated from ecosystemic initiatives with external resources and capabilities while renewing their internal resources and capabilities to make them better adapted to value cocreation with external stakeholders and to the new and rapidly evolving technological, consumer behaviour, regulatory, and competitive forces in their industry. This is exemplified by ING and the Royal Bank of Scotland's origination of *de novo* multi-sided blockchain networks, their establishment of open innovation capabilities like innovation labs, incubators, and accelerators, and ING's systematic spinning-off of fintech subsidiaries with whom it subsequently maintained partnerships. For banks that are federated organizationally, and especially when this federated structure causes them to be technological laggards, the focus is more on resource and capabilities renewal rather than on strategic renewal. For these banks, the emphasis is not so much on benefiting from strategies of interdependence to grow new revenue streams, but of renewing internal resources and capabilities to enable them to better cocreate value with external resources and capabilities in an environment of rapidly evolving technological, consumer behaviour, regulatory, and competitive forces. Banks in this situation, like Groupe BPCE and Crédit Mutuel accounted for a large and disproportionate number of fintech acquisitions to update and ameliorate the situation of internal resources and capabilities. For these federated banks, creating more centralized organizations through which they could orchestrate their value cocreation strategies with external resources and capabilities was also important, hence the establishment of numerous fintech subsidiaries and open innovation initiatives. These observations can also be applicable more generally to firms that, having undergone declines, can see in strategies of interdependence an opportunity to reverse and renew their fortunes by cocreating value with external resources and capabilities. For firms with federated organizational structures that cause them to be technological laggards, strategies of interdependence can be ways for them to renew their capabilities and rethink their organizational structures to make them better adapted to value cocreation with external resources and capabilities (e.g., by establishing centralized specialist subsidiaries, or centralized open innovation capabilities).

7 – Discussion

This study recognizes that since the 2007-08 Global Financial Crisis, banks have had to navigate a more globalized world with emerging and rapidly evolving technologies (e.g., artificial intelligence, cloud computing), the blurring of industry boundaries and the rise of new competitors (e.g., fintechs, bigtechs), new business models (e.g., the platform economy), and regulations and public policy enablers that promote digitalization (e.g., GDPR, PSD2, Open Banking Standard). In this context, an increasing number of strategic resources and capabilities fall outside the ownership and/or control of banks. Thus, banks must devise strategies to interact with these externally held and/or controlled resources and capabilities to cocreate value and sustain their competitive advantage. The RBV provides banking leaders a powerful framework to create these strategies. However, the RBV requires adaptation for it to adequately account for externally held and/or controlled resources and capabilities in the age of the platform economy, beyond those proposed by Dyer & Singh (1998) and Lavie (2006) which were more suitable to dyadic or multi-firm relationships. This study's primary theoretical contribution is a reformulated RBV that is better suited to dealing with value cocreation with external resources and capabilities in the age of the platform economy; this will be discussed in Section 7.1.1. This study also makes several secondary theoretical contributions, which are discussed in Section 7.1.2 to 7.1.5, and methodological contributions which is discussed in Section 7.1.6. As well these theoretical contributions, this study is also aimed at a diverse range of practitioners who need to increasingly strategize for value cocreation with external resources and capabilities as they deal with the forces of interdependence in the platform economy age. This study's managerial contributions are therefore presented in Section 7.2. Section 7.3 concludes by discussing this study's limitations and avenues for further research.

7.1 – Theoretical Contribution

Section 7.1.1.1 details this study's primary theoretical contribution, which is the reformulation of the RBV to make it better adapted to dealing with value cocreation with external resources and capabilities in the age of the platform economy. This adaptation provides a further theoretical contribution by helping to address several lingering critiques of the RBV; this is discussed in Section 7.1.1.2. This study also makes a number of secondary theoretical contributions. In proposing this adaptation to the RBV, this study draws

on several perspectives that deal with interdependence (ecosystems, platforms, networks), and in doing so presents a more unified way of approaching interdependence as called for by McIntyre & Srinivasan (2017); this is discussed in Section 7.1.2. This study also provides insights on the under-researched theme of network coopetition as opposed to dyadic coopetition as highlighted by Czakon, et al. (2020), Czakon & Czernek (2016), Yami & Nemeh (2014), and Ritala, et al. (2014); this is covered in Section 7.1.3. Building on Oliver's (1997) work to integrate institutional theory into the RBV, the addition of the institutional context to the platform economy dimension is discussed in Section 7.1.4. A further secondary theoretical contribution is made by shedding light on *de novo* ecosystem/platform origination, which as Dattée, et al. (2018) state is an under-researched area especially in sectors outside of large technology firms, this is covered in Section 7.1.5. Another one of this study's secondary contributions is a methodological one. Inspired by Nickerson, et al. (2013) who propose a more systematic approach to taxonomy creation in information systems research, this study proposes a systematic approach to taxonomy creation from longitudinal, multiple-case-study data; this is covered in Section 7.1.6.

7.1.1 - Expanding the RBV to Cater for the Forces of Interdependence in the Platform Economy Age

The RBV is both a theory of sustained competitive advantage and a theory of rents, which suggests that by marshalling firm-specific resources and capabilities efficiently, firms can generate rents and derive competitive advantage (Peteraf & Barney, 2003). A firm's resources and capabilities are "*bundles of tangible and intangible assets, including a firm's management skills, its organizational processes and routines, and the information and knowledge it controls*" (Barney, et al., 2011). Assuming that these resources and capabilities are heterogenous and imperfectly mobile, firms can derive Ricardian or monopoly rents as well as sustained competitive advantage by exploiting them, especially if these resources and capabilities are a) valuable, b) scarce, c) imperfectly imitable (due to unique historical conditions, causal ambiguity, social complexity, asset erosion, interconnectedness, asset mass efficiencies, and time compression diseconomies), and, d) imperfectly substitutable (Barney, 1991; Dierickx & Cool, 1989; Peteraf, 1993). Built on Penrose's (1959) foundations, developed in the 1980s (Lippman & Rumelt, 1983; Wernerfelt, 1984; Barney, 1986) and popularized by Barney (1991) in the 1990s, the RBV continued to evolve thereafter demonstrating a high level of versatility. The RBV contributed to different fields such as entrepreneurship (Alvarez & Busenitz, 2001; Foss, et al., 2008) and economics (Makadok, 2011;

Wernerfelt, 2011; Conner, 1991). It integrated with different perspectives such as institutional theory (Oliver, 1997), and organizational economics (Combs & Ketchen, 1999). It also generated several spin-offs such as the NRBV (Hart, 1995) and Dynamic Capabilities (Teece, et al., 1997).

Two important academic contributions that sought to adapt the RBV to interdependence were Dyer & Singh (1998) and Lavie (2006), who introduced the notion of short-run relational rents that a firm can derive through value cocreation with resources and capabilities that are owned or controlled by others. However, both these important contributions focus on value cocreation in the dyadic or multi-firm context, and not the platform context. Thus, in the spirit of Barney, et al.'s (2011) call for scholars to further innovate to help ensure that Resource Based Theory "*achieves revitalization and avoids decline*", this study contributes to the development of Resource Based Theory by proposing an adapted RBV – inspired by Lavie (2006) and Dyer & Singh's (1998) contributions – that is better adapted to interdependence in the platform economy age (Section 7.1.1.1) and in doing so contributes to addressing some of the remaining critiques of the RBV (Section 7.1.1.2).

7.1.1.1 – Rethinking the RBV's Treatment of Relational Rents and External Resources and Capabilities in the Platform Economy Age

Dyer & Singh (1998) proposed that a firm can combine its resources and capabilities with those of an external firm (or firms) to cocreate value and generate relational rents. Relational rents are a form of short-term quasi-rents that cannot be generated by firms in isolation and are created "*through the joint idiosyncratic contributions of the specific alliance partners*" (Dyer & Singh, 1998). Dyer & Singh (1998) presented a number of conditions that were found to increase relational rents including effective governance, the greater the investment in relation-specific assets, safeguards that protect from opportunistic behaviour, partner-specific absorptive capacity, firm management's experience in managing alliances, compatibility among partners, network tie strength, and network centrality. They also found that relational rents can be maintained through various isolating mechanisms, many of which are the same as those identified by RBV literature such as causal ambiguity and time-compression diseconomies, as well as other isolating mechanisms like partner-scarcity (e.g., complementors may have already partnered with other first-mover firms) and institutional factors (e.g., regulations that facilitate trust relationships). Lavie (2006) sought to integrate these considerations into the RBV rather than considering them as part of a

separate Relational View. Lavie (2006) challenged the necessity for firms to own resources and capabilities, which had hitherto been assumed (e.g., by Wernerfelt, 1984, and Barney, 1991), instead drawing on the Penrosian (1959) roots of the RBV to argue that resource accessibility and the ability to enjoy the benefits of resources and capabilities was sufficient. Lavie (2006) therefore incorporated relational rent as a component of a firm's overall internal rent which includes Ricardian and monopoly rents derived from (non-shared) internal resources and capabilities. Lavie (2006) also acknowledges the unforeseen rents that can be derived or lost when firms comingle their resources and capabilities to cocreate value by introducing the notion of inbound spillover rents and outbound spillover rents. Moreover, Lavie (2006) systematically demonstrated how the consideration of external resources and capabilities do not materially impact the RBV's underlying assumptions or isolating mechanisms.

Dyer & Singh's (1998) Relational View and Lavie's (2006) adaptation to the RBV to make it better suited for value cocreation with external resources and capabilities are well aligned to strategies of interdependence in dyadic and multi-partner contexts. However, given that both seminal works preceded the rise of the platform economy, the adaptations they propose do not adequately account for value cocreation with external resources and capabilities in the network or platform context. The technologies, consumer behaviours, regulations, and firms that have come to define the platform economy age, as well as the hypercompetitive pace of change that has often accompanied its rise, have forced firms to consider value cocreation with external resources and capabilities as a more fundamental and sustained phenomenon. This has led to the evolution of certain business models that incorporate value cocreation with external resources and capabilities as central considerations of overall strategies of sustained competitive advantage. This study contributes to the adaptation of the RBV in the platform economy age by taking into account value cocreation with external resources and capabilities in platform-mediated network contexts whereby value cocreation is ongoing and the generation of relational rents is sustained by more fundamental changes to business models.

Lavie (2006) and Dyer & Singh's (1998) treatment of relational rents as a short-term quasi-rent that are bound by the scope of firm's specific dyadic or multi-firm alliances is relevant to the traditional alliances that firms engaged in before the advent of the platform economy age. Moreover, the incorporation of these short-term quasi-rents creates theoretical tension with the RBV's avowed search for sustained competitive advantage. This study's proposed adaptation to the RBV thus removes this tension by a) incorporating

into the RBV the notion of temporary competitive advantage as a component of firm's overall aim for sustained competitive advantage, b) proposing that as well as short-term relational rents, strategies of interdependence can also contribute to long-term Ricardian or monopoly rents, and that these long-term rents can often be derived from the direct and indirect network externalities that are generated through platforms and networks. Additionally, the inclusion of temporary competitive advantage in this proposed adaptation of the RBV, allows firms to draw on the RBV in formulating strategies to navigate hypercompetitive environments.

Beyond this study's contribution to expanding the RBV to deal with external resources and capabilities in the platform economy age and expanding relational rents to include network externalities and long-term relational rents, this study also goes into the mechanics of how this adaptation to the RBV is achieved. In doing so, this study contributes to the RBV's "revitalization" as called for by Barney, et al. (2011) by incorporating considerations from managerial perspectives (ecosystems, platforms), economic perspectives (networks), and concepts (coopetition) that have sought to deal with interdependence and value cocreation with external stakeholders. Like Lavie (2006) and Dyer & Singh (1998), this study incorporates the structural characteristics of networks that make them economically attractive. However, while Lavie (2006) and Dyer & Singh (1998) incorporated structural elements that were relevant to dyadic or multi-firm alliances, this study incorporates platform-centric structural characteristics into the revised RBV such as calling for the multi-sidedness to be considered a strategic resource and for the management of multi-sided platforms to be considered a strategic capability.

Having incorporated considerations about the economic benefits of value cocreation with external resources and capabilities and the structural characteristics that facilitate the generation of these economic benefits, this study contributes further by incorporating considerations about the alignment mechanisms needed to bring a firm into contact with a network of external resources and capabilities, as well as considerations about the technological interfaces that facilitate this. In terms of alignment mechanisms, this study calls for considering as strategic capabilities the managerial ability to align different stakeholders including complementors in value cocreation activities, the managerial ability of coopetating, the managerial ability to lead ecosystems, the managerial ability to originate *de novo* ecosystems, and the managerial ability of knowing when and when not to platformize. In terms of technological interfaces, this study calls for considering as strategic resources a firm's modular technological architectures,

standards, and protocols, and their management as a strategic capability. This study therefore contributes to the adaptation of the RBV to the platform economy age by presenting a detailed, cohesive, and extensive reformulation of the RBV that incorporates wide ranging considerations about alignment mechanisms, network structure, technological interfaces, temporary competitive advantage, and the economic benefits of value cocreation with external resources and capabilities.

This study's reformulation of the RBV is supported empirically by this study's findings (elaborated on in Section 6.5.1), which drew on a wealth of data from the top 20 banks in Europe over a 12-year period. This data was organized in 4 modalities and 17 submodalities of banks' strategies of interdependence to best capture the wide-ranging considerations that are proposed as part of the reformulated RBV. The data was collected and interpreted with the rigour described in this study's research design and methodology (Section 4) to maximize the validity and generalizability of outcomes. Thus, this study's reformulation of the RBV is not only supported by strong theoretical foundations by building on the seminal works of Lavie (2006) and Dyer & Singh (1998) and incorporating considerations from several perspectives, but also by robust empirical findings that validate the reformulation.

This study's empirical findings demonstrate in a systematic and tangible way how the reformulated RBV can help identify the strategies of interdependence firms adopt to cocreate value with external resources and capabilities, especially in platform contexts. The empirical findings, for example, have demonstrated how banks have coopetated with competitors and complementors to establish payments networks, how they have originated and lead *de novo* multi-sided blockchain platforms, and how they have adopted technological modularity through open-APIs to facilitate value cocreation with external resources and capabilities. At a more holistic level, the findings also provide empirical support for the reformulated RBV's ability to lead to the creation of useful taxonomies of strategies of interdependence (both detailed ones and ones at a more abstracted and generalizable level).

7.1.1.2 – How an RBV Adapted for Interdependence Contributes to Addressing the Critiques of the RBV

As the RBV developed and evolved it had to address several critiques (e.g., Priem & Butler, 2001). While the majority of critiques have been addressed, three continue to linger (Kraaijenbrink, et al., 2010). This study's reformulation of the RBV contributes to addressing these lingering critiques.

Better Demarcating and Defining Resources and Capabilities

Kraaijenbrink, et al.'s (2010) first suggestion is to better demarcate and define resources, calling for a distinction to be made between the building, acquisition, possession, and deployment of resources and capabilities. Kraaijenbrink, et al. (2010) considers that the RBV fails to recognize that the ownership of resources and capabilities can at times be partial or constraint such as in the case of knowledge. Moreover, the RBV fails to distinguish between rivalrous and non-rivalrous resources and capabilities, and while it caters for rivalrous resources and capabilities that are often scarce and cannot continuously be redeployed, it does not adequately cater for non-rivalrous resources and capabilities that benefit from being redeployed many times. Moreover, Kraaijenbrink, et al. (2010) echo Newbert (2007) and Grant (1996a) in arguing that the RBV's focus should not be limited to considering individual resources but rather the managerial capabilities of configuring, integrating, and orchestrating those resources, which are better determinants of firm sustained competitive advantage.

This study's reformulation of the RBV explicitly challenges the RBV's overly narrow treatment of ownership of resources and capabilities as called for by Kraaijenbrink, et al. (2010). It does so by proposing that in the age of the platform economy, there are often circumstances where firms should consider as strategic resources and capabilities those resources and capabilities that it does not own or control, but which are instead owned or controlled by external stakeholders with whom the firm can cocreate value. In terms of the distinction between rivalrous and non-rivalrous resources and capabilities, these are addressed from an economic point of view through the reformulated RBV's consideration of network externalities and the structural considerations, like multi-sidedness, which drive them. From an alignment and technological perspective, this is addressed by the inclusion in the reformulated RBV of considerations about complementors, knowing when to platformize, coopetition, technological

modularity, and value cocreation. The reformulated RBV thus considers as non-rivalrous resources and capabilities, those resources and capabilities that it can mobilize to cocreate value and generate network externalities with external resources and capabilities through coopetitive engagements with external stakeholders mediated by multi-sided, modular technological platforms. The way the reformulated RBV's informs platform strategy at a more holistic level (e.g., platform dominance versus platform coexistence, complementor variety versus complementor exclusivity) is also driven by firms' managerial ability to grasp the distinction between rivalrous and non-rivalrous resources and capabilities.

Additionally, in keeping with Kraaijenbrink, et al.'s (2010) call for a better demarcation of resources and capabilities, this study's reformulated RBV proposes further demarcations of resources and capabilities. For example, this study proposes the demarcation of those resources and capabilities contributing to sustained competitive advantage and those contributing to temporary competitive advantage. The inclusion of coopetition as a consideration also creates a further demarcation and differentiation between non-rivalrous resources and capabilities that can be exposed to collaborative forces, rivalrous ones that should not, and a third or hybrid category of those resources and capabilities that can be exposed to coopetative – simultaneously competitive and collaborative – forces. The consideration relating to the managerial ability of knowing when and when not to platformize (Gawer & Cusumano, 2008) and strategic openness (Alexy, et al., 2018) also create a further demarcation between resources and capabilities that can sustain platformization and strategic openness and indeed lead to competitive advantage for the firm, and those resources and capabilities that if exposed to platformization and strategic openness lead to greater outbound spillover rents and the loss of competitive advantage for the firm.

Moreover, as called for by Kraaijenbrink, et al. (2010), Newbert (2007), and Grant (1996a), the reformulated RBV focuses on the strategically important managerial ability of configuring, integrating, and orchestrating a firm's own resources and capabilities and those of external stakeholders through platforms to cocreate value. The reformulated RBV does so by incorporating various relevant considerations. It incorporates considerations about management's alignment-related abilities such as coopetition, platform leadership, and the ability to originate *de novo* platforms. It includes considerations about the economic benefits of resource configuration, integration, and orchestration, such as network externalities, and the managerial ability to drive these economic benefits through multi-sidedness, network characteristics and network behaviour. It also integrates considerations about the strategically important

managerial ability to mobilize technological platforms to facilitate these configuration, integration, and orchestration activities, including through the adoption of technological modularity and technology standards and protocols. Furthermore, the consideration of architectural modularity, standards, and protocols as strategically important resources and their management as a strategically important capability, provide the technological enablers for the managerial ability of configuring, integrating, and orchestrating resources and capabilities.

This study demonstrates empirical examples of how firms better define and demarcate resources and capabilities. For example, a distinction is drawn between banks building resources and capabilities (e.g., fintech subsidiaries), acquiring them (e.g., acquiring fintechs), and deploying them (e.g., open innovation initiatives, blockchain consortia). The empirical findings also demonstrate how banks can generate value and sustained competitive advantage without fully owning resources and capabilities (e.g., UBS' origination of *de novo* blockchain consortia, ING's systematic spinning-off of fintech subsidiaries). Banks also make the distinction between rivalrous and non-rivalrous resources and capabilities (e.g., whether banks restrict their partnership with bigtech in the payments or not, the scope of banks' open innovation initiatives). Moreover, the empirical findings provide extensive examples of the importance of the managerial ability of configuring, integrating, and orchestrating resources to drive sustained competitive advantage (e.g., banks' coopetition with each other and other incumbents to create national payment networks, banks' participation in, leadership of, or origination of multi-sided blockchain platforms, their collaboration with bigtechs in payments and other value cocreation use-cases, the wide adoption by many banks of open-APIs).

Advancing a More Subjective and Firm-Specific Notion of the Value of Resources and Capabilities

The second lingering critique of the RBV is that it does not sufficiently advance a subjective and firm-specific notion of the value of resources and capabilities. The RBV's treatment of the value of resources and capabilities is based on bounded rationality and the assumption of the continuity and predictability of markets, which departs from Penrose's (1959) argument that while the market may determine resource price, the value a firm derives from it is not determined by that price (Kraaijenbrink, et al., 2010). This therefore makes the classic RBV ill-equipped with dealing with rapidly evolving, unpredictable environments. To remedy this, Kraaijenbrink, et al. (2010) join Witt (2007), Baker & Nelson (2005), Foss

(2011), Denrell, et al. (2003), and Kor et al. (2007) in calling for the entrepreneurial abilities of firm management to deploy resources and capabilities in innovative ways to create and internalize value to be taken into account. Kraaijenbrink, et al. (2010) make the additional suggestion that the value of resources and capabilities are not only determined by the entrepreneurial abilities of firm management, but also by external forces in a firm's institutional context (e.g., regulators).

This study's reformulated RBV draws on hypercompetition (D'Aveni, 1994; D'Aveni, et al., 2010) for one of its two key adaptations to the RBV – the inclusion of temporary competitive advantage especially in rapidly evolving, unstable environments. This adaptation, inspired by hypercompetition literature, directly challenges the RBV's boundedly-rational assumptions, and thus directly addresses the call by Kraaijenbrink, et al. (2010), Witt (2007), Baker & Nelson (2005), Foss (2011), Denrell, et al. (2003), and Kor et al. (2007) to take into account the idiosyncratic, entrepreneurial abilities of firm management to deploy resources and capabilities in innovative ways to create future value. By extending the scope of the RBV to include value cocreation with external resources and capabilities (e.g., complementors), the reformulated RBV also addresses Kraaijenbrink, et al.'s (2010) call to consider a firm's institutional context when determining the value of resources and capabilities. This study's reformulation of the RBV also extends the notion of the value of resources and capabilities by accounting for relational rents derived from value cocreation with external resources and capabilities as well as the network externalities a firm internalizes from its platform-based interactions with external resources and capabilities. Moreover, the reformulated RBV's inclusion of considerations relating to multi-sidedness, ecosystem leadership, *de novo* ecosystem origination, coopetition, knowing when and when not to platformize, and technological modularity, standards, and protocols, provide the alignment and technological mechanisms through which the entrepreneurial abilities of firm management can be taken into consideration.

This study's findings demonstrate empirically how banks have taken a more subjective approach to the value of resources and capabilities, especially given the hypercompetitive forces they have faced since the 2007-08 Global Financial Crisis. The majority of banks established open innovation initiatives like innovation labs, incubators, and accelerators and adopted open IT infrastructures to varying degrees (e.g., through open-APIs) through which they could collaborate with external stakeholders and experiment with new technologies and business models to cocreate value including temporary competitive advantage in contexts of rapidly evolving market conditions. Several banks having launched fintech initiatives or

entered into fintech partnerships did not hesitate to divest from them, terminate them, or spin them off demonstrating their ability to take a more nuanced and subjective view of the value of resources and capabilities in market conditions that were not continuous or stable. Moreover, this study also demonstrated the ability of banks to consider the institutional context when assessing the value of resources and capabilities, as exemplified by the opening-up of European banks' IT infrastructure in response to changes in the regulatory context such as PSD2 and Open Banking Standard or UBS' *de novo* origination of the MADREC multisided blockchain platform in response to MiFID II.

Towards a More Viable Theory of Sustained Competitive Advantage

The third lingering critique of the RBV is that it needs to promote a more viable theory of sustained competitive advantage. The RBV focuses on the ability of firms to build and possess resources and capabilities that will have a higher value in future markets than in the current market and thus provide the firm with a sustained competitive advantage versus competitors. However, as Kraaijenbrink, et al. (2010) point out, the RBV needs to include the context and processes of resource deployment through accounting for the ability of firm management to deploy "*imaginative processes that enable the firm to grasp the strategic disjunction between its resource set and the market situation in which it is operating*". To achieve this, the RBV needs to be less static by incorporating considerations about the timing of value creation, the process and timing of rent generation and appropriation, and the entrepreneurial abilities of firm management to generate new, innovative sources of sustained competitive advantage (Kraaijenbrink, et al., 2010).

This study's reformulation of the RBV proposes that the RBV should consider temporary competitive advantage as a component of firms' overall strategies for sustained competitive advantage. The incorporation of temporary competitive advantage enriches the RBV and directly addresses Kraaijenbrink, et al.'s (2010) call for a less static notion of sustained competitive advantage, by introducing a temporal dimension to the process of value creation, rent generation, and rent appropriation. This thus contributes to making the RBV better suited to deal with the entrepreneurial abilities of firm management to generate value in future markets in innovative ways, such as through strategic agility (Weber & Tarba, 2014) and by mobilizing or renewing resources and capabilities towards temporary competitive advantage in hypercompetitive markets (D'Aveni, et al., 2010).

Furthermore, this study's reformulated RBV incorporates additional considerations that also directly speak to Kraaijenbrink, et al.'s (2010) call for a more viable theory of sustained competitive advantage. The incorporation of considerations about value cocreation with external resources and capabilities, firm management's ability to coopetate with external stakeholders, and their ability to lead or originate *de novo* ecosystems all enrich the RBV with nuances related to management's entrepreneurial abilities to combine their internal resources and capabilities with those of external stakeholders to generate future value and orchestrate rent generation and appropriation, especially if assuming the position of ecosystem leader. In particular, the managerial ability of originating *de novo* ecosystems which require the focal, originating firm to tackle the "chicken and egg" problem of convincing other firms of the benefits of participating in an ecosystem when those benefits depend on that firm's participation in the ecosystem, touches directly on the entrepreneurial abilities of firm management of transforming resources into services that have a higher value in future markets. Moreover, the reformulated RBV's incorporation of considerations about multi-sidedness and network externalities address the process of rent generation and rent appropriation, particularly in the platform context. The incorporation of considerations about technological modularity, standards, and protocols and about the ability of firm management of knowing when and when not to platformize relate to the question of the process of resource deployment and value creation.

Once again, this study's empirical findings demonstrate how banks have increasingly adopted more nuanced approaches to sustained competitive advantage. Banks have established open innovation initiatives like innovation labs, incubators, and accelerators through which they collaborate with external stakeholders to cocreate innovative, entrepreneurial services that are intended to have a higher value in future markets. Banks honed their entrepreneurial capabilities through internal and external open innovation initiatives to generate new, innovative sources of rents and competitive advantage for example through coopetition with other banks and incumbents to launch payment networks, collaboration with bigtechs and fintechs on various innovative services, and through the participation, leadership, and/or origination of blockchain consortia. In addition, banks' extensive participation in blockchain consortia, and especially the leadership and origination of *de novo* blockchain multi-sided platforms by some banks such as UBS and ING, demonstrate how banks consider the process and timing of how rents are generated, distributed, and appropriated through these multi-sided blockchain platforms as part of their strategies for sustained competitive advantage.

Infusing Austrian Economic Thought into the RBV's Overly Neoclassical Microfoundations

As Kraaijenbrink, et al. (2010) point out, underlying these 3 lingering critiques of the RBV is an overly rigid adherence to neoclassical economic rationality. This leads to too much importance being accorded to resource ownership, undervaluing the importance of human involvement in the interpretation, bundling, and orchestration of resources and capabilities to generate value. As is pointed out by Foss, et al. (2008), Connell (2007; 2009), and Kraaijenbrink, et al. (2010), at its roots, the RBV has various Austrian economic influences. Penrose – a student of Fritz Machlup (in turn a student of Ludwig von Mises) – whose seminal work *The Theory of the Growth of the Firm* (1959) is foundational to the development of the RBV was influenced by Austrian economic rationality. However, while the RBV already accommodates Austrian economic influences such as its underlying assumption of resource heterogeneity which aligns with Austrian capital theory that emphasizes the heterogeneity of capital goods (Hayek, 1941; Lachmann, 1956; Foss & Ishikawa, 2007), the RBV nevertheless adheres too closely to the neoclassical notion of competitive equilibrium and assumes that resources and capabilities are always put to their best use (Foss & Ishikawa, 2007). Thus, as suggested by Foss & Ishikawa (2007), Kraaijenbrink, et al. (2010), and Lockett & Thompson (2001), the infusion of more Austrian economic thought into the RBV is necessary, especially in terms of further advancing the notion of entrepreneurial discovery, and the importance of firm management's idiosyncratic abilities to identify and appraise the value of resources and capabilities through entrepreneurial discovery, and to subsequently exploit them and actualize value through entrepreneurial activity. This is especially true in rapidly evolving environments where this process of entrepreneurial discovery can generate Schumpeterian rents for firms that have the potential to subsequently be converted into Ricardian rents (Peteraf & Barney, 2003).

This study's reformulation of the RBV contributes to infusing the RBV with Austrian economic thought especially in the context of the platform economy. The inclusion of temporary competitive advantage incorporates into the RBV greater consideration of time, uncertainty, and change. This makes the RBV better suited to dealing with hypercompetitive environments and provides a more expansive treatment of economic rents by explicitly accommodating Schumpeterian rents. The consideration of value cocreation with external resources and capabilities contributes by emphasizing the importance of entrepreneurial discovery and activity as important contributors to generating value from resources and capabilities and as such important drivers of sustained competitive advantage. More specifically, the inclusion of

considerations on alignment (coopetition, ecosystem leadership, *de novo* ecosystem origination), rent generation, distribution, and internalization in platform contexts (network externalities, network characteristics, multi-sidedness, knowing when and when not to platformize), and technological enablers (modularity, standards, and protocols), contribute by better equipping the RBV with the mechanics of entrepreneurial discovery and entrepreneurial activity, especially in the context of the platform economy.

As well as these primary theoretical contributions, this study makes a number of secondary theoretical and methodological contributions, which are elaborated on in Sections 7.1.2 – 7.1.6.

7.1.2 – A More Unified Perspective on Interdependence – Ecosystems, Platforms, Networks

There are several perspectives in business and management academic research that tackle various aspects of interdependence. These have become especially relevant in the age of the platform economy. The networks perspective focuses on the economic benefits of interdependence, such as direct and indirect network externalities (Katz & Shapiro, 1986), and the way firms can maximize the generation and internalization of these economic benefits through the consideration of network size (Venkatraman & Lee, 2004; Caillaud & Jullien, 2003), behaviour (Barney & Hansen, 1994; Gulati, et al., 2000), characteristics (Suarez, 2005; Afuah, 2013; Gulati & Gargiulo, 1999), and multi-sidedness (Rochet & Tirole, 2003; 2006). The ecosystems perspective focuses on the collaborative arrangements and alignment mechanisms through which different stakeholders collaborate to cocreate value (Adner, 2006; Adner, 2017; Autio & Thomas, 2014; Kapoor & Lee, 2013; Adner & Kapoor, 2010; Bonardi & Durand, 2003; Iansiti & Levien, 2004). The platform perspective considers the technological interfaces that mediate value cocreation (Gawer & Cusumano, 2002; 2014), including considerations related to architectural modularity (Jacobides, et al., 2016; Simon, 1962; 1965; Schilling, 2000; Evans & Basole, 2016), standards and protocols (Baldwin, 2008; Jacobides, et al., 2016; Bonardi & Durand, 2003), and the risks of platformization (Gawer & Cusumano, 2008). While these different perspectives provide avenues for deep research on the economic, managerial, and technological aspects of interdependence, an integrated view of interdependence is lacking. As McIntyre & Srinivasan (2017) state "*research streams in IO economics, strategic management, and technology management have made substantial gains in our understanding of*

the emergence of platforms and the dynamics of platform-mediated networks. Yet, each stream has been relatively confined to specific aspects of these settings, lacking a broader view of strategy considerations in the context of networks and platforms" and that "*future research will benefit from greater recognition of the potential synergies in the three existing streams described here, and that research efforts that incorporate these streams while accounting for market, firm, and complementor dynamics offer the greatest potential for furthering our understanding of strategy in the context of networks and platforms*".

This study's reformulation of the RBV incorporates considerations from the 3 perspectives on interdependence, thus contributing to answering McIntyre & Srinivasan's (2017) call for a more holistic, integrated approach. This study's integration of considerations from the 3 perspectives on interdependence also demonstrates how these perspectives are interwoven (for example, how technological modularity enables a focal firm's orchestration of complementors, which in turn impacts network size and characteristics, and consequently the level of network externalities that are generated). The 3 perspectives on interdependence also frequently reference the concept of coopetition (Brandenburger & Nalebuff, 1996) as an important alignment mechanism through which different stakeholders cocreate value. This study's reformulation of the RBV explicitly includes coopetition as a key consideration for value cocreation with external resources and capabilities. Thus, as an additional contribution aimed at presenting a more holistic, integrated, and wide-ranging approach to interdependence, this study positions the concept of coopetition within the ecosystem perspective, given coopetition's focus on aligning different stakeholders to cocreate value. This study also demonstrates empirically how firms often take an integrated, holistic approach to their strategies of interdependence. They do not separate their strategies of interdependence by the different aspects of interdependence. This thus reinforces the need for academic inquiries on interdependence to also adopt an integrated approach to the way they study these strategies.

7.1.3 – Network Coopetition

As Czakon, et al. (2020) point out, the majority of coopetition research has focused on dyadic coopetition, yet coopetition can also occur at the network level. However, as Czakon & Czernek (2016) emphasize, coopetition at the network level presents a number of additional complexities such as, the dilution of the influence of any single firm, the dispersion and anonymization of opportunistic behaviour, the uneven distribution of information across the network, and the diverse ways that firms can join a network beyond

partner selection. Moreover, few academic studies, such as Ritala, et al. (2014), considered coopetition in the context of networks mediated by technological platforms. This study explicitly calls for the incorporation of management's coopetative abilities – including managerial abilities related specifically to network coopetition – into a reformulated RBV and accommodates the technological aspects of network coopetition. This study also demonstrates empirical examples of how banks have engaged in network coopetition as part of their strategies of interdependence (e.g., participating in, leading, or originating multi-sided blockchain networks, coopetating with a large number of other incumbents to launch fintech initiatives). In doing so, this study provides a secondary contribution of furthering the consideration of network coopetition in business and management research. Thus, the reformulated RBV, with its influences from ecosystems, networks, and platforms literatures, provides a framework for network coopetition to be considered and examined.

Sanou, et al. (2016) found that firms that have a central position in coopetative networks are more likely to internalize a greater proportion of the network externalities that are generated. This aligns with this study's consideration of firms' managerial ability to lead and originate *de novo* multi-sided blockchain platforms such as UBS' leadership and origination of the Fnality International and MADREC multi-sided blockchain consortia. Yami & Nemeh (2014) argue that network coopetition is better suited for radical innovation, while dyadic coopetition is better suited to incremental innovation. Yami & Nemeh's (2014) findings are supported by this study's empirical findings, for example when it came to exploring innovative blockchain technology in different contexts, banks adopted network coopetition, while when considering more incremental innovations related to payment solutions banks often engaged with dyadic coopetition or coopetition with a lower number of external stakeholders.

7.1.4 – The Institutional Context

As Oliver (1997) highlights, while the RBV proposes that "*firm heterogeneity in acquiring and deploying resources and capabilities accounts for the generation of economic rents*" and sustained competitive advantage, it has not "*looked beyond properties of resources and resource markets to explain enduring firm heterogeneity. In particular it has not examined the social context within which resource selection decisions are embedded (e.g., firm traditions, network ties, regulatory pressures) and how this context might affect sustainable firm differences*". Oliver (1997) therefore proposes a model that incorporates

elements of Institutional Theory (DiMaggio & Powell, 1983) to account for the institutional context of firm management's decisions relating to the selection of resources and capabilities. The institutional context can be considered at three levels: the individual level which includes decision makers' norms and values, the firm level, which includes organizational culture and politics, and at the interfirm level including public and regulatory pressures and industry-wide norms (Oliver, 1997).

Oliver (1997) calls for future research on this topic to focus on both firm resource attributes and how these resources are developed, managed, and diffused, suggesting that "*longitudinal studies of the process of resource development and deployment may be another approach to understanding sources of sustained competitive advantage*". This study answers Oliver's (1997) call by accounting for the institutional factors behind this study's research question, including regulatory changes such as PSD2 and the Open Banking Standard, public policy enablers that have driven greater digitalization in the financial services industry, and changes in consumer behaviour. Moreover, not only has this study considered longitudinally banks' processes of resource development and deployment in response to interdependence, but it has also conducted a separate longitudinal firm-level study of their institutional context (Section 5) whose findings contributed to a set of second order findings and a meta-taxonomy that incorporates this study's institutional context. In doing so this study takes into consideration path dependencies and unique historical conditions linked to the banks' institutional context, for example whether some banks adhere to cooperative philosophies, whether some banks were particularly badly impacted by the 2007-08 Global Financial Crisis and required government bailouts, whether some banks became more or less international or more or less diversified in the aftermath of the 2007-08 Global Financial Crisis, and whether some banks had developed particular specialisms and market-share dominance in certain subsectors such as private banking and wealth management or in payments.

Oliver (1997) also calls for future studies on the process of resource accumulation and deployment to examine how "*firms are able to reduce time compression diseconomies […] actively manage their cultures to encourage organizational learning […] diffuse new competencies rapidly through the firm*". This study also addresses these calls by considering how banks have acquired, developed, and/or deployed their resources and capabilities and how they have interacted with external resources and capabilities in response to the growing forces of interdependence in their industry. Specifically, this study's modalities and submodalities of banks' strategies of interdependence address these points. For example, several

banks sought to reduce time compression diseconomies through acquisitions of innovative fintechs, others through partnerships with fintechs, bigtechs, and/or other incumbents, others still through the establishment of open innovation initiatives. To actively manage their cultures and encourage organizational learning as well as to diffuse new competencies rapidly through their organizations, banks for example, established open innovation initiatives, separate fintech subsidiaries, and launched open technological interfaces.

Finally, Oliver (1997) also notes that "*strategic alliances as strategic assets or as sources of institutional capital might be a valuable line of inquiry in future research on competitive advantage*". This study concurs but extends this beyond strategic alliances at the dyadic or multi-firm level to a firm's participation, leadership, and/or origination of platform-mediated networks and ecosystems, which is especially relevant in the age of the platform economy. Thus, while this study's reformulation of the RBV proposes that the platforms mediated networks and ecosystems that a firm participates in, leads, and/or originates are strategically important resources that contribute to sustained competitive advantage, it also suggests that these platform mediated networks and ecosystems are a source of institutional capital for the firm that also contribute to sustained competitive advantage. Moreover, while these platform mediated networks and ecosystems are a source of institutional capital for the firm, the process behind the firm deciding to participate in, lead, and/or originate them, is itself subject to an institutional context at the individual, firm, and interfirm levels, which further underlines the utility of conducting contextual studies (such as that in Section 5) to try to better understand firms' institutional milieu.

7.1.5 – *De Novo* Platform Origination

Firms that are able to lead existing ecosystems or originate *de novo* ecosystems are more likely to influence the generation, distribution, and internalization of network externalities (McIntyre & Srinivasan, 2017; Gawer, 2014). While several academic studies sought to address the governances and orchestration of existing ecosystems, much less academic inquiry has sought to tackle the process of *de novo* ecosystem origination (Dattée, et al., 2018; Autio & Thomas, 2014). An important challenge that presents in the origination of de novo ecosystems is the "chicken and egg" dilemma of having to convince prospective ecosystem participants of the value of the future ecosystem whose value is dependent on their participation. Several scholars (Dougherty & Dunne, 2011; Ozcan & Eisenhardt, 2009; Santos &

Eisenhardt, 2009) have sought to address this dilemma by emphasizing the role of the ecosystem leader's ability to envision and shape meaning to become "*the cognitive referent in a market*" (Santos & Eisenhardt, 2009). However, as Dattée, et al. (2018) point out, this is based on the assumption that a meaningful vision can be shaped, which is not always the case, especially in hypercompetitive environments. In such situations, Dattée, et al. (2018) suggest that *de novo* ecosystem origination should be a "*process of discovery*" orchestrated by the ecosystem leader who needs to continually influence, monitor, and update the ecosystem origination process and establish control points to maximize its ability to internalize the value created.

As a secondary theoretical contribution, this study calls for the ability of management to originate *de novo* ecosystems to be considered a strategically important capability that is a component of the proposed reformulation of the RBV. Moreover, as Dattée, et al. (2018) point out "*the multilayered IT industry we selected is known to promise particularly high returns from successful ecosystem approaches, and has thus been the focus of much work on ecosystems*"; hence, as a secondary contribution, this study also presents *de novo* ecosystem origination outside of the IT industry, in this case in the context of the banking industry. Dattée, et al. (2018) also propose several future research topics of interest including "*for more work to study control points and their origination, defense, application, and actual operationalization*" and "*studies on how an ecosystem "gets out of control" when the firm(s) initiating it can no longer steer its evolution or end up ostracized*". By taking into account management's ability to originate *de novo* ecosystems as a strategic capability in the reformulated RBV, this study captured empirically how banks originated *de novo* ecosystems. For example, UBS originated a *de novo* blockchain-based network for interbank settlements in 2015 which was then opened up to participation of a group of other banks in 2019 as Fnality International. In 2017, UBS also originated a *de novo* blockchain network called the Massive Autonomous Distributed Reconciliation (MADREC) platform to facilitate compliance with MiFID II, and managed to garner participation from Barclays, Credit Suisse, KBC, SIX, and Thomson Reuters. The Royal Bank of Scotland's subsidiary Ulster Bank also originated a *de novo* blockchain platform for interbank settlement called the Emerald Platform, which Ulster Bank open-sourced in 2016; this platform was then adopted as part of the interbank settlement platform – Project GreenPay – which was launched by Ulster Bank and a number of other Irish banks. In 2015, several German Banks, including Deutsche Bank, originated the *de novo* payments network Paydirekt, and while a number of other banks initially participated (e.g., BNP Paribas, ING and Santander) in the network, these later left the network since,

having entered the market too late, Paydirekt was unable to shape a convincing future vision vis-à-vis more established solutions in Germany like PayPal. The experience of the German banks with Paydirekt is the opposite of ING's experience with the Payconiq payment platform it developed in 2015, later opened to external participation, and which was subsequently supported by a large number of banks in the Netherlands, Belgium, and Luxembourg.

7.1.6 – Methodological Contribution – A Systematic Approach to Taxonomy Creation for Longitudinal, Multiple-Case Study Research

As Nickerson et al. (2013) point out taxonomies "*play an important role in research and management because the classification of objects helps researchers and practitioners understand and analyze complex domains*" and are useful for theory development. The process of taxonomy development has been well researched in several domains including the social sciences (e.g., Bailey (1994)). However, as Nickerson et al. (2013) highlight, the process of taxonomy development is often reached in an *ad hoc* or intuitive way; and while this observation was made by Nickerson et al. (2013) in the context of Information Systems (IS) research, as Nickerson et al. (2013) state "*our problem statement for taxonomy development is not specific to IS*". With this in mind, this study takes a systematic taxonomy development approach that is influenced by Nickerson, et al. (2013).

This study therefore makes a methodological contribution, by presenting a systematic taxonomy development process that can be derived from qualitative, longitudinal, case-study research. In particular, this study's taxonomy development process demonstrates how a systematic approach to taxonomy creation can be used when dealing with the combination of: a) a large number of cases (this study considers 20 cases), b) a large number of qualitative data points collected longitudinally from diverse sources (this study considers over 1,200 qualitative data points across the 20 cases derived from multiple sources such as databases, press releases, and financial statements over a 12 year period), c) a large number of modalities and submodalities used to order the data (this study uses 4 modalities and 17 submodalities), d) the interpretation of the data at a holistic, case-level and not at the variable-level. In adopting this systematic process, the resultant taxonomy is not derived in an *ad hoc* or intuitive way, and is more robust, complete, and extendible while facilitating theorization.

7.2 – Managerial Contribution

As well as this study's theoretical contributions presented in Section 7.1, this study also makes several managerial contributions. This study starts with the managerial context of banks' strategies of interdependence in the age of the platform economy (Section 2), posing this study's managerial question (Section 2.15) "How have large European banks been strategically responding to the rising forces of interdependence?". As such, this study's first managerial contribution addresses this managerial question and thus focuses on this study's contribution to banks. This study also makes managerial contributions to managers at fintechs (Section 7.2.2), bigtechs (Section 7.2.3), venture capital firms and innovation partners (Section 7.2.4), as well as to regulators (Section 7.2.5).

7.2.1 – Managerial Contributions for Banks

This section focuses on this study's managerial contribution for banks. Given this study's focus on large European banks, it starts by considering the managerial implications for top management (Section 7.2.1.1) and middle management (Section 7.2.1.2) at large European banks. However, this study's findings have managerial implications for top management and middle management at mid-size and smaller banks (Section 7.2.1.3) and non-European banks (Section 7.2.1.4).

7.2.1.1 – Implications for Top Management at Large European Banks

Since the 2007-08 Global Financial Crisis, the senior management of large European banks have had to contend with the emergence of numerous forces that have driven greater interdependence in the banking industry. These forces stem from more stringent banking regulations such as Basel III at both the global and European levels, regulations at the European level such as PSD2 and the Open Banking Standard that facilitate the activities of non-banking financial services providers, rapid technological changes and the emergence of new platform-centred business models, the proliferation of new competitors to banks such as fintechs and bigtechs, and the rapidly evolving consumer behaviours of the digitally native generation (Claessens, et al., 2018; Molyneux & Wilson, 2017). Recognizing that these forces mean that increasingly strategically important resources and capabilities fall outside the ownership and control of banks, leaders at large European banks have come to recognize the importance of value cocreation with external

stakeholders as part of banks' strategies for sustained competitive advantage. This is especially true in the European context since European regulators have taken the lead vis-à-vis their global counterparts in enacting open banking regulation, which has amplified these forces of interdependence. At the same time, European banking leaders are having to navigate these forces while contending with low profitability due to long-term near-zero interest rates, lower consumer trust in the banking sector following the 2007-08 Global Financial Crisis, and legacy technology estates and ways of working.

This study therefore makes a number of managerial contributions that directly address these critical issues that the top management at large European banks have been facing. Firstly, it provides them with a revised framework for driving sustained competitive advantage that takes into account value cocreation with external stakeholders and temporary competitive advantage, and which they can use to formulate their strategies for contending with the forces of interdependence. This revised framework breaks down the mechanics of value cocreation and temporary competitive advantage, allowing senior leaders to understand how they can apply the revised framework practically with their middle management and divisional leaders (e.g., with the Chief Information Officer and/or the Chief Technology Officer regarding the technological aspects of value cocreation such as technological modularity, with divisional heads such as the Head of Corporate Banking for the alignment aspects of value cocreation).

Secondly, this study provides top management at large European banks with the taxonomy of banks' strategies of interdependence to help them understand how their peers strategized for interdependence in the 12 years after the 2007-08 Global Financial Crisis. This enables these top managers to benchmark their bank and its strategies of interdependence against their peers. Moreover, this study breaks down strategies of interdependence – which by itself can be an abstract notion – into the modalities and submodalities of banks' strategies of interdependence. Thus, this would enable top managers to better understand the components and modalities of a specific taxon's strategies of interdependence, and how this differs practically from another taxon's strategies of interdependence. In addition, this study's longitudinal dimension allows these top managers to observe how their peers' strategies of interdependence evolved over time. Thus, this study's combination of considering the modalities and submodalities of strategies of interdependence, the longitudinal dimension, and the fact that it considers multiple-cases (20 banks) facilitates the ability of top managers at large European banks to a) simulate or analyse scenarios for evolving their bank's strategies of interdependence, b) put in place a roadmap for

moving to a future state strategy of interdependence, c) understand in detail how their strategies of interdependence is situated versus their peers, and, d) diagnose why the current state of their strategies of interdependence diverges from the state that they had originally intended.

Thirdly, the meta-taxonomy of strategies of interdependence provides these top managers with insights on strategies of interdependence at a more holistic, higher level of abstraction. It allows them to consider the institutional contexts that contribute to different strategies of interdependence. It also allows them to consider their own institutional context and how this relates to their existing strategies of interdependence or any evolution of their strategies of interdependence that they are considering.

Fourthly, this study provides a more measured treatment of the impact of the platform economy on banks from the point of view of the banking industry. In the years following the 2007-08 Global Financial Crisis and concurrently with the rise of the platform economy, a large number of business and management books, banking industry publications, reports from prominent consultancies, grey literature, and the financial media, characterized the rise of fintechs, the rapid evolution of new technologies and platform business models, and the incursion of bigtech into financial services, as heralding the steep decline and disintermediation of banks. These sources often characterized these new entrants as the future replacements of traditional banks, drawing on inaccurate and overused comparisons with platform-economy success stories (e.g., AirBnB versus hotels, Uber versus traditional taxis). What these sources often failed to fully recognize was a number of important strengths that banks possess, including: the unique ability of banks to originate new money through lending as opposed to simply intermediating the movement of existing money, the highly regulated nature of banks' activities, the specialized expertise of banks in certain financial operations, and historic relationships that banks have established with their customers. These sources therefore have the potential to overstate the magnitude or mischaracterize the nature of the disruption caused by the forces of interdependence on the banking sector, and consequently derail the ability of top management to strategize accordingly. This study, which was conducted from the point of view of banks, takes into account banks' often overlooked strengths and unique abilities as well as banks' capacity to adapt to disruptions. In doing so, this study helps to bring more balance to top managers with regards to the treatment of these forces of interdependence and to the ramifications of the age of platform economy. A potential implication of this balanced approach for top management is to move strategic thinking away from a defensive, reactive posture as implied by these industry sources and

grey literature, to a more proactive posture that sees exploitable opportunities in interdependence and in the rise of the platform economy.

7.2.1.2 – Implications for Middle Management at Large European Banks

The managerial implications for top management discussed in the previous section are also true for middle management and divisional heads at large European banks, albeit at a more operational level. However, beyond the inclusion of value cocreation with external stakeholders and temporary competitive advantage in the proposed framework for strategies of interdependence, the proposed framework breaks down in separate components the mechanics through which value is cocreated to drive temporary and sustained competitive advantage. These components can provide valuable insights to middle management and divisional heads at large European banks who need to effectuate top management's strategies of interdependence. For technology and operations leaders such as the Chief Information Officer, Chief Technology Officer, Chief Operating Officer, and Chief Data Officer, this study's contributions around the consideration of technological modularity, and technological standards and protocols as strategic resources and their management as strategic capabilities, have important implications on the technological and architectural decisions they make in their strategies of interdependence. For strategy leaders such as the Chief Strategy Officer, Head of Innovation, and Head of Digital Transformation, this study's contributions around the consideration of coopetition, value cocreation with ecosystem partners including complementors, and ecosystem leadership and/or origination as strategic capabilities, have important implications on the alignment mechanisms they adopt in their strategies of interdependence. This study's contribution around the consideration of knowing when to platformize as a strategic capability, also has important implication for these strategy leaders from a risk assessment perspective; it is also important for risk leaders at banks such as the Chief Risk Officer and the Chief Information Security Officer. For divisional heads like the Head of Corporate Banking, the Head of Retail Banking, and the Head of Private Banking and Wealth Management, this study's contributions around the consideration of the economic benefits of interdependence such as the generation of network externalities, their maximization through structural characteristics like multi-sidedness, as well as coopetition, value cocreation with ecosystem partners, and ecosystem leadership and/or origination as strategic resources and capabilities, have important implications on how they evaluate value cocreation opportunities and the alignment mechanisms they subsequently use to exploit them. These considerations as well as this study's broader

insights on the technologies, consumer behaviours, and regulations driving strategies of interdependence also have important implications from a training and development perspective. This is relevant for both the aforementioned middle management and divisional heads as well as for Human Resource leaders who need to make sense of the capabilities required for value cocreation activities as they consider their strategies for hiring new talent and/or training and developing existing talent.

The taxonomy of banks' strategies of interdependence coupled with the modalities and submodalities of banks' strategies of interdependence also provide valuable insights for middle management and divisional heads at large European banks regarding the ways in which different banks practically undertake different strategies of interdependence. Just as with top managers, middle managers and divisional heads can use this taxonomy and these modalities and submodalities to benchmark their strategies of interdependence versus peers, analyse scenarios for evolving their bank's strategies of interdependence, establish roadmaps for evolving their strategy of interdependence, and diagnose any issues in their current strategies of interdependence. However, with middle managers and divisional heads, this would be done at a more granular level for example at the modality level or at the level of the individual components of the proposed framework for strategies of interdependence (e.g., coopetition, technological modularity, ecosystem leadership).

7.2.1.3 – Implications for Small and Mid-Sized Banks

This study recognizes that the forces of interdependence are more likely to act more greatly on large, international, and diversified banks. This is because these forces can impact banks more broadly across their diverse business operations and their different geographies. At the same time, these banks can draw on their size, scope, and institutional legitimacy to put in place strategies that both protect them from the disruptive nature of these forces of interdependence and help them exploit interdependence to drive sustainable competitive advantage. On the other hand, the forces of interdependence are likely to act less broadly on small and mid-sized banks that have narrower business operations and a more limited geographic footprint. However, these small and mid-sized banks lack the same size, scope, and institutional legitimacy as their larger counterparts, which may limit their ability to defend against the disruptions caused by the forces of interdependence or exploit them as effectively for sustained competitive advantage. While this is a generalization, as some small and mid-sized banks, may be leaders

in some specialized banking functions or in some local or regional geographies, they would nevertheless need to take a different approach to defending against the disruptions caused by the forces of interdependence or exploiting strategies of interdependence compared to the large, international, diversified banks.

While this study considers the top 20 banks in Europe, which includes global giants like HSBC and BNP Paribas, it also includes banks that are more local or regional in their geographic footprint like Lloyds Banking Group and Nordea and banks that are more specialized in their business operations such as Standard Chartered and UBS. The modalities and sub-modalities of banks' strategies of interdependence are applicable to leaders of small and mid-sized banks, as is this study's proposed framework for strategies of interdependence. The difference for small and mid-sized banks is in the way they mobilize this framework. By considering the strategies of interdependence of the more specialized and less international banks in this study and how these differ from the strategies of interdependence of the large, international, diversified banks (through the taxonomy of banks' strategies of interdependence and the meta-taxonomy of strategies of interdependence), leaders at small and mid-sized banks can derive valuable insights for their own strategies of interdependence.

Moreover, for leaders at small and mid-sized banks that have ambitions to challenge their larger counterparts, by understanding how leaders at the top 20 European banks have strategized for interdependence from 2008-19, they can tweak their competitive approach accordingly. For example, they can learn from the mistakes made by fintechs and bigtechs in their approach to the large banks, or by better understanding large banks' strategic tendencies in response to the forces of interdependence they can learn how best to combine their efforts with fintechs and bigtechs to better compete against the large banks.

7.2.1.4 – Implications for Non-European Banks

This study focuses on the European context because European regulators have taken the lead globally in enacting open banking regulation (e.g., the European Commission's PSD2 and the UK Competition and Market Authority's Open Banking Standard that both came into effect in 2018) that have facilitated the activities of bigtechs and fintechs and consequently promoted greater interdependence in the European

banking sector. Interdependence in the European banking sector has also been amplified by several public policy enablers in Europe that promote the advancement of digitalization such as GDPR which came into effect in 2018. However, open banking is likely to become a regulatory reality for non-European banks in the future. For example, in March 2020 Banco de México published *The Law to Regulate Financial Technology Institutions* (*Ley para Regular Instituciones de Tecnolgía Finaciera*)[365] requiring banks to open up their customer data to third parties in a similar way to PSD2 and the Open Banking Standard, and in May 2018 the Australian Government agreed to implement the Consumer Data Right (CDR) which enabled a 3-phased implementation of open banking that commenced in 2019[366].

Given the increasing promotion of open banking by regulators outside of Europe, this study's managerial insights will be also relevant for top management, middle management, and divisional heads at banks outside of Europe. Just as in the European context, these regulatory changes in non-European geographies are likely to increase the forces of interdependence in banking by stimulating the activities of bigtechs and fintechs, as well as their venture capital and innovation partners, and by forcing banks to interact more with external stakeholders. Banking leaders in non-European geographies will therefore need to strategize to navigate these forces of interdependence. In much the same way as presented in Sections 7.2.1.1, 7.2.1.2, and 7.2.1.3, these banking leaders outside Europe can benefit from this study's insights, the taxonomy of banks' strategies of interdependence, the meta-taxonomy of strategies of interdependence, the revised framework for strategies of interdependence that considers value cocreation and temporary competitive advantage, and the modalities and submodalities of bank' strategies of interdependence. In particular, these banking leaders outside Europe can learn from the experience of their peers in Europe, drawing for example on this study's longitudinal dimension to examine the strategies adopted by the top 20 banks in Europe before 2015 when the European Parliament adopted PSD2, after 2015, and after 2018 when PSD2 came into effect.

7.2.2 – Managerial Contributions for Fintechs

Capitalizing on rapid technological advances, the rise of platform business models, changes in consumer behaviour, supporting regulatory reforms, and banks' struggling profitability, that emerged in the

[365] https://dof.gob.mx/nota_detalle.php?codigo=5610487&fecha=28/01/2021
[366] https://www.ausbanking.org.au/priorities/open-banking/

aftermath of the 2007-08 Global Financial Crisis, innovative fintechs emerged to challenge banks across different financial operations. The fintech boom that appeared in the last decade, and especially in the second half of the 2010s, was extensively covered by the financial press, grey literature, industry periodicals, and by consultancy and advisory firms. This coverage was often skewed towards overrepresenting the disruptive capacity of fintechs. This study takes a more measured approach. While this study acknowledges the potential of fintechs and their revitalizing effect on the banking industry, it does not overstate it; this study recognizes the unique ability of banks to originate new money, banks' institutional legitimacy, and the relationships and specialized skills that banks have developed over many decades, all of which are lacking in fintechs.

The forces of interdependence that this study considers are also a reality for fintechs, however they have a different implication for fintechs. While banks need to strategize to react to these forces of interdependence, fintechs benefit from these forces and are in fact part of what drives them. However, just as banking leaders are coming to terms with the role of fintechs in their industry and are strategizing for value cocreation with them, fintech leaders are increasingly realizing that they cannot replace banks and instead will need to collaborate with them to cocreate value. Thus, despite this study's focus on the point of view banks, it also has important managerial implications for fintech leaders as they seek to collaborate and coopetate with banks.

Thus, the combination of this study's more measure approach to the forces of interdependence in banking and its consideration of these phenomena from banks' point of view presents fintech leaders with important insights on banks' strategies of interdependence. These insights can inform the strategies that fintech leaders adopt as they begin to consider how they can cocreate value with banks. For example, this study's longitudinal dimension allows fintech leaders to understand how banks' relationship with fintechs evolved over time. The taxonomy of banks' strategies of interdependence and the interplay between the different modalities and submodalities of strategies of interdependence, can help fintech leaders understand the mechanics of their relationship with banks. For instance, are banks with corporate venture capital arms more likely to invest in and partner with fintechs? Are there some characteristics of banks that make them more likely to seek controlling stakes in the fintechs with whom they partner? Are there some characteristics of banks that make them more averse to collaborating with fintechs? Are banks with open innovation initiatives that are open to external participants more likely to partner with fintechs? Are

banks that are more resistant to open IT infrastructures less likely to seek collaborative/coopetative partnerships with fintechs?

7.2.3 – Managerial Contributions for Bigtechs

The last decade has also seen the increasing penetration of bigtechs like Apple, Google, and Alibaba into financial services, especially through the proliferation of payments applications like Apple Pay, Google Pay and Alipay. Bigtech's disruption of the banking sector and the threat bigtechs poses to banks was often overstated by the financial press, grey literature, industry periodicals, and by consultancy and advisory firms, in a similar way as they overstated the impact of fintechs. These sources also drew on the dominance of Chinese bigtechs like Alibaba and Tencent on the Chinese financial services sector, suggesting that this was a precursor to Western bigtechs' anticipated dominance of financial services in the West, and neglecting the nuances of the Chinese context that are not necessarily replicable in the West (nuances that came to the forefront in the People's Bank of China recent crackdown on Chinese technology giants' monopolistic behaviour in financial services[367], though this occurred after the timeline that this study considers). This study recognizes the significant impact of bigtechs on the banking sector and on the differences between bigtechs and fintechs, not least the size, institutional legitimacy, leading technology expertise, and wide customer base that bigtechs possess, which fintechs do not. However, by accounting for the unique capabilities that banks have and the fact that they are regulated entities, this study takes a more measured approach towards the forces of interdependence in the banking sector. Thus, just as banks and fintechs need to evolve their strategies towards value cocreation as opposed to seeking to displace one-another, so too should bigtechs and banks.

With this in mind, this study provides important managerial contributions for bigtech leaders as they seek to adopt strategies for value cocreation with banks. Through this study's taxonomy of banks' strategies of interdependence, the interplay between the modalities and submodalities of banks' strategies of interdependence, and the meta taxonomy of strategies of interdependence, bigtech leaders can obtain a better understanding of how banks strategize for interdependence and the approach they have taken to cocreate value with bigtechs over a 12-year period. In doing so, bigtech leaders can evolve and optimize their own financial services strategies to better cocreate value with banks. For example, this study's

[367] https://www.bloomberg.com/news/articles/2021-10-07/china-s-central-bank-governor-vows-to-continue-fintech-crackdown

managerial insights can help bigtech leaders understand how the propensity of certain banks to collaborate with bigtechs is impacted by certain characteristics such as banks' market share or dominance of a banking operation that the bigtech is challenging, banks' institutional context (international versus regional, specialized versus diversified), banks' open innovation capabilities, and the extent of banks' adoption of open IT infrastructures.

7.2.4 – Managerial Contributions for Venture Capital Firms and Innovation Partners

This study also presents important managerial contributions for leaders at the venture capital firms and innovation partners that have funded and supported the growth of fintech start-ups. According to the Bank for International Settlements, fintechs have raised 1 trillion USD in equity funding in more than 35,000 deals since 2010; around a quarter of this funding came from venture capital firms[368]. Venture capital firms therefore play a critical role in the proliferation of fintechs, and beyond the financial support they provide, venture capital provide fintechs important advisory roles to the fintech founders often contributing to their boards. Thus, the strategies that fintech leaders adopt are often influenced by their venture capital backers. Consequently, this study's managerial contributions to fintech leaders (Section 7.2.2) are also relevant to venture capital leaders who play important roles in guiding fintechs' strategies. Through this study's measured approach to interdependence in the banking sector, the taxonomy of banks' strategies of interdependence, and the meta taxonomy of strategies of interdependence, venture capital leaders – who have a vested interest in the success of the fintechs the back, not least in terms of their eventual exit strategies – can better advise the fintechs they support towards successful strategies of value cocreation with banks, and can better screen the fintechs they are considering funding in the future.

In a similar vein, this study has managerial implications for leaders of innovation partners that have also been key supporters of fintechs. These innovation partners include innovation labs, incubators, and accelerators that are often launched by governmental authorities, industry bodies, consulting firms, technology firms, and financial services firms. This study's insights on the way banks cocreate value with external stakeholders like fintechs can inform the strategies leaders at innovation partners adopt to support fintechs. For example, by recognizing that fintechs are better served by collaborating or coopetating with

[368] https://www.bis.org/publ/qtrpdf/r_qt2109c.htm

banks, leaders of these innovation partners can steer fintechs towards cocreating value with banks rather than seeking to compete against them head-to-head.

7.2.5 – Managerial Contributions for Regulators

Regulators have played an instrumental role in stimulating the increasing forces of interdependence in the banking sector. In the aftermath of the 2007-08 Global Financial Crisis, regulators enacted regulations like Basel III and the Dodd–Frank Wall Street Reform and Consumer Protection Act that increased the net regulatory burden on banks. At the same regulators – particularly those in Europe – enacted new regulations like PSD2 and the Open Banking Standard that facilitated the activities of fintechs and bigtechs, consequently increasing the forces of interdependence in banking. This study's longitudinal examination of the strategies that the top 20 banks in Europe adopted in response to the growing forces of interdependence in their industry gives leaders at European regulators a detailed systematic account of how these banks responded to interdependence and specifically the different regulatory triggers that occurred at different points in the 12 years after the 2007-08 Global Financial Crisis. This can allow leaders at regulators to obtain a better understanding of the effects of the regulations they enact on banks, including the identification of any unintended or unanticipated consequences of their regulations.

The deeper understanding on banks' strategies of interdependence that this study provides to leaders at regulators can also raise a number of important questions for them. For example, are there any risks associated with an overly platformized banking sector? In a system where value cocreation leads to a too wide distribution of banking-related activities, does the risk of dilution of the ownership of regulatory compliance rise to imprudent levels? Thus, by better understanding how their regulations impact banks' strategies of interdependence across different modalities, leaders at banking regulators can ensure that they either tweak existing regulations or evolve new regulations in ways that ensure that the resultant forces of interdependence in banking promote stability and fair competition in the sector as well as ensuring that risks are maintained at prudent levels and consumers adequately protected. Moreover, this study can provide important managerial contributions to leaders at regulators that have not yet embarked on the open banking journey. Such leaders can draw on this study's account of banks' strategies of interdependence in the European context, particularly the detailed taxonomy, and the meta-taxonomy that accounts for banks' institutional context, to draw parallels and comparisons with their own regulatory

contexts. By understanding how banks have strategized for interdependence in the European regulatory context, they can draw lessons to apply to their regulatory efforts as they embark upon open banking in their regions.

7.3 – Limitations and Avenues for Future Research

Naturally, this study is not without limitations. Many studies on interdependence considered the high technology industry given its prominence in this regard, however this study considered the banking context. Thus, while this study offers a fresh perspective on interdependence by focusing on an industry that has received a comparatively lower level of focus, it is nevertheless limited to large banks in Europe. Thus, it does not consider small and medium-sized banks, including those that have deep specialisms in certain aspects of banking. Nor does it consider other stakeholders within the financial services sector such as insurance companies, brokers, currency exchanges, and buy-side firms (e.g., pension funds, asset management firms). While these firms would also benefit from this study's insights, especially the meta-taxonomy of strategies of interdependence and the revised RBV, there will be aspects of interdependence that will be specific to them that this study would not have captured, indeed there are likely additional contributors to the forces of interdependence specific to these firms (e.g., insurtech start-ups in the insurance sector). Hence, future research should examine the forces of interdependence among small and medium-sized banks, as well as other non-bank financial services firms, and the strategies of interdependence that leaders at these firms adopt to deal with them.

This study's focus on the European context is mainly driven by European regulators' early promotion and enactment of regulatory reforms, like PSD2 and the Open Banking Standard, which have been key stimulants to the forces of interdependence. However, while regulatory changes are important catalysts, they are not the only contributors to increasing the forces of interdependence. Rapid technological advancements, changing consumer behaviours, and the emergence of new platform-based business models are all important contributors to the forces of interdependence, these are in no way limited to the European context and in fact some may be more advanced in other regional contexts (e.g., the contribution of rapid technological advancement to the forces of interdependence is arguably more pronounced in the US and in China where US and Chinese bigtechs have driven much of the technology innovation in the past decade). Thus, it will be important for future research to consider the forces of interdependence in non-

European contexts and how leaders at large, medium-sized, and small banks, as well as at non-bank financial services firms in non-European geographies strategize for interdependence.

The aftermath of the 2007-08 Global Financial Crisis created a perfect storm (low profitability, declining consumer trust, changing consumer behaviours, more onerous banking regulations, rapidly evolving technologies and new business models, the rise of fintechs, the penetration of bigtechs into banking, and the regulatory changes that facilitated fintechs and bigtechs' activities) for the forces of interdependence in banking, especially for larger banks and particularly in the European context. However, these forces are not necessarily particular to the banking sector. Changing consumer behaviours, new innovative technologies, new platform-based business models, disruptive start-ups, and regulatory reforms have impacted the majority of industries over the past 10-15 years, including the transport and logistics, retail, hospitality, and entertainment industries. Thus, future research should also focus on the forces of interdependence and how leaders strategize for interdependence across different industries.

This study has also considered the forces of interdependence and strategies of interdependence from the point of view the incumbent (large banks) as opposed to the new entrants, whether start-ups (fintechs) or large competitors from other industries (bigtechs). In the case of banking and the financial services sector, fintechs and bigtechs will strategize for interdependence differently from the industry's incumbents. It will be useful for future studies to capture their points-of-view. In fact, future studies should also capture the point of view of new entrants (distinguishing between start-ups and large firms from other industries) in considering the forces of interdependence and the strategies of interdependence adopted by leaders, beyond the context of European banking, and should also consider the context of banking more generally, as well as other industries.

These proposed future studies of the forces of interdependence and firms' strategies of interdependence would likely benefit from this study's insights, this study's revised RBV, its modalities and submodalities of strategies of interdependence, and the meta-taxonomy of strategies of interdependence as foundations on which they can build to develop their research. However, these studies will undoubtedly reveal nuances about the forces of interdependence and firm's strategies of interdependence that are specific to their diverse contexts. These nuances may include the revelation of new forces of interdependence or new dimensions to the forces that this study has identified. Similarly, these nuances may reveal new modalities

or submodalities of strategies of interdependence or reveal new dimensions to the modalities and submodalities highlighted in this study. Consequently, these new nuances may necessitate further tweaking to this study's proposed reformulation of the RBV, including the possibility of enriching it with further considerations, thus making the proposed reformulated RBV more of a general theory that can be applied across a wider range of industries and contexts.

This study considered the question of the forces of interdependence and firms' strategies of interdependence from the point of view of the strategic management discipline and from the Resource Based View theoretical perspective. This study's findings and insights are therefore informed by the themes that are focused on in strategic management and the RBV, such as firms' search for sustained competitive advantage. However, this study's research question can also be addressed through other theoretical lenses from the strategic management discipline such as the positioning school, the configuration school, the learning school, and business model research, as well as other disciplines such as organizational theory, human resource management, entrepreneurship, and economics. By considering the research question and strategies of interdependence through these diverse lenses, future research can uncover additional considerations that are specific to these lenses, thus further enriching academic research on strategies of interdependence and increasing the related managerial contributions even more. The RBV has traditionally been an adaptable perspective that has integrated with other perspectives and disciplines (as discussed in Section 3). As such this study's reformulated RBV can act as a launchpad for these future inquiries, indeed, the bridges to other lenses and disciplines are already present in this study's reformulated RBV (e.g., the consideration of relational rents and network externalities as a bridge to economics research, the consideration of platform leadership and platform origination as bridges to business model research).

In answering this study's research question and tackling the overarching theme of strategies of interdependence, this study adopts an internal realist ontology and soft-positivist epistemology. This study's internal realist ontology considers objective reality as being causally independent from the human mind which cannot be observed directly as it requires human understanding to make sense of it. Thus, while this study considers banks' strategies of interdependence as an objective reality, these can best be captured through observing modalities of banks' strategies of interdependence. Consequently, this ontological and epistemological stance guides the methodology and research design that this study adopts

to answer the research question, including the identification of modalities and submodalities of banks' strategies of interdependence, the use of a multiple-case study methodology, and the resultant findings and taxonomy of banks' strategies of interdependence. This study's ontological and epistemological stance also informs the theoretical framework that was used and the proposed reformulation – including the mechanics of the proposed reformulation – of that theoretical framework. This alignment between ontology, epistemology, theoretical framework and proposed reformulation, methodology, and findings leads to cohesive outcomes, contributions, and implications. However, this study's research question and the broader themes it addresses such as the forces of interdependence and firms' strategies of interdependence, can and should be considered from different ontological and epistemological stances. Adopting different ontological and epistemological lenses (e.g., some that are more positivist and others that are more constructivist) will lead to the adoption of different methodologies and research designs (e.g., ones that are more statistical, and others that rely more on first had interviews with firm management). Only adopting a single ontology and epistemology creates limitations to the depth and breadth of insights that can be derived. Thus, future research on the forces of interdependence, and on firms' strategies of interdependence, would benefit from adopting different ontological and epistemological lenses. This would contribute to enriching knowledge on the forces of interdependence and on firms' strategies of interdependence, leading to contributions that can be applied in wider contexts.

Finally, this study is a descriptive one; it systematically and meticulously presents a description of the strategies of interdependence the top 20 banks in Europe adopted from 2008 to 2019. However, it does not make any claims relating to causality, nor does it seek to explain the advantage of a specific strategy of interdependence over another. As such, future research efforts should include explanatory studies that seek to tackle causality in the context of strategies of interdependence. This should include questions relating to the conditions that cause a strategy of interdependence to be preferable to another, whether certain conditions have greater causal implications relative to others, the interplay between these conditions and firms' institutional contexts, the relationship between these conditions and the components of the reformulated RBV, the relative importance of specific considerations and components of the reformulated RBV under different causal conditions, and how the components of the reformulated RBV can be manipulated and configured to help firms respond to different causal triggers through optimized strategies of interdependence.

8 – Conclusion

This study began by recognizing the technological, regulatory, competitive, financial, business model, and consumer behaviour-related forces that have been assailing banks since the 2007-08 Global Financial Crisis. In this platform economy age, these forces lead to much greater interdependence in the banking sector. This was especially true in Europe since European regulators took the lead in enacting regulations that facilitated these forces. In this context, banks increasingly had to rely on resources and capabilities which they did not own or control to (co)create value. Thus, this study posed the research question which sought to describe the strategies that firms adopted in response to interdependence in the platform economy age – more specifically the strategies adopted by the top 20 banks in Europe from 1 January 2008 to 31 December 2019.

The research question was addressed through the lens of the Resource Based View (RBV) of strategy. However, to adequately cater for these new forces of interdependence, the RBV required adaptation. Dyer & Singh (1998) and Lavie (2006) had proposed reformulations to the RBV to make it better suited to value cocreation with external resources and capabilities, however both of these seminal studies were conducted before the advent of the platform economy and therefore were more focused on dyadic and multi-firm interdependence. Hence, to adequately answer this study's research question, the RBV required further adaptation to consider platform-related interdependence. Building on Lavie (2006) and Dyer & Singh (1998), I therefore proposed a further reformulation to the RBV to make it better adapted to platform-related interdependence, by incorporating a) external resources and capabilities including in the platform context, and b) incorporating temporary competitive advantage. To achieve this, I drew on two managerial perspectives (ecosystems, platforms), an economic perspective (networks), and the concepts of coopetition and hypercompetition to propose 8 considerations that need to be included in the reformulated RBV to cater for the incorporation of external resources and capabilities: 1) the consideration of network externalities as contributors to relational rents, 2) the consideration of network multisidedness as a strategic resource and its management as a strategic capability, 3) network size, structure, and conduct as strategic resources and their management as a strategic capability, 4) the ability to cocreate value across ecosystems of different stakeholders including complementors as a strategic capability, 5) coopetition as a strategic capability, 6) ecosystem leadership and the ability to originate *de* novo ecosystems as a strategic

capability 7) knowing when to platformize as a strategic capability, and 8) technological modularity, standards, and protocols as strategic resources and their management as a strategic capability.

Having proposed the reformulation of the RBV, this study set out the research design and methodology used to answer the research question empirically. Adopting an internal realist ontological stance, a soft-positivist epistemology, and an abductive conceptual framework, this study proposed 4 modalities and 17 submodalities of banks' strategies of interdependence through which the objective reality of banks' strategies of interdependence were observed. The study used a longitudinal, multiple-case study methodology to capture the data for the top 20 banks in Europe for the time period considered across the different modalities and submodalities. In doing so, this study triangulated across different data types and sources (e.g., databases, annual financial statements, press releases) resulting in over 1,000 data points that were organized into 20 comprehensive single case matrices and which were then used to manipulate and analyse the data (e.g., into content analytic meta-tables). This ultimately led to the formulation of a taxonomy of banks' strategies of interdependence. The data collected for the 20 banks also allowed this study to create a contextual analysis to better understand the banks' institutional context, their financial performance, and a geographic and business segment analysis over the period considered. The first order findings were reinterpreted and abstracted, and the contextual findings incorporated, to generate a meta-taxonomy of strategies of interdependence that was more holistic and could be applied more broadly to non-banking contexts.

This study's findings demonstrate the different ways in which banks have responded strategically to the forces of interdependence in the age of the platform economy. The findings, and specifically the taxonomy of banks' strategies of interdependence, support and validate this study's proposed reformulation of the RBV. As such, this study makes an important, empirically supported theoretical contribution by proposing a reformulated RBV that is better suited at dealing with interdependence in the age of the platform economy. The findings also validate the individual considerations that were proposed as part of the underlying mechanics of the proposed reformulation of the RBV (as elaborated on in Section 6.5.1). The reformulation of the RBV also helps to address a number of its lingering critiques including the need to better demarcate and define resources and capabilities, the need to advance a more subjective and firm-specific notion of the value of resources and capabilities, and the need to advance a more viable theory of sustained competitive advantage (Kraaijenbrink, et al., 2010). The reformulation also contributes to the

infusion of more Austrian economic thought into an RBV that has become overly neoclassical despite its early Austrian economic influences (Foss & Ishikawa, 2007; Kraaijenbrink, et al., 2010; Lockett & Thompson, 2001). This study also makes several other secondary theoretical contributions. It proposes a more unified perspective on interdependence, bringing together 3 perspectives on interdependence that focus on different aspects of the phenomenon – the networks perspective's focus on the economic benefits of interdependence, the ecosystems perspective's focus on alignment mechanisms, and the platforms perspective's focus on the technological enablers of interdependence – as called for by McIntyre & Srinivasan's (2017). This study also builds on Oliver (1997) who suggests that strategic alliances can be strategic resources that can provide firms with institutional capital but extends this beyond dyadic and multi-firm alliances to platform-based relationships. Furthermore, this study deals with under-researched areas such as network coopetition (Czakon, et al., 2020) and *de novo* platform origination (Dattée, et al., 2018). As well as these primary and secondary theoretical contributions, this study also makes a methodological contribution by presenting a rigorous and systematic approach to taxonomy creation for longitudinal, multiple-case study research.

This study's taxonomy of banks' strategies of interdependence demonstrates the various strategies that the top 20 European banks adopted in response to the rising forces of interdependence in the 12 years following the 2007-08 Global Financial Crisis. This ranged from banks that sought to completely reinvent themselves as a "bank-as-a-platform" such as BBVA, to those that sought sophisticated but less transformational platform leadership strategies such as HSBC, to those that adopted much more targeted strategies of interdependence like Rabobank; from banks that sought wide-ranging strategies of interdependence like BNP Paribas to those that were much more limited in their approach like Deutsche Bank; from specialist leaders like UBS that although taking a limited approach to strategies of interdependence consistently sought to be leaders, to those banks like Groupe BPCE that sought to renew their capabilities – often through acquisition – through strategies of interdependence, to those banks like ING that saw in strategies of interdependence an opportunity for strategic renewal. These insights, as well as the reformulated RBV as a strategic framework through which leaders can strategize for interdependence, provide a compelling managerial contribution to top managers at large European banks who need to contend with the forces of interdependence and the impact of the platform economy on their industry.

These managerial contributions are not limited to top management but also apply to middle management who need to implement top management's strategic decisions; the modalities and submodalities of banks' strategies of interdependence and the underlying considerations of the reformulated RBV will be particularly relevant for them. This study also has important managerial implications for small and mid-sized banks, as well as non-European banks, especially as increasingly non-European regulators – such as those in Mexico and Australia – have either enacted open banking standards in their jurisdictions or are seriously exploring enacting them. Moreover, this study also has important managerial implications for leaders at regulators, for example, leaders at regulators seeking to embark on the open banking journey, and who wish to gather insights on how banks strategized for interdependence in the European context. The disruptive impact of fintechs and bigtechs on the banking industry has often been overstated by the grey literature, thus, this study's measured approach which takes into account the unique strengths of banks, provides leaders at bigtechs, fintechs, and their venture capital backers and innovation partners, useful insights, especially in presenting a balanced account of how banks have been reacting to their influences and how they can seek to better engage with banks in strategies of value cocreation in the future. This study's second order findings, including the meta-taxonomy of strategies of interdependence provides more holistic insights for leaders at firms (especially incumbents) more broadly as they seek to strategize for interdependence in their contexts.

Finally, this study has focused on the European banking sector, specifically large banks, has considered their strategies from the point of view of the Resource Based View, has adopted an internal realist ontology and soft-positivist epistemology which has subsequently influenced the methodological choices that were taken, and is a descriptive study that does not claim any causal links. Hence, future research should consider the research question and/or related themes in the context of wider financial services stakeholders (e.g., insurance firms, smaller banks, non-European banks), across different industries, and from the point of view of new entrants (e.g., fintechs, bigtechs, start-ups). Future research should also endeavour to address the research question and associated themes from the point of view of different academic disciplines and through different theoretical lenses, adopt different ontological, epistemological, and methodological approaches, and seek to tackle the question of causality (e.g., what causes a strategy of interdependence to be preferable over others under certain conditions). These further research efforts will undoubtedly draw out additional nuances related to the forces of interdependence and firms' strategies to

navigate them, leading to the potential to reveal new dimensions or considerations that need to be incorporated into this study's proposed reformulation of the RBV to enrich it further.

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Appendix 1 – Table of Figures and Table of Tables

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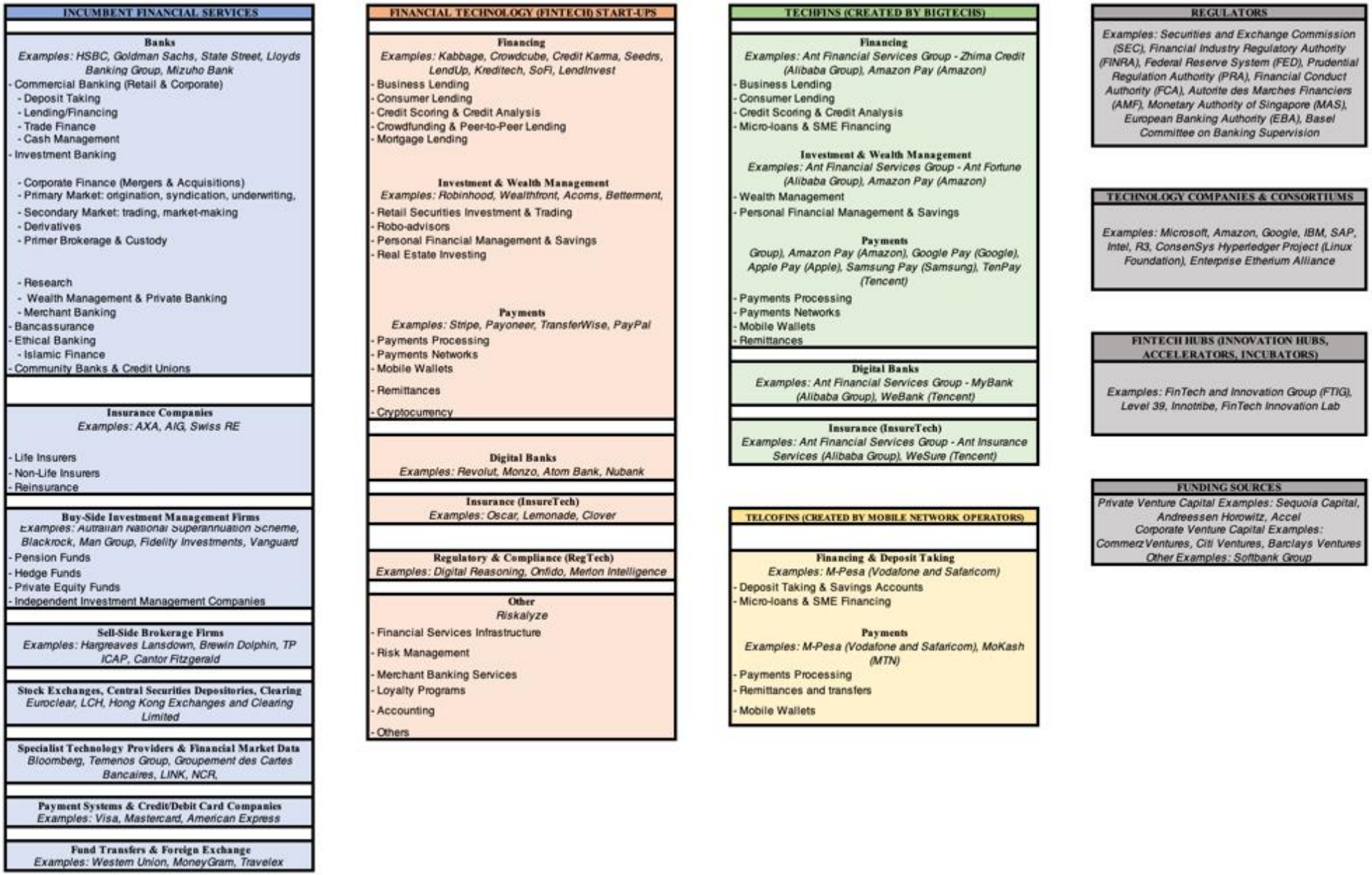
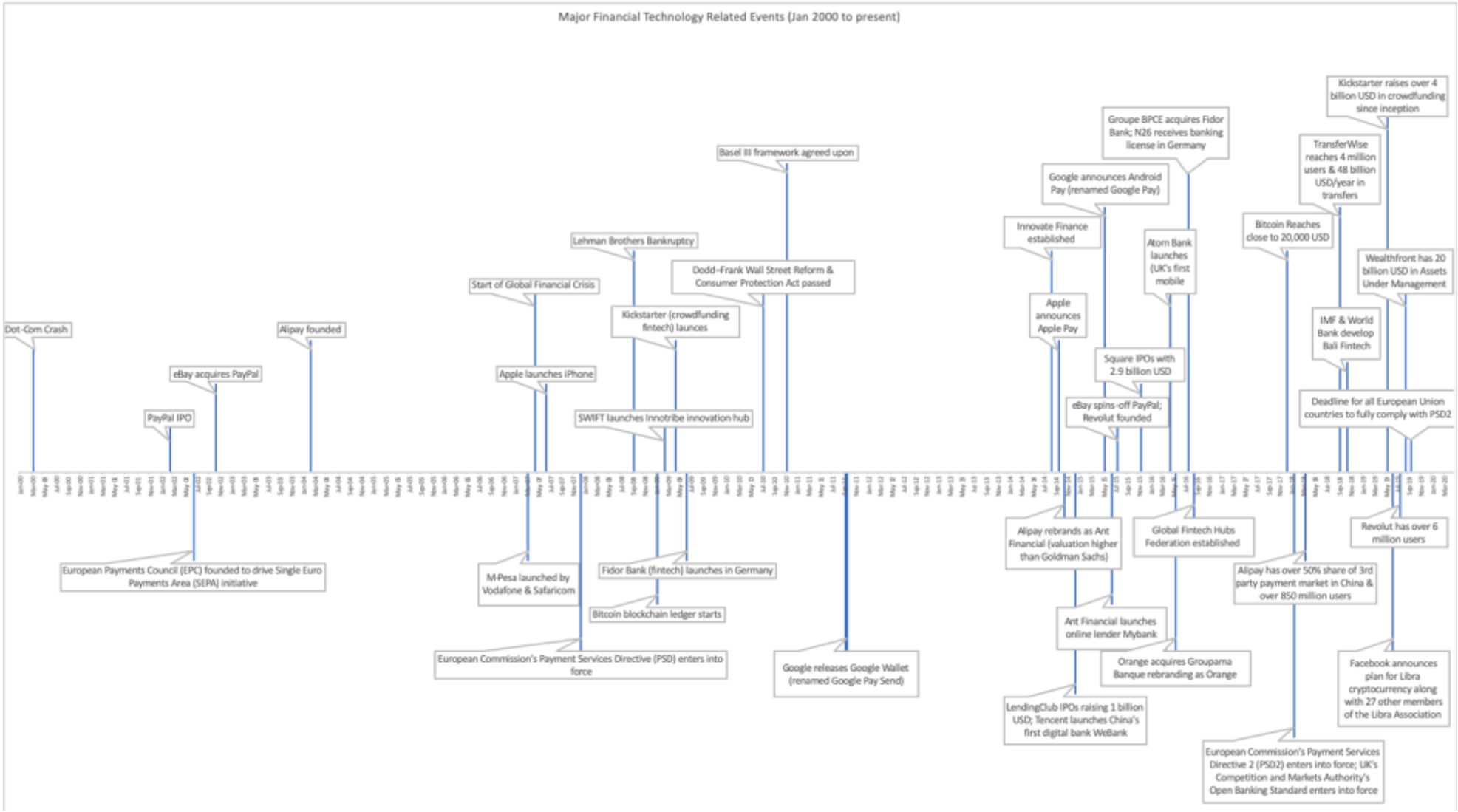
Appendix 2 – Banking & Financial Services Landscape



Appendix 3 – Timeline of Major Financial Technology Events



Appendix 4 – Top 20 European Banks by Assets

Rank	Bank	Total Assets (EUR billions as at 31 Dec 2018)	Headquarters
1	HSBC	2,234	UK
2	BNP Paribas	2,041	France
3	Credit Agricole	1,855	France
4	Banco Santander	1,459	Spain
5	Deutsche Bank	1,348	Germany
6	Societe Generale *	1,298	France
7	Groupe BPCE **	1,278	France
8	Barclays	1,262	UK
9	Lloyds Banking Group	888	UK
10	ING	887	Netherlands
11	Credit Mutuel Group	853	France
12	UBS	837	Switzerland
13	UniCredit	831	Italy
14	Intesa Sanpaolo	788	Italy
15	Royal Bank of Scotland	773	UK
16	Credit Suisse	683	Switzerland
17	Banco Bilbao Vizcaya Argentaria (BBVA)	677	Spain
18	Standard Chartered	602	UK
19	Rabobank	590	Netherlands
20	Nordea Bank ***	557	Finland

Source: S&P Global Market Intelligence

Data reported in local currencies converted to Euros at the end of period exchange rate

* Assets adjusted for the pending sale of Macedonia-based Ohridska Bank AD, Moldova-based BC Mobiasbanca - Groupe Societe Generale SA, Poland-based Euro Bank SA, Serbia-based Societe Generale Banka Srbija ad Beograd and completed sale of Albania-based Banka Societe Generale Albania Sha, Bulgaria-based Societe Generale Expressbank AD and Madrid-based Self Trade Bank SAU

** Assets adjusted for the pending acquisition of France-based Oney Bank SA

*** Assets adjusted for the completed acquisition of Norway-based Gjensidige Bank ASA

Appendix 5 – List of Financial Indicators Used for Data Collection Activity 1

- Interest Income: total interest income from loans, federal funds sold, resale agreements and other short-term interbank investments. Includes federal funds sold and repurchase agreements. Includes deposits at interest with other banks. Includes interest from direct financing lease receivables
- Net Interest Income: this is the total income a bank makes from the interest it derives through the loans it originates minus the related expenses incurred in originating those loans. This is an important indicator as banks make the majority of their revenue through their core activity of loan origination
    - Calculated as: Interest Income + Investment Income - Interest Expenses
- Net Interest Income Growth: measures the percent growth of net interest income from one year to the next
    - Calculated as: [(Net Interest Income for the current period / Net Interest Income for the last period) -1] * 100
- Non-Interest Income: this is the total income a bank makes from non-interest earning activities. This includes account fees, loan fees, brokerage fees, income from trading, advisory fees, and wealth management fees. Banks are encouraged to diversify their income sources as non-interest income is less sensitive to changes in interest rates. The sources of non-interest income are the ancillary activities that are most being disrupted by fintech and bigtech, as such this indicator is particularly important to consider
    - Calculated as: Trading Account Profits + Commissions & Fees + Other Operating Income
- Non-Interest Income Growth: measures the percent growth of non-interest income from one year to the next
    - Calculated as: (Total Non-Interest Income in Current Period - Total Non-Interest Income same period a year ago) * 100 / Total Non-Interest Income same period a year ago
- Total Income: this is the sum of net interest income and non-interest income. Excludes revenue from discontinued operations
- Total Income Growth: this measures the percent growth of total income from one year to the next
- Operating Income (Losses): This is the total operating revenue minus total operating expenses. Total operating expenses includes interest expense, provision for loan losses, commissions and fees paid, and other operating expense
- Net Income/Net Profit (Losses): Amount of profit the bank made after paying all of its expenses
- Net Income/Net Profit Growth: A percentage increase or decrease of net income by comparing current period with same period prior year
    - Calculated as: (Net Income from Current Period - Net Income from Same Period Prior Year) * 100 / Net Income from Same Period Prior Year
- Net Interest Margin: a bank's net profit that is derived from interest-bearing assets such as the loans it originates. This is the primary revenue source for most banks and is sensitive to interest rate changes; the higher the margin, the more profitable the bank

- Loan to Asset Ratio: banks with higher loan to asset ratios are more reliant on interest-bearing assets such as the loans they originate for their income; banks with lower loan to asset ratios have more diversified revenue streams since they derive a greater proportion of their revenues from non-interest-bearing instruments such as through trading activities. Banks with lower loan to asset ratios are usually less sensitive to changes in interest rates
    - Calculated as: (Total Loans/Total Assets) * 100
- Return on Asset Ratio (ROA): this measures the profitability of a bank's assets (consisting mostly of the loans it originates) and is an indicator of management's performance. It measures the effectiveness of a bank's use of assets to generate income
    - Calculated as net income / average total assets * 100
- Efficiency Ratio (Cost to Income Ratio): this measures how well a bank manages its total non-interest expenses and is a key driver of overall financial performance. Total non-interest expenses include items like salaries and related staff expenses, premises and equipment and all other non-interest expenses
    - Calculated as: Operating Expenses / (Net Interest Income + Commissions & Fees Earned + Other Operating Income (Losses) + Trading Account Profits (Losses) + Gain/Loss on Investments/Loans + Other Income (Loss) - Commissions & Fees Paid + Taxable Equivalent Adjustment or Net Revenue - Net of Commissions Paid) * 100
- Pre-Tax Profit Margin: this measures the profitability and operating efficiency of a bank. The ratio shows the percentage of revenues that are converted into pre-tax profits
    - Calculated as: pre-tax profit (loss) / total revenue * 100
- Return on Total Equity (ROE): the higher the return on total equity the more flexibility a bank has to use internally generated funds to invest in company growth and other initiatives versus using external capital. It is a measure of bank's profitability and reveals how much profit a bank generates with the money shareholders have invested (expressed in percentage terms)
    - Calculated as: (Net Income / Average Total Common Equity) * 100
    - Average Total Common Equity is the average of the beginning balance and ending balance of total common equity
    - Includes common equity and preferred equity
- Tier 1 Capital Ratio: this is the ratio of a bank's core tier 1 capital to its total risk-weighted assets. Tier 1 capital includes equity capital, audited retained earnings and disclosed reserves. Risk-weighted assets are the assets held by bank that are weighted for credit risk (e.g., government securities held by a bank receive a much lower risk weighting than mortgage loans that that bank issues). The Tier 1 Capital Ratio is an important measure of a bank's financial strength that has been adopted as part of the Basel III Accord on banking regulation. A higher ratio indicates that a bank is well capitalized (it has enough equity and is not overindebted) and can absorb losses to remain liquid. Basel III has set the minimum tier 1 capital ratio at 6%.

Appendix 6 – List of Boolean and Keyword Searches Used in Data Collection Activity 3

For the "acquisitions and investments" modality and specifically the "establishment of corporate venture capital subsidiary and fintech funds", "establishment of fintech subsidiaries", and "establishment of internal innovation labs, incubators, and/or accelerators" submodalities, Boolean searches and keyword searches of documentary evidence were conducted, especially using Factiva and annual financial statements. For all Factiva searches, the date range was set to "1 Jan 2008" to "31 Dec 2019" and the following format for Boolean searches was used (("Name of Bank") and ("keyword")). For these 3 submodalities the following searches were conducted in Factiva:

- For "establishment of corporate venture capital subsidiary and fintech funds":
  - (("Name of Bank") and ("VENTURE CAPITAL"))
  - (("Name of Bank") and ("VC"))
  - (("Name of Bank") and ("FINTECH FUND"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY FUND"))
  - (("Name of Bank") and ("FINTECH") and ("FUND"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY") and ("FUND"))
- For "establishment of fintech subsidiaries":
  - (("Name of Bank") and ("FINTECH"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY"))
  - (("Name of Bank") and ("FINTECH") and ("SUBSIDIARY"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY") and ("SUBSIDIARY"))
  - (("Name of Bank") and ("FINTECH SUBSIDIARY"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY SUBSIDIARY"))
  - (("Name of Bank") and ("FINTECH ARM"))
  - (("Name of Bank") and ("FINANCIAL TECHNOLOGY ARM"))
- For "establishment of internal innovation labs, incubators, and/or accelerators":
  - (("Name of Bank") and ("INCUBATOR"))
  - (("Name of Bank") and ("ACCELERATOR"))
  - (("Name of Bank") and ("INNOVATION LAB"))

- ((“Name of Bank”) and (“INNOVATION CENTRE”))
- ((“Name of Bank”) and (“INNOVATION CENTER”))
- ((“Name of Bank”) and (“INNOVATION HUB”))
- ((“Name of Bank”) and (“INNOVATION OUTPOST”))

The keywords used to search the annual financial statements were: “VENTURE CAPITAL”, “VC”, “FINTECH FUND”, “FINANCIAL TECHNOLOGY FUND”, “FINTECH”, “FINANCIAL TECHNOLOGY”, “INCUBAT”, “ACCELERAT”, “INNOVATION”, “LAB”, “HUB”, “OUTPOST”. Beyond just conducting keyword searches, the introduction, strategy section, and innovation section of the annual financial statements were read to improve the contextualization and richness of understanding. Moreover, the banks’ websites were consulted in detail as these often have “innovation” or “strategy” sections; the corporate venture capital arms, fintech arms, incubators, accelerators, innovation labs, fintech funds often have their own websites as well which were consulted in detail.

For the “partnerships” modality and specifically the “partnerships with bigtech”, “partnerships with other financial institutions”, “consortium initiatives, especially blockchain consortia”, and “partnership cessations”, Boolean searches and keyword searches of documentary evidence were conducted in much the same way as with the “acquisitions and investments” modality. The following searches were conducted in Factiva:

- For "partnerships with bigtech”, “partnerships with other financial institutions”, and “partnership cessations”:
  - ((“Name of Bank”) and (“BIGTECH”))
  - ((“Name of Bank”) and (“APPLE”))
  - ((“Name of Bank”) and (“AMAZON”))
  - ((“Name of Bank”) and (“ALIBABA”))
  - ((“Name of Bank”) and (“TENCENT”))
  - ((“Name of Bank”) and (“GOOGLE”))
  - ((“Name of Bank”) and (“SAMSUNG”))
  - ((“Name of Bank”) and (“PAYPAL”))
  - ((“Name of Bank”) and (“PARTNER”) and (“TECH”))
  - ((“Name of Bank”) and (“TELCO”))
  - ((“Name of Bank”) and (“TELECOMMUNICATION”))

- For “Consortium initiatives, especially blockchain consortia”
    - (((“Name of Bank”) and (“BLOCKCHAIN”))
    - (((“Name of Bank”) and (“DISTRIBUTED LEDGER”))
    - (((“Name of Bank”) and (“CONSORTIUM”))

The annual financial statements were also consulted in the same way as described for the “acquisitions and investments” modality, however keywords used here were: “BIGTECH”, “APPLE”, “AMAZON”, “ALIBABA”, “TENCENT”, “GOOGLE”, “SAMSUNG”, “PAYPAL”, “PARTNER”, “TELCO”, “TELECOMMUNICATION”, “BLOCKCHAIN”, “DISTRIBUTED LEDGER”, and “CONSORTIUM”. Moreover, many of the consortium initiatives, especially the blockchain consortia have their own websites, which were also consulted in detail.

For the “open IT infrastructure” modality and its submodalities “establishment of open-API portals, developer kits, and sandboxes”, and “open innovation technological interfaces for staff, external developers and customers to co-innovate”, Boolean and keyword searches were used in Factiva and annual financial statements. The following searches were conducted in Factiva:

- (((“Name of Bank”) and (“OPEN INNOVATION”))
- (((“Name of Bank”) and (“OPEN API”))
- (((“Name of Bank”) and (“PSD2”))
- (((“Name of Bank”) and (“OPEN BANKING”))
- (((“Name of Bank”) and (“COINNOVATION”))
- (((“Name of Bank”) and (“INNOVATION PLATFORM”))
- (((“Name of Bank”) and (“DEVELOPER PORTAL”))

The annual financial statements were also consulted in the same way as described for the “acquisitions and investments” and “partnerships” modalities, however keywords used here were: “OPEN INNOVATION”, “OPEN BANKING”, “OPEN API”, “API”, “PSD2”, “COINNOVATION”, “INNOVATION PLATFORM”, and “DEVELOPER PORTAL”. Moreover, banks often have webpages set up for their open APIs, developer portals and sandboxes, these were also consulted.

Appendix 7 – Historical Financial Data for the 20 Banks

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Total Revenue	92,365.0	65,642.0	68,669.9	71,151.3	70,877.3	63,140.6	61,138.0	70,109.8	57,364.4	59,701.0	64,682.2
	% Growth		-28.9%	4.6%	3.6%	-0.4%	-10.9%	-3.2%	14.7%	-18.2%	4.1%	8.3%
BNP Paribas	Total Revenue	77,571.0	70,439.0	72,579.0	70,803.0	66,872.0	59,846.0	62,829.0	67,486.0	67,492.0	59,049.0	60,895.0
	% Growth		-9.2%	3.0%	-2.4%	-5.6%	-10.5%	5.0%	7.4%	0.0%	-12.5%	3.1%
Credit Agricole	Total Revenue	55,860.0	44,020.0	43,488.0	44,487.0	38,732.0	36,657.0	36,526.0	37,143.0	35,332.0	36,791.0	39,424.0
	% Growth		-21.2%	-1.2%	2.3%	-12.9%	-5.4%	-0.4%	1.7%	-4.9%	4.1%	7.2%
Banco Santander	Total Revenue	69,561.5	68,809.4	75,387.6	82,796.0	80,999.0	72,976.0	75,046.0	74,920.0	72,578.0	74,326.0	72,849.0
	% Growth		-1.1%	9.6%	9.8%	-2.2%	-9.9%	2.8%	-0.2%	-3.1%	2.4%	-2.0%
Deutsche Bank	Total Revenue	58,492.0	44,853.0	44,412.0	53,790.0	51,957.0	45,256.0	45,396.0	47,093.0	43,744.0	41,599.0	39,579.0
	% Growth		-23.3%	-1.0%	21.1%	-3.4%	-12.9%	0.3%	3.7%	-7.1%	-4.9%	-4.9%
Societe Generale	Total Revenue	57,196.0	43,273.0	45,295.0	48,537.0	44,240.0	41,536.0	40,778.0	45,230.0	43,908.0	40,898.0	40,464.0
	% Growth		-24.3%	4.7%	7.2%	-8.9%	-6.1%	-1.8%	10.9%	-2.9%	-6.9%	-1.1%
Groupe BPCE	Total Revenue	*	44,668.0	42,381.0	45,444.0	43,345.0	41,177.0	43,190.0	42,972.0	42,382.0	41,566.0	40,964.0
	% Growth			-5.1%	7.2%	-4.6%	-5.0%	4.9%	-0.5%	-1.4%	-1.9%	-1.4%
Barclays	Total Revenue	50,874.8	44,879.1	47,174.1	48,712.5	42,229.1	42,874.3	39,997.2	37,188.2	33,369.6	30,594.8	32,435.8
	% Growth		-11.8%	5.1%	3.3%	-13.3%	1.5%	-6.7%	-7.0%	-10.3%	-8.3%	6.0%
Lloyds Banking Group	Total Revenue	25,666.9	49,413.1	50,653.0	41,237.2	46,570.0	39,631.4	32,659.9	34,663.1	31,794.0	28,688.2	25,945.0
	% Growth		92.5%	2.5%	-18.6%	12.9%	-14.9%	-17.6%	6.1%	-8.3%	-9.8%	-9.6%
ING	Total Revenue	152,647.0	86,894.0	77,723.0	73,602.0	67,945.0	55,932.0	52,285.0	51,206.0	49,492.0	48,994.0	33,326.0
	% Growth		-43.1%	-10.6%	-5.3%	-7.7%	-17.7%	-6.5%	-2.1%	-3.3%	-1.0%	-32.0%
Credit Mutuel Group	Total Revenue	31,131.0	29,515.0	29,401.0	43,506.0	47,605.0	47,687.0	49,843.0	50,035.0	49,245.0	50,804.0	33,107.0
	% Growth		-5.2%	-0.4%	48.0%	9.4%	0.2%	4.5%	0.4%	-1.6%	3.2%	-34.8%
UBS	Total Revenue	46,059.1	29,500.4	33,888.5	33,197.8	30,966.8	30,046.1	30,067.0	36,417.4	34,301.3	34,754.0	36,708.9
	% Growth		-36.0%	14.9%	-2.0%	-6.7%	-3.0%	0.1%	21.1%	-5.8%	1.3%	5.6%
UniCredit	Total Revenue	65,266.9	46,497.0	40,925.0	41,190.4	40,049.3	36,613.6	33,468.3	27,587.6	25,142.0	24,592.3	25,825.1
	% Growth		-28.8%	-12.0%	0.6%	-2.8%	-8.6%	-8.6%	-17.6%	-8.9%	-2.2%	5.0%
Intesa Sanpaolo	Total Revenue	17,841.0	27,022.0	24,836.0	25,266.0	27,819.0	25,231.0	24,745.0	24,228.0	22,418.0	28,488.0	23,816.0
	% Growth		51.5%	-8.1%	1.7%	10.1%	-9.3%	-1.9%	-2.1%	-7.5%	27.1%	-16.4%
Royal Bank of Scotland	Total Revenue	69,863.8	50,135.1	44,076.5	37,643.7	31,745.5	27,384.5	24,470.1	23,247.4	19,785.2	18,162.3	18,763.7
	% Growth		-28.2%	-12.1%	-14.6%	-15.7%	-13.7%	-10.6%	-5.0%	-14.9%	-8.2%	3.3%
Credit Suisse	Total Revenue	30,748.7	34,167.2	36,409.7	34,671.6	31,869.6	30,104.6	29,656.9	31,472.9	27,459.2	28,068.9	28,833.3
	% Growth		11.1%	6.6%	-4.8%	-8.1%	-5.5%	-1.5%	6.1%	-12.8%	2.2%	2.7%
BBVA	Total Revenue	41,508.0	31,745.0	29,822.0	32,062.0	33,185.0	32,672.0	31,543.0	33,677.0	37,363.0	39,033.0	38,248.0
	% Growth		-23.5%	-6.1%	7.5%	3.5%	-1.5%	-3.5%	6.8%	10.9%	4.5%	-2.0%
Standard Chartered	Total Revenue	16,016.9	15,058.3	16,171.8	17,606.6	20,486.0	19,351.0	18,689.2	18,910.1	17,822.5	18,723.9	20,167.2
	% Growth		-6.0%	7.4%	8.9%	16.4%	-5.5%	-3.4%	1.2%	-5.8%	5.1%	7.7%
Rabobank	Total Revenue	30,917.0	24,002.0	24,376.0	25,216.0	26,504.0	23,720.0	22,492.0	21,352.0	22,946.0	20,880.0	21,638.0
	% Growth		-22.4%	1.6%	3.4%	5.1%	-10.5%	-5.2%	-5.1%	7.5%	-9.0%	3.6%
Nordea Bank	Total Revenue	20,485.0	15,492.0	14,595.0	16,685.0	17,071.0	15,823.0	15,693.0	14,547.0	13,696.0	13,218.0	12,663.0
	% Growth		-24.4%	-5.8%	14.3%	2.3%	-7.3%	-0.8%	-7.3%	-5.9%	-3.5%	-4.2%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Revenue figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Revenue is defined as: *Gross revenue from any operating activity. Total revenue is defined as the sum of total interest income, investment income, trading profit (loss), commissions and fees earned and other operating income. Excludes revenue from discontinued operations. Revenue may be negative due to large trading account losses.* " As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 1 – Historical Financial Data – Total Revenue & Total Revenue Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Net Income	3,914.4	4,195.1	9,939.5	12,076.9	10,915.7	12,203.8	10,320.6	12,190.3	2,240.9	9,577.9	11,633.2
	% Growth		7.2%	136.9%	21.5%	-9.6%	11.8%	-15.4%	18.1%	-81.6%	327.4%	21.5%
BNP Paribas	Net Income	3,021.0	5,832.0	7,843.0	6,050.0	6,564.0	4,818.0	157.0	6,694.0	7,702.0	7,759.0	7,526.0
	% Growth		93.0%	34.5%	-22.9%	8.5%	-26.6%	-96.7%	4163.7%	15.1%	0.7%	-3.0%
Credit Agricole	Net Income	1,024.0	1,125.0	1,263.0	-1,470.0	-6,389.0	2,510.0	2,344.0	3,516.0	3,540.0	3,649.0	4,400.0
	% Growth		9.9%	12.3%	-216.4%	-334.6%	139.3%	-6.6%	50.0%	0.7%	3.1%	20.6%
Banco Santander	Net Income	8,876.4	8,942.5	8,180.9	5,330.0	2,295.0	4,175.0	5,816.0	5,966.0	6,204.0	6,619.0	7,810.0
	% Growth		0.7%	-8.5%	-34.8%	-56.9%	81.9%	39.3%	2.6%	4.0%	6.7%	18.0%
Deutsche Bank	Net Income	-3,835.0	4,973.0	2,310.0	4,132.0	263.0	666.0	1,663.0	-6,794.0	-1,402.0	-751.0	267.0
	% Growth		229.7%	-53.5%	78.9%	-93.6%	153.2%	149.7%	-508.5%	79.4%	46.4%	135.6%
Societe Generale	Net Income	2,010.0	678.0	3,917.0	2,385.0	790.0	2,044.0	2,679.0	4,001.0	3,874.0	2,806.0	4,121.0
	% Growth		-66.3%	477.7%	-39.1%	-66.9%	158.7%	31.1%	49.3%	-3.2%	-27.6%	46.9%
Groupe BPCE	Net Income	*	537.0	3,640.0	2,685.0	2,147.0	2,669.0	2,907.0	3,242.0	3,988.0	3,024.0	3,026.0
	% Growth			577.8%	-26.2%	-20.0%	24.3%	8.9%	11.5%	23.0%	-24.2%	0.1%
Barclays	Net Income	5,509.8	10,546.9	4,098.2	3,370.0	-769.5	636.1	94.3	-67.5	2,546.5	-1,464.7	2,425.4
	% Growth		91.4%	-61.1%	-17.8%	-122.8%	182.7%	-85.2%	-171.6%	3872.5%	-157.5%	265.6%
Lloyds Banking Group	Net Income	970.7	3,174.3	-373.2	-3,212.1	-1,814.1	-987.1	1,752.1	1,184.7	2,954.1	3,946.6	4,862.1
	% Growth		227.0%	-111.8%	-760.7%	43.5%	45.6%	277.5%	-32.4%	149.4%	33.6%	23.2%
ING	Net Income	-729.0	-935.0	2,810.0	5,781.0	4,161.0	3,545.0	1,251.0	4,010.0	4,651.0	4,905.0	4,703.0
	% Growth		-28.3%	400.5%	105.7%	-28.0%	-14.8%	-64.7%	220.5%	16.0%	5.5%	-4.1%
Credit Mutuel Group	Net Income	440.0	1,831.0	2,916.0	2,145.0	2,150.0	2,651.0	2,955.0	3,020.0	3,253.0	2,978.0	3,504.0
	% Growth		316.1%	59.3%	-26.4%	0.2%	23.3%	11.5%	2.2%	7.7%	-8.5%	17.7%
UBS	Net Income	-13,429.0	-1,812.7	5,467.7	3,380.7	-2,057.8	2,577.7	2,854.0	5,811.0	2,939.8	948.3	3,827.2
	% Growth		86.5%	401.6%	-38.2%	-160.9%	225.3%	10.7%	103.6%	-49.4%	-67.7%	303.6%
UniCredit	Net Income	4,011.8	1,702.3	1,323.3	-9,206.4	864.9	-13,964.8	2,007.8	1,694.2	-11,790.1	5,473.1	3,892.4
	% Growth		-57.6%	-22.3%	-795.7%	109.4%	-1714.6%	114.4%	-15.6%	-795.9%	146.4%	-28.9%
Intesa Sanpaolo	Net Income	2,553.0	2,805.0	2,705.0	-8,190.0	1,605.0	-4,550.0	1,251.0	2,739.0	3,111.0	7,316.0	4,050.0
	% Growth		9.9%	-3.6%	-402.8%	119.6%	-383.5%	127.5%	118.9%	13.6%	135.2%	-44.6%
Royal Bank of Scotland	Net Income	-29,812.5	-3,000.2	-1,167.4	-2,301.6	-7,095.9	-10,126.7	-3,438.5	-2,195.8	-6,437.1	1,575.5	2,364.4
	% Growth		89.9%	61.1%	-97.2%	-208.3%	-42.7%	66.0%	36.1%	-193.2%	124.5%	50.1%
Credit Suisse	Net Income	-5,183.1	4,454.8	3,699.8	1,587.5	1,119.4	1,890.2	1,543.9	-2,758.0	-2,486.5	-885.3	1,752.7
	% Growth		185.9%	-16.9%	-57.1%	-29.5%	68.9%	-18.3%	-278.6%	9.8%	64.4%	298.0%
BBVA	Net Income	5,020.0	4,210.0	4,606.0	3,004.0	1,676.0	2,228.0	2,618.0	2,642.0	3,475.0	3,519.0	5,324.0
	% Growth		-16.1%	9.4%	-34.8%	-44.2%	32.9%	17.5%	0.9%	31.5%	1.3%	51.3%
Standard Chartered	Net Income	2,214.8	2,430.5	3,272.1	3,486.4	3,803.0	3,080.3	1,970.2	-1,977.9	-223.3	1,081.3	893.2
	% Growth		9.7%	34.6%	6.5%	9.1%	-19.0%	-36.0%	-200.4%	88.7%	584.3%	-17.4%
Rabobank	Net Income	2,599.0	2,099.0	2,682.0	2,549.0	1,963.0	1,960.0	1,784.0	2,139.0	1,960.0	2,616.0	2,944.0
	% Growth		-19.2%	27.8%	-5.0%	-23.0%	-0.2%	-9.0%	19.9%	-8.4%	33.5%	12.5%
Nordea Bank	Net Income	2,671.0	2,314.0	2,657.0	2,627.0	3,119.0	3,116.0	3,332.0	3,662.0	3,766.0	3,031.0	3,077.0
	% Growth		-13.4%	14.8%	-1.1%	18.7%	-0.1%	6.9%	9.9%	2.8%	-19.5%	1.5%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Net income figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Net Income: *Amount of profit the company made after paying all of its expenses. It is known as bottom-line or net profit.* " As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 2 – Historical Financial Data – Net Revenue & Net Revenue Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Net Interest Income	29,272.4	29,378.7	29,875.8	29,342.7	29,488.2	27,008.2	26,401.7	29,438.0	27,035.6	25,086.4	25,902.0
	% Growth		0.4%	1.7%	-1.8%	0.5%	-8.4%	-2.2%	11.5%	-8.2%	-7.2%	3.3%
BNP Paribas	Net Interest Income	13,498.0	21,021.0	24,060.0	23,981.0	21,745.0	19,451.0	20,319.0	22,553.0	22,376.0	22,577.0	21,164.0
	% Growth		55.7%	14.5%	-0.3%	-9.3%	-10.5%	4.5%	11.0%	-0.8%	0.9%	-6.3%
Credit Agricole	Net Interest Income	12,113.0	14,422.0	15,213.0	15,051.0	14,947.0	13,120.0	11,911.0	12,072.0	12,430.0	12,904.0	12,655.0
	% Growth		19.1%	5.5%	-1.1%	-0.7%	-12.2%	-9.2%	1.4%	3.0%	3.8%	-1.9%
Banco Santander	Net Interest Income	17,538.5	26,298.5	29,224.4	30,594.0	29,923.0	25,935.0	29,547.0	33,267.0	31,502.0	34,878.0	34,711.0
	% Growth		49.9%	11.1%	4.7%	-2.2%	-13.3%	13.9%	12.6%	-5.3%	10.7%	-0.5%
Deutsche Bank	Net Interest Income	12,453.0	12,459.0	15,583.0	17,445.0	15,975.0	14,833.0	14,272.0	15,882.0	14,707.0	12,378.0	13,192.0
	% Growth		0.0%	25.1%	11.9%	-8.4%	-7.1%	-3.8%	11.3%	-7.4%	-15.8%	6.6%
Societe Generale	Net Interest Income	8,414.0	11,964.0	12,288.0	12,627.0	11,626.0	10,489.0	10,431.0	10,028.0	9,927.0	10,919.0	11,019.0
	% Growth		42.2%	2.7%	2.8%	-7.9%	-9.8%	-0.6%	-3.9%	-1.0%	10.0%	0.9%
Groupe BPCE	Net Interest Income	*	12,752.0	12,182.0	12,509.0	10,995.0	11,544.0	11,542.0	11,059.0	10,904.0	10,232.0	8,641.0
	% Growth			-4.5%	2.7%	-12.1%	5.0%	0.0%	-4.2%	-1.4%	-6.2%	-15.5%
Barclays	Net Interest Income	14,967.8	13,286.6	14,810.3	14,491.8	14,568.0	14,055.1	15,579.2	14,624.0	12,909.8	11,294.2	10,344.8
	% Growth		-11.2%	11.5%	-2.2%	0.5%	-3.5%	10.8%	-6.1%	-11.7%	-12.5%	-8.4%
Lloyds Banking Group	Net Interest Income	9,704.5	10,134.8	14,631.9	14,634.7	9,518.0	8,643.6	13,227.8	15,591.0	11,353.8	12,457.6	15,140.2
	% Growth		4.4%	44.4%	0.0%	-35.0%	-9.2%	53.0%	17.9%	-27.2%	9.7%	21.5%
ING	Net Interest Income	11,042.0	12,593.0	13,593.0	13,711.0	12,144.0	11,795.0	12,340.0	12,624.0	13,328.0	13,794.0	14,018.0
	% Growth		14.0%	7.9%	0.9%	-11.4%	-2.9%	4.6%	2.3%	5.6%	3.5%	1.6%
Credit Mutuel Group	Net Interest Income	3,970.0	7,392.0	8,183.0	7,767.0	6,346.0	7,615.0	7,198.0	7,075.0	6,899.0	7,124.0	7,548.0
	% Growth		86.2%	10.7%	-5.1%	-18.3%	20.0%	-5.5%	-1.7%	-2.5%	3.3%	6.0%
UBS	Net Interest Income	3,779.8	4,270.0	4,510.5	5,549.5	4,960.3	4,701.9	5,397.5	6,305.6	5,885.1	5,142.4	4,833.1
	% Growth		13.0%	5.6%	23.0%	-10.6%	-5.2%	14.8%	16.8%	-6.7%	-12.6%	-6.0%
UniCredit	Net Interest Income	19,709.8	17,731.9	16,474.7	16,228.5	13,695.3	12,178.7	12,464.3	11,067.5	10,712.2	10,612.9	11,266.1
	% Growth		-10.0%	-7.1%	-1.5%	-15.6%	-11.1%	2.3%	-11.2%	-3.2%	-0.9%	6.2%
Intesa Sanpaolo	Net Interest Income	11,656.0	11,716.0	11,111.0	11,929.0	11,789.0	9,796.0	10,130.0	9,616.0	9,076.0	6,821.0	7,436.0
	% Growth		0.5%	-5.2%	7.4%	-1.2%	-16.9%	3.4%	-5.1%	-5.6%	-24.8%	9.0%
Royal Bank of Scotland	Net Interest Income	23,481.6	15,302.2	17,230.3	15,197.2	15,547.2	11,568.4	11,525.3	12,071.4	10,747.8	10,517.9	9,821.5
	% Growth		-34.8%	12.6%	-11.8%	2.3%	-25.6%	-0.4%	4.7%	-11.0%	-2.1%	-6.6%
Credit Suisse	Net Interest Income	5,383.7	4,565.5	4,747.1	5,229.2	5,927.0	6,594.5	7,438.7	8,711.4	6,938.4	5,905.2	6,069.6
	% Growth		-15.2%	4.0%	10.2%	13.3%	11.3%	12.8%	17.1%	-20.4%	-14.9%	2.8%
BBVA	Net Interest Income	12,133.0	14,325.0	13,849.0	13,714.0	14,864.0	14,135.0	14,913.0	16,437.0	17,527.0	18,093.0	17,749.0
	% Growth		18.1%	-3.3%	-1.0%	8.4%	-4.9%	5.5%	10.2%	6.6%	3.2%	-1.9%
Standard Chartered	Net Interest Income	5,186.8	5,559.9	6,437.7	7,352.4	8,461.3	8,480.3	8,369.3	8,580.6	7,092.5	7,297.4	7,473.0
	% Growth		7.2%	15.8%	14.2%	15.1%	0.2%	-1.3%	2.5%	-17.3%	2.9%	2.4%
Rabobank	Net Interest Income	8,517.0	8,075.0	8,614.0	9,174.0	9,171.0	9,093.0	9,118.0	9,139.0	8,835.0	8,843.0	8,559.0
	% Growth		-5.2%	6.7%	6.5%	0.0%	-0.9%	0.3%	0.2%	-3.3%	0.1%	-3.2%
Nordea Bank	Net Interest Income	5,093.0	5,281.0	5,159.0	5,456.0	5,563.0	5,525.0	5,482.0	4,963.0	4,727.0	4,666.0	4,491.0
	% Growth		3.7%	-2.3%	5.8%	2.0%	-0.7%	-0.8%	-9.5%	-4.8%	-1.3%	-3.8%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Net interest income figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Net Interest Income: *The difference between revenues generated by interest-bearing assets and the cost of servicing (interest-burdened) liabilities. Calculated as: Interest Income + Investment Income - Interest Expenses* ". As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 3 – Historical Financial Data – Net Interest Income & Net Interest Income Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Total Non-Interest Income	29,786.3	20,899.4	24,515.2	25,744.2	26,580.0	24,343.6	22,484.0	27,457.4	18,938.0	23,244.1	22,576.6
	% Growth		-29.8%	17.3%	5.0%	3.2%	-8.4%	-7.6%	22.1%	-31.0%	22.7%	-2.9%
BNP Paribas	Total Non-Interest Income	18,732.0	23,979.0	25,191.0	23,679.0	22,396.0	22,879.0	24,122.0	26,105.0	26,598.0	24,097.0	25,070.0
	% Growth		28.0%	5.1%	-6.0%	-5.4%	2.2%	5.4%	8.2%	1.9%	-9.4%	4.0%
Credit Agricole	Total Non-Interest Income	8,754.0	8,542.0	10,795.0	10,269.0	6,169.0	7,623.0	9,083.0	10,360.0	9,591.0	11,459.0	13,522.0
	% Growth		-2.4%	26.4%	-4.9%	-39.9%	23.6%	19.2%	14.1%	-7.4%	19.5%	18.0%
Banco Santander	Total Non-Interest Income	14,518.0	15,636.4	22,480.8	22,178.0	22,208.0	21,529.0	20,390.0	17,267.0	17,009.0	17,901.0	18,154.0
	% Growth		7.7%	43.8%	-1.3%	0.1%	-3.1%	-5.3%	-15.3%	-1.5%	5.2%	1.4%
Deutsche Bank	Total Non-Interest Income	3,943.0	17,900.0	15,633.0	18,912.0	20,364.0	19,656.0	20,395.0	21,126.0	18,108.0	17,507.0	14,787.0
	% Growth		354.0%	-12.7%	21.0%	7.7%	-3.5%	3.8%	3.6%	-14.3%	-3.3%	-15.5%
Societe Generale	Total Non-Interest Income	16,542.0	12,399.0	16,683.0	15,728.0	14,022.0	14,051.0	15,814.0	19,077.0	18,788.0	16,716.0	17,786.0
	% Growth		-25.0%	34.6%	-5.7%	-10.8%	0.2%	12.5%	20.6%	-1.5%	-11.0%	6.4%
Groupe BPCE	Total Non-Interest Income	*	10,203.0	12,807.0	12,521.0	12,650.0	13,217.0	13,547.0	14,858.0	15,425.0	15,625.0	17,483.0
	% Growth			25.5%	-2.2%	1.0%	4.5%	2.5%	9.7%	3.8%	1.3%	11.9%
Barclays	Total Non-Interest Income	15,108.7	21,129.7	23,602.8	24,553.3	18,341.7	20,909.4	17,862.4	17,956.3	15,557.9	14,978.3	15,898.6
	% Growth		39.9%	11.7%	4.0%	-25.3%	14.0%	-14.6%	0.5%	-13.4%	-3.7%	6.1%
Lloyds Banking Group	Total Non-Interest Income	3,576.0	17,706.2	16,434.9	10,907.5	17,530.2	14,702.9	8,821.4	10,397.7	11,446.8	10,415.2	7,467.3
	% Growth		395.1%	-7.2%	-33.6%	60.7%	-16.1%	-40.0%	17.9%	10.1%	-9.0%	-28.3%
ING	Total Non-Interest Income	55,636.0	6,826.0	9,119.0	8,691.0	7,682.0	4,444.0	4,086.0	4,822.0	5,223.0	4,956.0	5,458.0
	% Growth		-87.7%	33.6%	-4.7%	-11.6%	-42.2%	-8.1%	18.0%	8.3%	-5.1%	10.1%
Credit Mutuel Group	Total Non-Interest Income	5,593.0	7,250.0	7,630.0	21,368.0	24,523.0	26,533.0	27,854.0	30,358.0	30,562.0	31,700.0	12,754.0
	% Growth		29.6%	5.2%	180.1%	14.8%	8.2%	5.0%	9.0%	0.7%	3.7%	-59.8%
UBS	Total Non-Interest Income	4,634.4	13,956.8	20,191.6	18,590.4	17,717.1	19,370.6	19,202.0	24,073.1	21,651.2	22,708.6	22,516.4
	% Growth		201.2%	44.7%	-7.9%	-4.7%	9.3%	-0.9%	25.4%	-10.1%	4.9%	-0.8%
UniCredit	Total Non-Interest Income	9,488.4	11,177.4	11,564.8	10,777.8	12,157.6	13,705.5	11,324.0	8,965.9	8,772.0	9,517.8	10,192.4
	% Growth		17.8%	3.5%	-6.8%	12.8%	12.7%	-17.4%	-20.8%	-2.2%	8.5%	7.1%
Intesa Sanpaolo	Total Non-Interest Income	6,185.0	6,936.0	6,846.0	5,575.0	7,612.0	7,939.0	8,479.0	9,702.0	9,092.0	17,865.0	13,236.0
	% Growth		12.1%	-1.3%	-18.6%	36.5%	4.3%	6.8%	14.4%	-6.3%	96.5%	-25.9%
Royal Bank of Scotland	Total Non-Interest Income	7,595.8	20,322.4	16,854.8	12,381.5	7,407.9	9,371.6	8,203.4	6,825.7	5,915.6	5,307.5	6,237.6
	% Growth		167.5%	-17.1%	-26.5%	-40.2%	26.5%	-12.5%	-16.8%	-13.3%	-10.3%	17.5%
Credit Suisse	Total Non-Interest Income	513.4	17,413.2	17,879.4	15,973.8	13,540.1	14,212.9	13,961.8	13,354.2	11,517.9	12,707.4	11,849.0
	% Growth		3291.8%	2.7%	-10.7%	-15.2%	5.0%	-1.8%	-4.4%	-13.8%	10.3%	-6.8%
BBVA	Total Non-Interest Income	10,657.0	7,527.0	8,159.0	7,320.0	7,980.0	8,925.0	8,174.0	8,479.0	9,188.0	9,403.0	8,260.0
	% Growth		-29.4%	8.4%	-10.3%	9.0%	11.8%	-8.4%	3.7%	8.4%	2.3%	-12.2%
Standard Chartered	Total Non-Interest Income	4,685.9	5,685.0	5,934.7	5,630.4	6,541.5	6,022.8	5,810.2	5,636.3	6,015.0	5,879.1	5,515.3
	% Growth		21.3%	4.4%	-5.1%	16.2%	-7.9%	-3.5%	-3.0%	6.7%	-2.3%	-6.2%
Rabobank	Total Non-Interest Income	3,672.0	4,207.0	4,448.0	3,917.0	4,539.0	3,964.0	3,854.0	3,759.0	6,416.0	4,924.0	5,357.0
	% Growth		14.6%	5.7%	-11.9%	15.9%	-12.7%	-2.8%	-2.5%	70.7%	-23.3%	8.8%
Nordea Bank	Total Non-Interest Income	3,732.0	4,519.0	4,908.0	4,730.0	5,132.0	5,219.0	5,698.0	5,998.0	5,949.0	5,643.0	5,410.0
	% Growth		21.1%	8.6%	-3.6%	8.5%	1.7%	9.2%	5.3%	-0.8%	-5.1%	-4.1%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Total Non-Interest Income figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Total Non-Interest Income: *Sum of trading account profits (losses), commissions and fees, and other operating income (losses). Figure is reported in millions. Calculated as: Trading Account Profits + Commissions & Fees + Other Operating Income* ". As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 4 – Historical Financial Data – Non-Interest Income & Non-Interest Income Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Operating Income	12,444.3	3,809.7	12,478.2	13,379.0	13,300.9	15,243.4	12,175.4	14,704.6	4,301.0	13,120.6	14,707.0
	% Growth		-69.4%	227.5%	7.2%	-0.6%	14.6%	-20.1%	20.8%	-70.8%	205.1%	12.1%
BNP Paribas	Operating Income	3,224.0	8,482.0	12,561.0	9,471.0	8,588.0	7,528.0	2,939.0	9,787.0	10,771.0	10,310.0	9,169.0
	% Growth		163.1%	48.1%	-24.6%	-9.3%	-12.3%	-61.0%	233.0%	10.1%	-4.3%	-11.1%
Credit Agricole	Operating Income	156.0	1,071.0	3,165.0	2,740.0	627.0	1,654.0	2,557.0	3,318.0	3,372.0	5,009.0	6,066.0
	% Growth		586.5%	195.5%	-13.4%	-77.1%	163.8%	54.6%	29.8%	1.6%	48.5%	21.1%
Banco Santander	Operating Income	8,722.0	9,976.9	11,898.6	9,187.0	3,092.0	5,273.0	8,029.0	10,042.0	10,553.0	12,539.0	13,699.0
	% Growth		14.4%	19.3%	-22.8%	-66.3%	70.5%	52.3%	25.1%	5.1%	18.8%	9.3%
Deutsche Bank	Operating Income	-5,202.0	5,143.0	3,641.0	5,654.0	651.0	1,087.0	2,497.0	-6,261.0	-1,265.0	1,091.0	1,111.0
	% Growth		198.9%	-29.2%	55.3%	-88.5%	67.0%	129.7%	-350.7%	79.8%	186.2%	1.8%
Societe Generale	Operating Income	3,683.0	116.0	5,713.0	4,270.0	2,757.0	2,337.0	4,557.0	5,681.0	6,390.0	4,767.0	6,269.0
	% Growth		-96.9%	4825.0%	-25.3%	-35.4%	-15.2%	95.0%	24.7%	12.5%	-25.4%	31.5%
Groupe BPCE	Operating Income	*	723.0	5,648.0	4,707.0	3,812.0	4,649.0	5,151.0	5,788.0	6,062.0	5,237.0	5,014.0
	% Growth			681.2%	-16.7%	-19.0%	22.0%	10.8%	12.4%	4.7%	-13.6%	-4.3%
Barclays	Operating Income	11,930.0	4,869.8	6,683.8	6,689.2	810.2	3,406.6	3,339.2	2,399.7	3,354.5	3,749.1	3,871.0
	% Growth		-59.2%	37.3%	0.1%	-87.9%	320.4%	-2.0%	-28.1%	39.8%	11.8%	3.2%
Lloyds Banking Group	Operating Income	1,093.9	-10,531.2	856.0	-4,118.0	-781.9	438.2	2,146.7	2,268.8	5,189.6	6,015.3	6,725.9
	% Growth		-1062.7%	108.1%	-581.1%	81.0%	156.0%	389.9%	5.7%	128.7%	15.9%	11.8%
ING	Operating Income	-636.0	-1,064.0	3,617.0	6,243.0	4,020.0	4,017.0	3,569.0	5,680.0	5,815.0	7,090.0	6,696.0
	% Growth		-67.3%	439.9%	72.6%	-35.6%	-0.1%	-11.2%	59.1%	2.4%	21.9%	-5.6%
Credit Mutuel Group	Operating Income	362.0	2,835.0	4,187.0	3,257.0	3,656.0	4,216.0	4,502.0	5,031.0	5,212.0	5,714.0	5,206.0
	% Growth		683.1%	47.7%	-22.2%	12.3%	15.3%	6.8%	11.8%	3.6%	9.6%	-8.9%
UBS	Operating Income	-11,789.1	-1,721.9	5,351.6	4,314.7	-1,561.6	2,619.1	1,949.0	4,983.8	3,655.5	4,676.8	5,278.9
	% Growth		85.4%	410.8%	-19.4%	-136.2%	267.7%	-25.6%	155.7%	-26.7%	27.9%	12.9%
UniCredit	Operating Income	5,712.5	2,103.4	1,807.5	1,100.2	-579.2	-8,060.1	2,674.2	-219.2	-11,836.4	3,024.1	3,458.4
	% Growth		-63.2%	-14.1%	-39.1%	-152.6%	-1291.6%	133.2%	-108.2%	-5299.7%	125.5%	14.4%
Intesa Sanpaolo	Operating Income	3,361.0	2,889.0	2,936.0	832.0	3,060.0	-2,454.0	2,507.0	3,863.0	2,735.0	6,592.0	4,838.0
	% Growth		-14.0%	1.6%	-71.7%	267.8%	-180.2%	202.2%	54.1%	-29.2%	141.0%	-26.6%
Royal Bank of Scotland	Operating Income	-9,258.1	-2,671.3	-547.0	-3,312.3	-6,706.2	-10,285.7	3,123.3	-3,742.8	-4,733.0	2,380.3	3,735.3
	% Growth		71.1%	79.5%	-505.6%	-102.5%	-53.4%	130.4%	-219.8%	-26.5%	150.3%	56.9%
Credit Suisse	Operating Income	-9,309.2	5,271.7	5,281.9	2,698.7	1,692.7	3,124.6	2,779.0	-2,496.6	-2,270.0	1,404.9	2,722.6
	% Growth		156.6%	0.2%	-48.9%	-37.3%	84.6%	-11.1%	-189.8%	9.1%	161.9%	93.8%
BBVA	Operating Income	6,002.0	6,530.0	6,562.0	4,986.0	1,953.0	3,282.0	4,376.0	6,076.0	6,850.0	7,218.0	7,699.0
	% Growth		8.8%	0.5%	-24.0%	-60.8%	68.0%	33.3%	38.8%	12.7%	5.4%	6.7%
Standard Chartered	Operating Income	3,441.5	3,762.2	4,649.9	4,897.8	5,342.3	5,247.1	3,881.5	-775.3	956.4	2,347.0	2,109.3
	% Growth		9.3%	23.6%	5.3%	9.1%	-1.8%	-26.0%	-120.0%	223.4%	145.4%	-10.1%
Rabobank	Operating Income	2,878.0	1,845.0	2,994.0	2,868.0	2,008.0	455.0	2,088.0	2,862.0	3,095.0	3,892.0	4,141.0
	% Growth		-35.9%	62.3%	-4.2%	-30.0%	-77.3%	358.9%	37.1%	8.1%	25.8%	6.4%
Nordea Bank	Operating Income	3,373.0	3,027.0	3,573.0	3,505.0	3,946.0	4,037.0	4,289.0	4,665.0	4,513.0	3,975.0	3,829.0
	% Growth		-10.3%	18.0%	-1.9%	12.6%	2.3%	6.2%	8.8%	-3.3%	-11.9%	-3.7%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Operating Income figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Operating Income: total operating revenue minus total operating expenses.Total operating expenses includes interest expense, provision for loan losses, commissions and fees paid, and other operating expense." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
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- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 5 – Historical Financial Data – Operating Income & Operating Income Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Interest Income	62,392.8	44,652.0	44,070.1	45,300.0	44,125.2	38,554.5	38,419.6	42,541.5	38,340.6	36,362.9	42,042.1
	% Growth		-28.4%	-1.3%	2.8%	-2.6%	-12.6%	-0.3%	10.7%	-9.9%	-5.2%	15.6%
BNP Paribas	Interest Income	33,066.0	33,979.0	36,338.0	35,670.0	35,807.0	29,523.0	31,525.0	33,926.0	33,479.0	32,138.0	34,022.0
	% Growth		2.8%	6.9%	-1.8%	0.4%	-17.5%	6.8%	7.6%	-1.3%	-4.0%	5.9%
Credit Agricole	Interest Income	37,095.0	35,346.0	32,374.0	33,591.0	32,210.0	28,599.0	26,879.0	26,269.0	25,050.0	24,704.0	24,817.0
	% Growth		-4.7%	-8.4%	3.8%	-4.1%	-11.2%	-6.0%	-2.3%	-4.6%	-1.4%	0.5%
Banco Santander	Interest Income	50,536.7	53,173.0	52,906.8	60,618.0	58,791.0	51,447.0	54,656.0	57,198.0	55,156.0	48,900.0	47,896.0
	% Growth		5.2%	-0.5%	14.6%	-3.0%	-12.5%	6.2%	4.7%	-3.6%	-11.3%	-2.1%
Deutsche Bank	Interest Income	18,039.0	12,732.0	12,353.0	18,419.0	15,814.0	13,478.0	13,758.0	13,879.0	14,772.0	14,954.0	15,793.0
	% Growth		-29.4%	-3.0%	49.1%	-14.1%	-14.8%	2.1%	0.9%	6.4%	1.2%	5.6%
Societe Generale	Interest Income	40,185.0	30,545.0	28,294.0	32,389.0	29,904.0	27,024.0	24,532.0	25,431.0	24,660.0	23,679.0	16,320.0
	% Growth		-24.0%	-7.4%	14.5%	-7.7%	-9.6%	-9.2%	3.7%	-3.0%	-4.0%	-31.1%
Groupe BPCE	Interest Income	*	26,838.0	22,969.0	25,349.0	24,016.0	22,615.0	21,833.0	20,568.0	19,741.0	18,963.0	17,325.0
	% Growth			-14.4%	10.4%	-5.3%	-5.8%	-3.5%	-5.8%	-4.0%	-3.9%	-8.6%
Barclays	Interest Income	35,219.2	23,844.8	23,366.0	23,729.3	23,691.4	21,573.8	21,545.4	18,259.3	16,896.0	14,700.9	16,434.3
	% Growth		-32.3%	-2.0%	1.6%	-0.2%	-8.9%	-0.1%	-15.3%	-7.5%	-13.0%	11.8%
Lloyds Banking Group	Interest Income	22,090.9	31,707.0	34,218.1	30,329.8	29,039.8	24,928.5	23,838.5	24,265.4	20,347.2	18,273.1	18,477.7
	% Growth		43.5%	7.9%	-11.4%	-4.3%	-14.2%	-4.4%	1.8%	-16.1%	-10.2%	1.1%
ING	Interest Income	97,011.0	79,850.0	68,334.0	64,649.0	60,003.0	51,394.0	48,163.0	26,628.0	25,617.0	25,328.0	26,157.0
	% Growth		-17.7%	-14.4%	-5.4%	-7.2%	-14.3%	-6.3%	-44.7%	-3.8%	-1.1%	3.3%
Credit Mutuel Group	Interest Income	23,784.0	18,779.0	18,019.0	18,740.0	18,424.0	17,829.0	17,208.0	16,658.0	15,871.0	15,429.0	16,447.0
	% Growth		-21.0%	-4.0%	4.0%	-1.7%	-3.2%	-3.5%	-3.2%	-4.7%	-2.8%	6.6%
UBS	Interest Income	27,207.3	10,697.8	8,927.3	9,664.3	9,214.5	8,046.6	7,973.9	9,101.1	10,156.2	9,501.3	8,329.8
	% Growth		-60.7%	-16.5%	8.3%	-4.7%	-12.7%	-0.9%	14.1%	11.6%	-6.4%	-12.3%
UniCredit	Interest Income	44,081.2	30,786.4	25,312.7	25,565.4	23,804.3	19,479.7	18,168.7	13,159.8	11,950.5	11,439.3	12,694.5
	% Growth		-30.2%	-17.8%	1.0%	-6.9%	-18.2%	-6.7%	-27.6%	-9.2%	-4.3%	11.0%
Intesa Sanpaolo	Interest Income	24,626.0	15,950.0	12,990.0	14,640.0	14,247.0	12,477.0	11,701.0	10,292.0	9,372.0	9,236.0	10,060.0
	% Growth		-35.2%	-18.6%	12.7%	-2.7%	-12.4%	-6.2%	-12.0%	-8.9%	-1.5%	8.9%
Royal Bank of Scotland	Interest Income	62,267.9	29,543.2	26,562.8	24,244.5	22,851.5	17,065.8	16,229.4	16,427.2	13,782.7	12,596.8	12,487.7
	% Growth		-52.6%	-10.1%	-8.7%	-5.7%	-25.3%	-4.9%	1.2%	-16.1%	-8.6%	-0.9%
Credit Suisse	Interest Income	14,204.7	7,759.5	8,260.4	9,112.3	8,364.9	7,682.6	7,838.1	9,583.5	9,020.3	9,287.9	10,739.7
	% Growth		-45.4%	6.5%	10.3%	-8.2%	-8.2%	2.0%	22.3%	-5.9%	3.0%	15.6%
BBVA	Interest Income	26,698.0	20,433.0	18,054.0	20,767.0	21,164.0	20,047.0	19,352.0	20,991.0	23,580.0	29,296.0	29,831.0
	% Growth		-23.5%	-11.6%	15.0%	1.9%	-5.3%	-3.5%	8.5%	12.3%	24.2%	1.8%
Standard Chartered	Interest Income	9,352.7	7,798.4	8,672.0	10,472.8	12,081.5	11,536.5	10,932.1	11,068.8	9,796.2	10,649.4	11,969.6
	% Growth		-16.6%	11.2%	20.8%	15.4%	-4.5%	-5.2%	1.3%	-11.5%	8.7%	12.4%
Rabobank	Interest Income	27,245.0	19,795.0	19,928.0	19,295.0	20,006.0	18,048.0	17,360.0	16,580.0	15,624.0	15,165.0	16,281.0
	% Growth		-27.3%	0.7%	-3.2%	3.7%	-9.8%	-3.8%	-4.5%	-5.8%	-2.9%	7.4%
Nordea Bank	Interest Income	16,753.0	10,973.0	9,687.0	11,955.0	11,939.0	10,604.0	9,995.0	7,998.0	7,314.0	7,157.0	7,253.0
	% Growth		-34.5%	-11.7%	23.4%	-0.1%	-11.2%	-5.7%	-20.0%	-8.6%	-2.1%	1.3%

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Interest Income figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Interest Income: Total interest income from loans, federal funds sold, resale agreements and other short-term interbank investments. Includes federal funds sold and repurchase agreements. Includes deposits at interest with other banks. Includes interest from direct financing lease receivables." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 6 – Historical Financial Data – Interest Income & Interest Income Growth

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Total Loans to Total Assets	37.9	39.0	39.9	37.5	37.6	41.0	37.5	38.8	36.6	38.5	38.7
BNP Paribas	Total Loans to Total Assets	24.5	35.2	37.0	37.0	35.8	37.9	34.4	36.9	37.3	39.5	39.2
Credit Agricole	Total Loans to Total Assets	20.2	21.7	22.3	21.0	20.1	20.6	20.3	22.1	23.2	23.7	23.1
Banco Santander	Total Loans to Total Assets	60.4	63.1	61.1	61.3	58.6	62.2	60.2	61.0	60.9	60.4	59.9
Deutsche Bank	Total Loans to Total Assets	12.3	17.4	21.6	19.3	19.9	23.7	24.0	26.6	26.0	27.5	32.2
Societe Generale	Total Loans to Total Assets	34.3	36.9	35.5	33.7	29.7	29.8	28.4	30.0	30.2	32.7	33.0
Groupe BPCE	Total Loans to Total Assets	*	50.0	54.7	51.2	51.1	51.1	48.5	51.6	51.4	51.9	52.1
Barclays	Total Loans to Total Assets	22.8	31.3	29.6	28.3	29.1	32.9	31.9	36.1	32.8	32.7	29.4
Lloyds Banking Group	Total Loans to Total Assets	55.9	62.5	61.6	60.2	57.0	59.9	57.2	56.8	55.3	56.4	56.1
ING	Total Loans to Total Assets	—	50.1	50.2	48.1	49.3	49.7	52.7	70.3	67.3	68.4	67.2
Credit Mutuel Group	Total Loans to Total Assets	51.9	54.0	56.1	57.4	54.6	54.6	53.1	53.6	53.6	54.6	56.0
UBS	Total Loans to Total Assets	17.0	23.1	20.0	18.8	22.3	28.4	29.8	33.2	32.8	35.0	35.5
UniCredit	Total Loans to Total Assets	60.0	64.0	63.3	64.2	59.7	60.3	57.9	53.4	52.5	57.0	63.9
Intesa Sanpaolo	Total Loans to Total Assets	—	60.9	58.8	61.7	57.3	57.4	54.8	53.3	50.3	50.2	48.5
Royal Bank of Scotland	Total Loans to Total Assets	35.2	41.5	35.8	31.4	34.4	40.5	33.5	38.4	41.0	44.3	44.4
Credit Suisse	Total Loans to Total Assets	20.3	23.1	21.3	22.3	26.3	28.4	29.7	33.4	33.8	35.2	37.5
BBVA	Total Loans to Total Assets	62.9	62.1	63.0	59.6	56.9	57.4	54.7	57.1	57.8	56.3	57.0
Standard Chartered	Total Loans to Total Assets	40.5	46.1	47.0	45.5	44.8	43.6	39.8	41.2	40.1	43.4	38.0
Rabobank	Total Loans to Total Assets	70.2	72.1	70.5	63.4	63.6	67.3	66.6	67.5	67.0	70.5	74.6
Nordea Bank	Total Loans to Total Assets	53.8	52.4	51.1	43.7	48.3	48.6	45.0	48.1	48.9	50.9	53.2

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Total Loans to Total Assets figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Total Loans to Total Assets: Measures the percentage of total loans to total assets. Unit: Actual. Calculated as: (Total Loans/Total Assets) * 100." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.

- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 7 – Historical Financial Data – Loans to Assets Ratio

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Return on Assets	0.23	0.24	0.55	0.67	0.53	0.60	0.52	0.54	0.10	0.44	0.54
BNP Paribas	Return on Assets	0.16	0.28	0.39	0.31	0.339	0.26	0.01	0.33	0.38	0.39	0.38
Credit Agricole	Return on Assets	0.07	0.07	0.08	(0.09)	(0.38)	0.16	0.15	0.23	0.23	0.24	0.28
Banco Santander	Return on Assets	0.90	0.83	0.70	0.43	0.18	0.35	0.49	0.46	0.46	0.48	0.54
Deutsche Bank	Return on Assets	(0.18)	0.27	0.14	0.20	0.01	0.037	0.10	(0.41)	(0.09)	(0.05)	0.02
Societe Generale	Return on Assets	0.18	0.06	0.36	0.21	0.06	0.17	0.21	0.30	0.29	0.21	0.32
Groupe BPCE	Return on Assets	*	—	0.35	0.25	0.19	0.24	0.25	0.27	0.33	0.24	0.24
Barclays	Return on Assets	0.27	0.55	0.25	0.19	(0.04)	0.038	0.01	(0.00)	0.18	(0.11)	0.19
Lloyds Banking Group	Return on Assets	0.20	0.39	(0.03)	(0.28)	(0.15)	(0.09)	0.17	0.10	0.30	0.42	0.53
ING	Return on Assets	(0.06)	(0.07)	0.23	0.46	0.340	0.32	0.12	0.40	0.50	0.58	0.54
Credit Mutuel Group	Return on Assets	0.08	0.32	0.50	0.36	0.344	0.41	0.43	0.42	0.42	0.37	0.42
UBS	Return on Assets	(0.99)	(0.16)	0.57	0.30	(0.19)	0.28	0.33	0.62	0.34	0.11	0.48
UniCredit	Return on Assets	0.39	0.17	0.14	(0.99)	0.09	(1.59)	0.24	0.20	(1.37)	0.65	0.47
Intesa Sanpaolo	Return on Assets	0.42	0.44	0.42	(1.26)	0.24	(0.70)	0.20	0.41	0.44	0.96	0.51
Royal Bank of Scotland	Return on Assets	(1.12)	(0.13)	(0.06)	(0.13)	(0.41)	(0.73)	(0.27)	(0.17)	(0.65)	0.18	0.29
Credit Suisse	Return on Assets	(0.65)	0.61	0.49	0.19	0.14	0.26	0.21	(0.34)	(0.33)	(0.12)	0.26
BBVA	Return on Assets	0.96	0.78	0.85	0.52	0.28	0.37	0.43	0.38	0.47	0.49	0.78
Standard Chartered	Return on Assets	0.85	0.78	0.91	0.87	0.80	0.63	0.37	(0.32)	(0.04)	0.19	0.16
Rabobank	Return on Assets	0.44	0.34	0.43	0.37	0.26	0.28	0.26	0.31	0.29	0.41	0.49
Nordea Bank	Return on Assets	0.62	0.47	0.49	0.41	0.45	0.48	0.51	0.56	0.60	0.51	0.54

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Return on Assets figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Return on Assets: Indicator of how profitable a company is relative to its total assets, in percentage. Return on assets gives an idea as to how efficient management is at using its assets to generate earnings. Calculated as: (Trailing 12M Net Income / Average Total Assets) * 100. Average Total Assets is the average of the beginning balance and ending balance of total assets." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.

- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 8 – Historical Financial Data – Return on Assets Ratio

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Efficiency Ratio	47.18	51.97	55.22	57.48	62.82	59.64	67.35	66.50	82.99	67.81	64.45
BNP Paribas	Efficiency Ratio	75.68	58.07	60.43	61.62	67.93	70.04	83.04	68.36	67.67	69.38	71.93
Credit Agricole	Efficiency Ratio	81.44	67.90	65.51	56.68	72.86	71.00	69.96	67.37	69.39	65.49	63.79
Banco Santander	Efficiency Ratio	49.89	47.72	55.10	60.12	56.47	63.67	60.63	57.60	56.13	56.26	54.35
Deutsche Bank	Efficiency Ratio	130.13	72.13	82.59	77.63	92.93	90.01	88.41	115.90	99.60	93.97	93.48
Societe Generale	Efficiency Ratio	72.28	72.55	62.63	66.45	71.04	71.53	68.07	65.89	66.48	74.47	71.14
Groupe BPCE	Efficiency Ratio	*	77.07	68.74	67.99	72.61	70.69	70.22	68.07	69.02	72.09	73.70
Barclays	Efficiency Ratio	34.73	57.39	63.73	70.25	84.02	78.65	80.79	84.18	76.26	73.35	76.86
Lloyds Banking Group	Efficiency Ratio	60.66	140.30	53.17	62.95	77.96	83.11	84.84	88.31	71.10	68.06	63.00
ING	Efficiency Ratio	99.03	88.93	90.83	61.91	66.91	58.35	66.52	57.03	60.99	55.86	59.23
Credit Mutuel Group	Efficiency Ratio	78.43	63.72	64.82	84.14	85.07	83.10	83.64	83.33	82.95	82.09	66.97
UBS	Efficiency Ratio	263.60	103.14	76.74	80.63	106.93	88.20	91.27	82.20	85.77	81.73	79.24
UniCredit	Efficiency Ratio	65.79	62.21	67.60	72.42	66.49	77.12	69.14	80.16	99.29	72.88	69.65
Intesa Sanpaolo	Efficiency Ratio	66.78	63.72	65.42	68.81	58.81	74.32	61.07	62.18	64.95	56.82	59.99
Royal Bank of Scotland	Efficiency Ratio	96.82	62.99	67.89	74.60	100.89	103.63	92.25	126.68	126.46	80.14	72.26
Credit Suisse	Efficiency Ratio	297.66	72.85	75.20	85.44	89.84	83.19	85.42	110.67	111.91	90.80	82.56
BBVA	Efficiency Ratio	59.60	46.33	49.45	56.32	57.23	61.58	62.40	55.37	56.75	52.42	50.83
Standard Chartered	Efficiency Ratio	54.49	52.37	56.18	56.23	57.11	54.28	60.24	73.05	72.99	70.56	78.75
Rabobank	Efficiency Ratio	65.17	67.88	65.97	64.84	67.38	75.92	63.05	69.24	77.29	72.74	68.48
Nordea Bank	Efficiency Ratio	53.05	49.99	51.96	55.17	51.13	51.37	52.82	49.07	48.90	54.01	55.77

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Efficiency Ratio (Cost to Income Ratio) figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Efficiency Ratio (Cost to Income Ratio): Efficiency Ratio (also known as Cost to Income Ratio) is an efficiency measure commonly used in the financial sector. The efficiency ratio measures costs compared to revenues. Unit: Actual. Calculated as: (Operating Expenses / ((Net Interest Income + Commissions & Fees Earned + Other Operating Income (Losses) + Trading Account Profits (Losses) + Gain/Loss on Investments/Loans + Other Income (Loss) - Commissions & Fees Paid) + Taxable Equivalent Adjustment or Net Revenue - Net of Commissions Paid) * 100." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.

- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
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- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 9 – Historical Financial Data – Efficiency Ratio

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Pretax Margin	10.77	10.12	26.44	28.55	28.66	33.09	28.81	29.89	13.98	31.51	34.77
BNP Paribas	Pretax Margin	12.17	20.00	26.44	20.25	23.51	19.14	7.09	21.33	22.89	24.23	22.08
Credit Agricole	Pretax Margin	5.75	6.53	10.03	5.50	(8.15)	14.11	15.41	16.99	15.20	24.34	24.82
Banco Santander	Pretax Margin	33.84	25.25	23.31	14.89	6.87	15.54	21.38	18.89	22.20	22.91	26.86
Deutsche Bank	Pretax Margin	(35.01)	17.13	12.73	14.83	2.24	4.22	8.99	(16.47)	(2.47)	4.11	4.75
Societe Generale	Pretax Margin	16.06	3.28	20.17	14.50	6.10	11.91	16.59	20.99	21.96	18.59	21.24
Groupe BPCE	Pretax Margin	*	(1.60)	23.01	18.63	15.83	19.74	21.04	23.63	24.19	21.33	20.28
Barclays	Pretax Margin	21.47	14.96	18.21	17.03	2.99	9.66	8.37	4.85	13.89	15.39	15.05
Lloyds Banking Group	Pretax Margin	7.20	4.20	1.05	(15.98)	(2.76)	2.09	9.92	8.71	22.76	26.33	29.80
ING	Pretax Margin	(2.26)	(7.85)	17.29	28.83	20.55	25.66	22.57	35.38	31.82	38.76	35.12
Credit Mutuel Group	Pretax Margin	4.28	18.73	26.38	11.50	11.43	12.34	12.96	13.25	13.16	13.80	26.44
UBS	Pretax Margin	(208.07)	(9.31)	21.90	18.02	(6.56)	11.05	8.24	16.93	13.63	17.03	18.56
UniCredit	Pretax Margin	17.11	10.11	7.76	(28.61)	(1.55)	(59.18)	15.47	2.45	(57.71)	18.38	16.75
Intesa Sanpaolo	Pretax Margin	9.04	18.52	18.03	(54.51)	15.29	(27.00)	15.91	21.10	17.70	31.67	26.40
Royal Bank of Scotland	Pretax Margin	(165.22)	(8.34)	(1.37)	(4.97)	(28.35)	(49.78)	16.62	(19.70)	(29.99)	16.15	23.64
Credit Suisse	Pretax Margin	(159.38)	24.35	24.01	13.27	9.33	16.00	13.96	(10.28)	(11.27)	8.68	16.30
BBVA	Pretax Margin	30.39	26.25	29.18	16.38	6.93	5.03	17.24	18.47	23.93	25.21	32.47
Standard Chartered	Pretax Margin	31.62	32.94	37.37	37.52	35.54	31.49	22.52	(9.66)	2.82	16.26	16.63
Rabobank	Pretax Margin	23.40	19.84	25.16	21.76	15.08	3.18	12.96	22.24	17.82	26.38	28.07
Nordea Bank	Pretax Margin	38.48	31.38	36.15	34.82	37.77	38.31	38.52	42.92	43.32	38.78	39.93

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Pretax Margin figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Pretax Margin: Calculated as: (Pretax Income (Losses) / Net Revenue * 100." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 10 – Historical Financial Data – Pre-Tax Margin

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Return on Common Equity	5.11	5.07	9.24	10.59	8.06	8.75	7.27	6.84	0.71	5.64	7.60
BNP Paribas	Return on Common Equity	6.73	10.57	11.76	8.56	8.59	5.74	(0.10)	7.46	8.27	8.22	7.76
Credit Agricole	Return on Common Equity	2.66	2.75	2.95	(3.55)	(16.39)	6.41	4.91	6.58	5.94	6.01	7.41
Banco Santander	Return on Common Equity	15.74	14.17	11.39	7.13	3.14	5.87	7.70	7.07	6.93	6.71	8.18
Deutsche Bank	Return on Common Equity	(11.32)	14.77	5.40	8.08	0.49	1.23	2.70	(10.72)	(2.74)	(1.71)	(0.04)
Societe Generale	Return on Common Equity	7.02	1.88	8.84	5.10	1.64	3.41	4.27	6.23	5.62	3.86	5.65
Groupe BPCE	Return on Common Equity	*	—	8.35	5.88	4.49	5.24	5.45	5.74	6.70	4.82	4.65
Barclays	Return on Common Equity	14.63	22.39	7.16	5.56	(1.19)	1.04	(0.32)	(0.72)	2.87	(3.39)	2.58
Lloyds Banking Group	Return on Common Equity	7.17	10.73	(0.72)	(6.06)	(3.35)	(2.07)	3.43	1.10	4.75	7.03	8.90
ING	Return on Common Equity	(2.26)	(4.65)	5.59	8.88	6.76	5.96	1.02	8.09	9.53	9.79	9.28
Credit Mutuel Group	Return on Common Equity	1.72	6.75	9.42	6.53	6.08	6.83	7.02	6.64	6.74	5.84	6.58
UBS	Return on Common Equity	(61.35)	(7.44)	17.16	8.30	(4.99)	6.75	7.03	11.71	5.88	2.01	8.56
UniCredit	Return on Common Equity	7.12	2.97	2.14	(15.91)	1.51	(25.51)	4.26	3.54	(27.69)	11.94	7.35
Intesa Sanpaolo	Return on Common Equity	5.08	5.52	5.09	(16.29)	3.32	(9.67)	2.80	5.98	6.64	14.86	7.97
Royal Bank of Scotland	Return on Common Equity	(43.44)	(5.28)	(1.47)	(2.66)	(8.44)	(14.12)	(6.34)	(4.03)	(15.64)	1.81	3.91
Credit Suisse	Return on Common Equity	(22.41)	17.77	13.19	4.90	3.02	4.81	4.05	(6.70)	(6.29)	(2.35)	4.72
BBVA	Return on Common Equity	19.04	15.32	14.12	8.11	4.21	5.31	5.72	5.48	7.34	7.51	11.39
Standard Chartered	Return on Common Equity	15.22	13.25	12.91	12.03	11.12	8.71	5.37	(5.10)	(1.06)	1.70	1.35
Rabobank	Return on Common Equity	8.89	6.53	7.44	6.38	4.73	4.92	4.61	5.50	4.97	6.71	7.38
Nordea Bank	Return on Common Equity	15.35	11.55	11.36	10.41	11.54	10.89	11.29	12.03	11.87	9.35	9.49

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Return on Common Equity figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Return on Common Equity: Measure of a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested, in percentage. Calculated as: (T12 Net Income Available for Common Shareholders / Average Total Common Equity) * 100. Average Total Common Equity is the average of the beginning balance and ending balance of total common equity. If either the beginning or ending total common equity is negative, Return on Equity will not be calculated." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 11 – Historical Financial Data – Return on Common Equity

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Return on Total Equity (Including Pref.)	5.17	5.20	9.35	10.77	8.27	8.94	7.25	7.05	1.35	5.90	7.29
BNP Paribas	Return on Total Equity (Including Pref.)	5.65	9.50	10.88	8.07	8.16	5.57	0.18	7.21	7.82	7.76	7.49
Credit Agricole	Return on Total Equity (Including Pref.)	2.48	2.58	2.77	(3.32)	(15.40)	6.09	5.07	6.77	6.32	6.27	7.53
Banco Santander	Return on Total Equity (Including Pref.)	15.74	14.17	11.39	7.13	3.14	5.87	7.70	7.07	6.93	7.14	8.18
Deutsche Bank	Return on Total Equity (Including Pref.)	(11.32)	14.77	5.40	8.08	0.49	1.23	2.60	(9.68)	(2.13)	(1.13)	0.40
Societe Generale	Return on Total Equity (Including Pref.)	6.35	1.73	8.84	5.10	1.64	4.08	5.05	7.00	6.40	4.63	6.85
Groupe BPCE	Return on Total Equity (Including Pref.)	*	—	7.97	5.80	4.49	5.24	5.45	5.74	6.70	4.82	4.65
Barclays	Return on Total Equity (Including Pref.)	14.63	22.39	7.16	5.56	(1.19)	1.02	0.13	(0.08)	3.34	(1.99)	3.39
Lloyds Banking Group	Return on Total Equity (Including Pref.)	7.17	10.73	(0.72)	(6.06)	(3.35)	(2.07)	3.22	1.81	5.08	7.11	8.71
ING	Return on Total Equity (Including Pref.)	(2.26)	(2.82)	6.63	12.05	8.00	7.00	2.54	8.09	9.53	9.79	9.28
Credit Mutuel Group	Return on Total Equity (Including Pref.)	1.72	6.75	9.42	6.53	6.08	6.83	7.02	6.64	6.74	5.84	6.58
UBS	Return on Total Equity (Including Pref.)	(61.35)	(7.44)	17.16	8.30	(4.84)	6.41	6.90	11.71	5.88	2.01	8.56
UniCredit	Return on Total Equity (Including Pref.)	7.12	2.97	2.14	(15.91)	1.51	(25.51)	4.18	3.41	(26.37)	11.09	6.76
Intesa Sanpaolo	Return on Total Equity (Including Pref.)	5.08	5.52	5.09	(16.29)	3.32	(9.67)	2.80	5.92	6.44	13.98	7.38
Royal Bank of Scotland	Return on Total Equity (Including Pref.)	(42.37)	(3.91)	(1.31)	(2.66)	(8.02)	(13.49)	(4.84)	(2.92)	(10.31)	2.85	4.45
Credit Suisse	Return on Total Equity (Including Pref.)	(21.77)	19.26	14.40	5.83	3.90	5.99	4.35	(6.67)	(6.28)	(2.35)	4.72
BBVA	Return on Total Equity (Including Pref.)	19.04	15.32	14.12	8.11	4.21	5.31	5.72	5.48	7.34	7.51	11.39
Standard Chartered	Return on Total Equity (Including Pref.)	15.08	13.66	13.22	12.29	11.36	8.93	5.64	(4.64)	(0.51)	2.44	2.08
Rabobank	Return on Total Equity (Including Pref.)	8.89	6.53	7.44	6.38	4.73	4.92	4.61	5.50	4.97	6.71	7.38
Nordea Bank	Return on Total Equity (Including Pref.)	15.35	11.05	10.50	9.64	10.75	10.21	10.60	11.66	11.87	9.25	9.32

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Return on Total Equity (Including Pref.) figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Return on Total Equity (Including Pref.): Amount of net income returned for the company as a percentage of average total equity. This field measures the company's profitability. Calculated as: [Trailing 12M Net Income / Average of Current and Prior Period (Common Equity + Preferred Equity)] * 100." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 12 – Historical Financial Data – Return on Total Equity

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Tier 1 Capital Ratio	8.30	10.80	12.10	11.50	13.40	12.00	12.50	13.90	16.10	17.30	17.00
BNP Paribas	Tier 1 Capital Ratio	7.80	10.10	11.40	11.60	13.60	11.70	11.50	12.20	12.90	13.20	13.10
Credit Agricole	Tier 1 Capital Ratio	8.60	9.50	10.30	11.20	11.70	10.90	13.70	13.70	15.10	14.10	13.70
Banco Santander	Tier 1 Capital Ratio	9.10	10.10	10.00	11.01	11.17	12.60	12.20	12.55	12.53	12.77	13.12
Deutsche Bank	Tier 1 Capital Ratio	10.10	12.60	12.30	12.90	15.10	16.90	16.10	14.70	15.60	16.80	15.70
Societe Generale	Tier 1 Capital Ratio	8.80	10.70	10.60	10.70	12.50	11.80	12.60	13.50	14.50	13.80	13.70
Groupe BPCE	Tier 1 Capital Ratio	*	9.10	10.10	10.60	12.20	12.80	12.70	13.30	14.50	15.40	15.90
Barclays	Tier 1 Capital Ratio	8.60	13.00	13.50	12.90	13.20	11.30	13.00	14.70	15.60	17.20	17.00
Lloyds Banking Group	Tier 1 Capital Ratio	8.00	9.60	11.60	12.50	13.80	14.50	16.50	16.40	17.00	17.20	18.20
ING	Tier 1 Capital Ratio	9.32	10.23	12.25	11.69	14.35	13.50	13.49	14.45	16.34	16.24	16.20
Credit Mutuel Group	Tier 1 Capital Ratio	9.80	11.80	10.80	11.00	14.60	14.90	16.10	16.40	16.30	17.90	17.90
UBS	Tier 1 Capital Ratio	11.00	15.40	17.80	15.90	21.30	13.60	19.40	21.00	19.70	18.28	17.54
UniCredit	Tier 1 Capital Ratio	6.66	8.63	9.46	9.32	11.44	10.09	11.26	11.50	9.04	15.36	13.64
Intesa Sanpaolo	Tier 1 Capital Ratio	7.10	8.40	9.40	11.50	12.10	12.30	14.20	13.80	13.90	15.20	15.20
Royal Bank of Scotland	Tier 1 Capital Ratio	10.00	14.10	12.90	13.00	12.40	13.10	13.20	19.10	17.70	17.90	18.40
Credit Suisse	Tier 1 Capital Ratio	13.30	16.30	17.20	15.20	15.20	16.80	17.10	18.00	18.00	18.90	16.20
BBVA	Tier 1 Capital Ratio	7.90	9.40	10.50	10.30	10.77	12.20	11.90	12.10	12.90	13.00	13.20
Standard Chartered	Tier 1 Capital Ratio	9.90	11.50	14.00	13.70	13.40	12.20	11.40	14.10	15.70	16.00	16.80
Rabobank	Tier 1 Capital Ratio	12.70	13.80	15.70	17.00	17.20	16.60	16.00	16.40	17.60	18.80	19.50
Nordea Bank	Tier 1 Capital Ratio	9.30	11.40	11.40	12.20	14.30	15.70	17.60	18.50	20.70	22.30	17.30

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Tier 1 Capital Ratio figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Tier 1 Capital Ratio: The ratio of Tier 1 capital to risk-weighted assets. The Bank of International Settlements in Basel requires a Tier I ratio of 4.4%. In Europe it is referred to as the BIS ratio, the European Solvency ratio, or the Cooke ratio as the Cooke committee established it." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.
- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 13 – Historical Financial Data – Tier 1 Capital Adequacy Ratio

	12 Months Ending	FY 2008 12/31/2008	FY 2009 12/31/2009	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015	FY 2016 12/31/2016	FY 2017 12/31/2017	FY 2018 12/31/2018
HSBC	Annualized Net Interest Margin	2.92	2.95	2.69	2.52	2.33	2.15	1.96	1.89	1.74	1.64	1.66
BNP Paribas	Annualized Net Interest Margin	0.77	1.11	1.29	1.32	1.43	1.53	1.52	1.64	1.60	1.59	1.47
Credit Agricole	Annualized Net Interest Margin	0.88	1.02	1.09	1.16	1.25	1.10	1.00	0.99	1.01	1.01	0.94
Banco Santander	Annualized Net Interest Margin	2.05	2.62	2.68	2.72	2.51	2.31	2.69	2.93	2.80	2.89	2.79
Deutsche Bank	Annualized Net Interest Margin	1.02	1.42	1.57	1.49	1.28	1.30	1.37	1.54	1.42	1.21	1.33
Societe Generale	Annualized Net Interest Margin	0.82	1.21	1.23	1.21	1.22	1.19	1.14	0.96	0.86	1.05	1.16
Groupe BPCE	Annualized Net Interest Margin	*	—	1.41	1.38	1.16	1.21	1.20	1.14	1.11	1.00	0.81
Barclays	Annualized Net Interest Margin	1.11	1.08	1.10	1.30	1.25	1.27	1.44	1.36	1.74	1.57	1.62
Lloyds Banking Group	Annualized Net Interest Margin	2.43	0.99	1.55	1.59	0.99	1.00	1.49	1.61	1.36	1.56	2.02
ING	Annualized Net Interest Margin	0.92	1.51	1.63	1.59	1.51	1.59	1.66	1.63	1.68	1.68	1.77
Credit Mutuel Group	Annualized Net Interest Margin	0.75	1.38	1.49	1.39	1.10	1.27	1.15	1.06	0.99	1.01	1.02
UBS	Annualized Net Interest Margin	0.36	0.58	0.64	0.76	0.70	0.80	0.95	0.95	0.91	0.79	0.78
UniCredit	Annualized Net Interest Margin	2.03	1.92	1.89	1.85	1.57	1.46	1.55	1.41	1.44	1.46	1.54
Intesa Sanpaolo	Annualized Net Interest Margin	2.13	2.07	1.88	1.96	1.90	1.62	1.75	1.59	1.40	0.96	1.01
Royal Bank of Scotland	Annualized Net Interest Margin	1.42	1.31	1.53	1.42	1.51	1.42	1.55	1.58	1.65	1.73	1.99
Credit Suisse	Annualized Net Interest Margin	0.74	0.73	0.68	0.72	0.79	1.01	1.14	1.19	1.04	1.20	1.32
BBVA	Annualized Net Interest Margin	2.66	3.08	2.63	2.58	3.03	2.89	2.97	2.81	2.38	2.57	2.61
Standard Chartered	Annualized Net Interest Margin	2.54	2.35	2.22	2.31	2.25	2.16	1.95	1.71	1.54	1.56	1.58
Rabobank	Annualized Net Interest Margin	1.52	1.45	1.56	1.61	1.59	1.58	1.62	1.64	1.64	1.73	1.75
Nordea Bank	Annualized Net Interest Margin	1.48	1.27	1.03	0.99	1.05	1.03	0.91	0.81	0.79	0.91	1.01

- Source: Bloomberg
- All values in millions of EUR except values relating to per share ratios or percentages (%)
- FY 2019 not included as most banks had not yet released their 2019 annual results at the time of extraction
- Annualized Net Interest Margin figures are as reported. Bloomberg does not alter underlying as reported figures, however figures are adjusted by Bloomberg as follows: "Annualized Net Interest Margin = (Investment Income – Interest Expenses) / Average Earning Assets." As such, values may differ from those disclosed in annual financial statements due to adjustments for the purpose of standardisation.

- * 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.
- Numbers in green represent banks ranking in the top 5 for a particular measure per year
- Numbers in red represent banks ranking in the bottom 5 for a particular measure per year

Appendix 6 – Table 14 – Historical Financial Data – Annualized Net Interest Margin

Appendix 8 – Historical Business & Geographic Segmentation Data for the 20 Banks

	Product Segment	Revenue For Fiscal Period Ending	12 months Dec-31-2008	12 months Dec-31-2009	12 months Dec-31-2010	12 months Dec-31-2011	12 months Dec-31-2012	12 months Dec-31-2013	12 months Dec-31-2014	12 months Dec-31-2015	12 months Dec-31-2016	12 months Dec-31-2017	12 months Dec-31-2018	12 months Dec-31-2019
HSBC	Wealth and Personal Banking / Retail Banking and Wealth Management / Global Private Banking		42.0%	43.4%	42.4%	41.2%	47.8%	40.8%	42.5%	40.7%	45.9%	42.8%	44.4%	45.2%
	Commercial Banking		23.2%	21.4%	20.0%	20.9%	21.9%	21.0%	23.8%	22.2%	27.2%	25.4%	27.2%	26.4%
	Global Banking and Markets		21.2%	39.8%	29.8%	24.2%	26.7%	29.4%	25.6%	28.4%	33.1%	28.5%	30.3%	27.6%
	Other		13.6%	(4.5%)	7.8%	13.7%	3.5%	8.8%	8.1%	8.8%	(6.2%)	3.3%	(1.9%)	0.8%
BNP Paribas	Retail Banking & Services		66.0%	46.7%	48.2%	*	59.8%	58.8%	71.0%	69.2%	68.9%	70.4%	71.9%	70.2%
	Corporate and Institutional Banking		33.4%	51.4%	45.8%	*	44.1%	42.9%	28.7%	28.8%	28.0%	28.9%	27.1%	27.8%
	Other		0.5%	2.0%	6.0%	*	-3.9%	-1.7%	0.2%	2.0%	3.1%	0.7%	0.9%	2.1%
Crédit Agricole	Asset Gathering (Asset Management & Insurance)		30.3%	29.5%	30.3%	27.6%	41.3%	39.6%	37.2%	30.8%	31.6%	30.4%	30.7%	32.1%
	Retail Banking		44.4%	39.7%	31.3%	31.4%	44.5%	41.5%	39.3%	37.0%	33.2%	31.0%	30.1%	30.1%
	Specialised Financial Services (inc. Corporate Banking)		18.0%	17.8%	16.2%	15.3%	10.3%	11.2%	11.6%	13.2%	13.9%	13.2%	12.3%	11.7%
	Wholesale Banking		4.6%	18.0%	28.7%	32.6%	26.5%	23.9%	26.0%	29.4%	30.9%	29.2%	29.1%	28.8%
	Other (Non-Business)		2.7%	(4.9%)	(6.5%)	(6.9%)	(22.5%)	(16.3%)	(14.2%)	(10.4%)	(9.5%)	(3.9%)	(2.2%)	(2.7%)
Santander	Retail Banking		*	*	86.8%	*	79.7%	84.9%	78.9%	87.3%	85.0%	86.9%	82.8%	83.9%
	Corporate & Investment Banking		*	*	16.3%	*	18.6%	13.7%	12.5%	13.0%	13.9%	12.3%	12.3%	12.7%
	Private Banking, Asset & Wealth Management, Insurance		*	*	3.5%	*	3.5%	-	-	-	3.0%	4.2%	5.3%	5.6%
	Other		*	*	-6.6%	*	-1.8%	1.3%	8.6%	-0.3%	-2.0%	-3.4%	-0.4%	-2.3%
Deutsche Bank	Corporate Bank		*	67.1%***	71.5%***	55.6%***	60.5%***	56.7%***	24.1%	56.8%***	55.7%***	20.6%	20.7%	22.1%
	Investment Bank		*						32.6%			31.8%	30.2%	30.8%
	Private Bank		*	18.9%	20.1%	29.3%	27.4%	29.1%	24.4%	31.1%	37.2%	32.4%	33.0%	35.0%
	Asset Management (AM)		*	10.5%	16.5%	13.6%	13.9%	15.7%	8.6%	9.3%	10.5%	9.8%	8.8%	10.4%
	Other		*	3.5%	-8.2%	1.5%	-1.7%	-1.5%	10.3%	2.8%	-3.4%	5.4%	7.3%	1.7%
Société Générale	Retail Banking & Financial Services		69.0%	75.3%	57.9%	64.6%	71.1%	71.3%	62.8%	60.8%	62.4%	65.7%	63.2%	64.4%
	Global Banking & Investor Solutions (Global Markets, Investor Services, Financing, Advisory, Corporate Banking, Investment Banking, Securities Services, Brokerage)		10.4%	36.3%	36.7%	30.4%	33.5%	36.9%	36.7%	35.7%	34.7%	35.7%	32.3%	32.3%
	Global Banking & Investor Solutions (Asset & Wealth Management, Private Banking)		6.1%	9.0%	5.3%	5.2%	6.7%	5.7%	5.0%	4.6%	4.2%	4.4%	3.9%	4.1%
	Other		14.4%	(20.7%)	0.2%	(0.2%)	(11.3%)	(13.9%)	(4.5%)	(1.1%)	(1.4%)	(5.7%)	0.7%	(0.7%)
Groupe BPCE	Retail Bank and Insurance		#	78.6%	68.1%	72.7%	73.2%	69.9%	71.5%	68.5%	68.9%	69.3%	66.3%	66.7%
	Corporate & Investment Banking		#	7.7%	13.0%	13.3%	13.0%	12.3%	12.7%	12.9%	13.4%	15.5%	13.6%	13.1%
	Asset & Wealth Management		#	8.9%	8.1%	9.1%	10.5%	11.8%	13.6%	15.9%	12.0%	13.9%	15.6%	16.4%
	Other		#	4.8%	10.8%	4.9%	3.4%	6.0%	2.3%	2.6%	5.7%	1.2%	4.4%	3.8%
Barclays	Retail Banking		36.9%	32.4%	27.1%	29.3%	36.7%	32.6%	33.5%	33.7%	33.8%	34.7%	33.3%	33.7%
	Corporate Banking, Investment Banking, Asset & Wealth Management, Payments		65.7%	76.1%	71.3%	63.7%	71.5%	61.1%	63.0%	65.4%	69.9%	69.1%	68.0%	68.5%
	Other		-2.6%	-8.6%	1.5%	7.0%	-8.2%	6.3%	3.5%	0.9%	-3.7%	-3.8%	-1.3%	-2.1%
Lloyds Banking Group	Retail Banking , Consumer Finance & Wealth Management		63.1%	50.1%	46.0%	53.6%	57.3%	60.5%	64.3%	58.3%	58.1%	56.4%	60.3%	59.6%
	Corporate & Commercial Banking		5.6%	18.2%	34.9%	25.5%	40.6%	29.1%	28.2%	27.2%	28.6%	26.4%	25.9%	23.5%
	Insurance		38.9%	34.0%	15.9%	17.9%	11.7%	11.2%	11.0%	12.5%	13.1%	12.0%	12.1%	13.5%
	Other		-7.6%	-2.4%	3.2%	3.0%	-9.5%	-0.8%	-3.6%	1.9%	0.2%	5.2%	1.6%	3.5%
ING	Retail Banking (inc. Direct/Online Banking)		67.3%	67.9%	53.3%	53.1%	55.9%	68.8%	71.2%	66.1%	67.6%	68.2%	68.5%	69.0%
	Corporate & Wholesale Banking		32.5%	32.1%	31.7%	30.2%	31.5%	31.3%	28.8%	31.5%	32.4%	31.1%	31.5%	31.0%
	Other		0.3%	0.0%	15.0%	16.7%	12.6%	-0.1%	0.0%	2.3%	0.0%	0.7%	0.0%	0.0%
Crédit Mutuel	Retail Banking		98.7%	77.1%	78.3%	86.3%	76.3%	76.2%	74.8%	73.8%	72.0%	70.9%	73.0%	72.7%
	Corporate and Investment Banking		(11.2%)	12.4%	9.8%	6.6%	7.9%	7.2%	6.7%	6.8%	6.8%	6.8%	6.5%	5.2%
	Insurance		14.0%	11.8%	11.9%	10.4%	14.1%	13.9%	15.0%	13.5%	12.9%	14.1%	13.5%	13.6%
	Asset Management/Private Banking		6.3%	4.6%	4.6%	4.7%	4.7%	4.8%	4.8%	5.0%	4.8%	4.9%	5.0%	5.2%
	Other		-7.8%	-5.8%	-4.6%	-8.0%	-3.0%	-2.0%	-1.2%	0.8%	3.5%	3.2%	2.0%	3.4%
UBS	Wealth Management		65.0%	*	*	*	50.8%	50.8%	53.2%	50.8%	53.1%	54.5%	55.6%	56.6%
	Personal & Corporate Banking		19.5%	*	*	*	14.7%	13.5%	13.3%	12.7%	14.0%	13.0%	13.8%	12.9%
	Asset Management		11.5%	*	*	*	7.4%	7.0%	6.8%	6.7%	6.8%	7.0%	6.1%	6.7%
	Investment Bank		0.0%	*	*	*	28.1%	30.4%	29.6%	28.8%	27.1%	25.8%	26.6%	25.2%
	Other		4.0%	*	*	*	1.0%	1.8%	2.9%	-1.0%	1.0%	0.3%	2.1%	1.3%
	* Data not disclosed													
	# 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.													
	Data obtained from S&P Capital IQ (unless otherwise indicated)													

Appendix 7 – Table 1 (1/2) – Business Product Segmentation

	Product Segment	Revenue For Fiscal Period Ending	12 months Dec-31-2008	12 months Dec-31-2009	12 months Dec-31-2010	12 months Dec-31-2011	12 months Dec-31-2012	12 months Dec-31-2013	12 months Dec-31-2014	12 months Dec-31-2015	12 months Dec-31-2016	12 months Dec-31-2017	12 months Dec-31-2018	12 months Dec-31-2019
UniCredit	Commercial Banking		*	*	47.2%	47.9%	48.7%	53.8%	63.5%	72.1%	129.3%	63.6%	65.4%	69.0%
	Corporate & Investment Banking (CIB)		*	*	29.9%	27.4%	19.9%	18.5%	19.9%	26.6%	49.6%	22.6%	23.2%	24.5%
	Central Easter Europe & Poland		*	*	17.0%	19.3%	40.8%	28.0%	26.2%	20.1%	45.6%	21.6%	23.1%	24.1%
	Other		*	*	5.8%	5.4%	-9.4%	-0.3%	-9.6%	-18.8%	-124.6%	-7.8%	-11.6%	-17.6%
Intesa Sanpaolo	Retail & Commercial Banking		67.4%	58.6%	60.1%	57.1%	57.8%	68.5%	48.2%	46.7%	50.8%	49.9%	*	46.9%
	Corporate & Investment Banking		12.0%	20.8%	23.2%	23.0%	23.7%	20.7%	18.8%	19.4%	19.9%	19.5%	*	23.0%
	Asset Management		2.0%	1.8%	1.7%	2.1%	2.3%	2.5%	3.9%	5.0%	3.8%	4.5%	*	4.6%
	Private Banking		3.5%	3.8%	4.6%	6.0%	6.4%	5.5%	10.5%	11.0%	10.3%	10.9%	*	10.9%
	International Subsidiary Banks		12.8%	12.8%	13.9%	13.2%	9.8%	13.1%	11.9%	10.6%	11.8%	10.9%	*	11.0%
	Insurance		-	-	-	-	-	-	6.7%	7.2%	6.9%	6.1%	*	6.3%
	Other		2.3%	2.2%	-3.6%	-1.3%	0.0%	-10.3%	0.0%	0.0%	-3.5%	-1.8%	*	-2.7%
Royal Bank of Scotland	Retail & Commercial Banking		54.1%	30.4%	38.8%	44.5%	107.1%	84.3%	62.0%	71.2%	81.7%	78.4%	75.1%	66.4%
	Corporate Banking		25.7%	13.9%	23.2%	25.9%	-	-	-	-	-	-	-	-
	Investment Banking		13.8%	54.5%	35.5%	27.9%	63.7%	29.5%	11.8%	20.1%	7.9%	9.7%	11.8%	10.3%
	Private Banking & Wealth Management		7.8%	5.6%	5.8%	6.9%	11.1%	7.5%	4.2%	4.5%	5.4%	5.3%	6.0%	5.8%
	International Banking		17.9%	12.8%	18.4%	15.2%	-	3.7%	2.4%	2.6%	3.0%	3.1%	4.6%	4.5%
	Insurance		33.0%	24.1%	(4.1%)	-	-	-	-	-	-	-	-	-
	Other		-52.3%	-41.3%	-17.6%	-20.5%	-81.9%	-25.1%	19.6%	1.6%	1.9%	3.6%	2.5%	13.1%
Credit Suisse	Private Banking & Wealth Management		158.6%	35.6%	39.7%	51.7%	56.7%	37.0%	38.0%	39.1%	48.7%	49.5%	52.7%	53.6%
	Investment Banking		-31.3%	61.6%	50.8%	40.4%	53.6%	50.7%	45.3%	46.6%	45.6%	42.6%	38.5%	36.4%
	Corporate & Institutional Banking		-	5.0%	6.6%	-	-	7.5%	7.2%	10.3%	12.3%	11.9%	11.8%	12.0%
	Other		-27.2%	-2.3%	3.0%	7.9%	-10.3%	4.8%	9.5%	4.0%	-6.5%	-4.0%	-2.9%	-2.0%
BBVA	Banking Activity in Spain (inc. non-core real estate)		31.0%	38.1%	0.0%	32.4%	30.1%	28.9%	30.9%	29.0%	26.0%	24.4%	28.1%	27.1%
	The United States		9.5%	11.7%	-	11.1%	10.1%	9.9%	10.3%	11.3%	11.0%	11.4%	14.3%	13.1%
	Mexico		22.2%	23.6%	-	27.1%	26.4%	29.8%	31.5%	30.3%	27.4%	28.2%	34.4%	31.0%
	Turkey		-	-	-	-	-	4.5%	4.6%	10.4%	17.3%	16.3%	18.6%	13.2%
	South America		14.5%	17.6%	-	20.9%	24.3%	26.9%	25.0%	19.2%	16.4%	17.6%	17.7%	15.1%
	Rest of Eurasia		-	4.6%	-	7.5%	7.6%	3.8%	3.6%	2.0%	2.0%	1.9%	2.0%	2.2%
	Wholesale Banking & Asset Management		11.5%	-	-	-	-	-	-	-	-	-	-	-
	Other		11.3%	4.4%	0.0%	1.0%	1.5%	-3.8%	-5.8%	-2.1%	-0.1%	0.3%	-15.1%	-1.7%
Standard Chartered	Corporate & Institutional Banking		55.6%	63.3%	63.7%	62.5%	63.2%	59.7%	58.5%	37.1%	42.0%	44.3%	45.3%	46.5%
	Retail Banking		40.7%	34.7%	36.2%	37.5%	36.2%	29.1%	31.8%	41.1%	37.2%	34.2%	34.0%	33.4%
	Commercial Banking		-	-	-	-	-	7.9%	5.9%	4.0%	7.2%	8.8%	8.2%	10.0%
	Private Banking		-	-	-	-	-	3.4%	3.8%	4.1%	4.4%	3.8%	3.7%	4.2%
	Other		3.7%	2.0%	0.0%	0.0%	0.5%	0.0%	0.0%	13.8%	9.2%	8.9%	8.9%	5.9%
Rabobank	Domestic Retail Banking		56.9%	51.6%	53.6%	56.7%	57.4%	65.5%	56.6%	55.6%	60.2%	60.0%	61.0%	62.1%
	Wholesale & Rural Banking		11.6%	23.3%	26.0%	27.6%	30.6%	31.7%	32.9%	24.3%	28.9%	27.6%	25.7%	29.0%
	Leasing		8.6%	6.9%	8.4%	10.6%	9.6%	10.1%	14.1%	13.6%	14.6%	9.7%	10.7%	11.6%
	Asset Management		15.1%	9.4%	10.5%	4.3%	3.4%	0.0%	-	-	-	-	-	-
	Property Development		4.1%	4.6%	3.7%	3.6%	1.2%	(1.8%)	(0.4%)	4.9%	5.2%	5.8%	5.0%	2.9%
	Other		3.8%	4.2%	-2.2%	-2.8%	-2.3%	-5.6%	-3.3%	1.6%	-8.8%	-3.1%	-2.3%	-5.7%
Nordea	Personal Banking		-	-	*	*	*	*	50.8%	34.8%	33.8%	38.7%	37.6%	40.8%
	Business Banking		-	-	*	*	*	*		19.5%	18.8%	23.0%	24.5%	25.8%
	Large Corporates & Institutions		-	-	*	*	*	*	24.1%	23.7%	21.5%	19.6%	19.0%	16.5%
	Asset and Wealth Management		-	-	*	*	*	*	17.4%	19.9%	21.4%	21.6%	18.6%	12.1%
	Other		8.4%	21.0%	*	*	*	*	7.7%	2.1%	4.6%	-2.9%	0.3%	4.8%
	Nordic Banking		77.0%	64.7%	*	*	*	*	-	-	-	-	-	-
	New European Markets		5.6%	4.4%	*	*	*	*	-	-	-	-	-	-
	Financial Institutions		5.1%	6.1%	*	*	*	*	-	-	-	-	-	-
	Shipping, Offshore, & Oil Services		3.9%	3.7%	*	*	*	*	-	-	-	-	-	-
	* Data not disclosed													
	# 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.													
	Data obtained from S&P Capital IQ (unless otherwise indicated)													

Appendix 7 – Table 1 (2/2) – Business Product Segmentation

	Geographic Segment	Revenue For Fiscal Period Ending	12 months Dec-31-2008	12 months Dec-31-2009	12 months Dec-31-2010	12 months Dec-31-2011	12 months Dec-31-2012	12 months Dec-31-2013	12 months Dec-31-2014	12 months Dec-31-2015	12 months Dec-31-2016	12 months Dec-31-2017	12 months Dec-31-2018	12 months Dec-31-2019
HSBC	Europe		47.4%	45.3%	36.4%	36.1%	26.1%	33.1%	35.3%	35.6%	33.8%	33.7%	32.9%	32.1%
	Asia		30.9%	40.5%	34.8%	34.9%	41.4%	40.7%	40.1%	43.9%	50.8%	50.8%	54.2%	55.7%
	Middle East and North Africa (MENA)		4.2%	3.2%	3.3%	3.8%	3.6%	4.3%	5.4%	4.8%	6.0%	4.9%	4.8%	6.7%
	North America		7.7%	1.6%	16.1%	14.9%	18.7%	12.9%	13.6%	12.7%	14.2%	13.9%	13.4%	11.9%
	Latin America		14.1%	16.4%	15.1%	15.9%	14.7%	13.4%	10.7%	9.1%	3.3%	5.4%	4.8%	5.2%
	Other		(4.4%)	(6.9%)	(5.8%)	(5.7%)	(4.5%)	(4.5%)	(5.2%)	(6.1%)	(8.1%)	(8.8%)	(10.0%)	(11.6%)
BNP Paribas	Europe		75.8%	76.7%	78.8%	*	76.3%	78.4%	75.7%	73.3%	73.1%	73.4%	74.6%	75.1%
	North America / Americas		14.7%	14.3%	12.9%	*	11.4%	10.3%	10.3%	11.8%	11.9%	11.7%	10.9%	10.5%
	Asia & Pacific		4.6%	4.8%	4.6%	*	5.5%	6.9%	6.9%	7.5%	7.1%	7.4%	7.1%	7.2%
	Other		4.9%	4.2%	3.7%	*	6.9%	4.4%	7.1%	7.4%	8.0%	7.5%	7.4%	7.2%
Crédit Agricole	France		51.5%	48.8%	51.1%	53.2%	47.9%	51.9%	50.5%	52.6%	51.4%	54.1%	52.9%	53.0%
	Europe (ex-France)		42.8%	42.4%	40.0%	38.9%	45.6%	40.9%	42.6%	40.2%	40.8%	38.8%	40.5%	40.0%
	Central America and South America		0.9%	0.6%	0.3%	0.3%	0.3%	0.2%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%
	Africa and the Middle East		2.7%	2.6%	2.4%	2.2%	2.7%	2.7%	2.7%	3.0%	3.0%	2.5%	2.3%	2.4%
	Asia and Oceania		6.5%	5.5%	6.1%	5.4%	3.6%	4.3%	3.9%	4.0%	4.5%	4.2%	4.1%	4.3%
	Other		(4.3%)	-	-	-	-	-	-	-	-	-	-	-
Santander	Europe (ex. UK)		*	*	31.3%	22.0%	9.0%	28.5%	26.7%	30.5%	33.0%	*	*	36.8%
	United Kingdom		*	*	17.3%	15.8%	17.9%	14.3%	15.0%	17.8%	16.6%	*	*	11.2%
	United States		*	*	7.3%	9.6%	10.3%	9.1%	10.9%	13.3%	12.5%	*	*	12.0%
	Latin America		*	*	50.6%	53.7%	64.6%	46.9%	38.9%	38.7%	39.9%	*	*	44.6%
	Other		*	*	-6.6%	-1.3%	-1.8%	1.3%	8.6%	-0.3%	-2.0%	*	*	-4.6%
Deutsche Bank	Germany		*	25.5%	31.0%	38.5%	37.0%	36.2%	34.3%	30.7%	35.3%	36.9%	38.5%	40.9%
	UK		*	39.2%	21.7%	16.7%	14.2%	16.2%	14.1%	18.1%	16.3%	16.2%	14.5%	11.4%
	Rest of EMEA		*		9.3%	14.8%	15.3%	13.7%	14.1%	12.4%	14.7%	14.3%	13.5%	14.2%
	Americas (Primarily United States)		*	21.5%	26.1%	19.2%	25.4%	23.4%	25.6%	25.0%	22.7%	22.2%	21.6%	19.6%
	Asia/Pacific		*	10.6%	13.2%	10.9%	11.0%	12.1%	12.0%	13.2%	12.4%	12.4%	12.5%	13.2%
	Other		*	3.2%	(1.3%)	(0.1%)	(2.9%)	(1.6%)	(0.1%)	0.5%	(1.6%)	(2.0%)	(0.6%)	0.6%
Société Générale	France		50.8%	43.0%	49.5%	49.2%	42.6%	44.8%	45.3%	47.5%	47.7%	45.0%	46.7%	47.5%
	Europe		34.5%	38.9%	33.3%	33.8%	38.7%	38.7%	41.6%	33.8%	34.5%	37.0%	35.3%	34.1%
	Americas		7.1%	9.1%	8.4%	7.1%	6.8%	5.6%	5.5%	7.5%	7.0%	6.2%	5.9%	6.0%
	Africa		5.1%	5.4%	5.1%	5.6%	7.0%	5.0%	4.8%	4.7%	4.9%	5.7%	5.9%	6.7%
	Asia/Oceania		2.5%	3.6%	3.7%	4.2%	4.9%	6.0%	2.8%	6.4%	5.9%	6.1%	6.3%	5.7%
Groupe BPCE	France		#	*	85.3%	85.5%	84.5%	83.9%	82.8%	80.1%	81.5%	78.7%	79.3%	76.1%
	Rest of Europe		#	*	5.3%	5.1%	5.0%	4.6%	5.0%	6.0%	4.7%	6.1%	6.2%	7.7%
	North America		#	*	6.2%	6.2%	7.0%	8.0%	9.1%	10.7%	10.4%	11.1%	11.0%	11.0%
	Rest of World		#	*	3.2%	3.3%	3.6%	3.5%	3.1%	3.1%	3.3%	4.1%	3.5%	5.2%
Barclays	United Kingdom		56.7%	44.1%	40.4%	49.0%	29.8%	41.0%	52.6%	55.2%	51.7%	51.8%	54.5%	54.6%
	Europe		18.9%	15.3%	15.4%	13.0%	17.8%	14.4%	13.3%	10.2%	9.7%	9.4%	7.7%	8.1%
	United States		0.2%	22.4%	22.8%	18.0%	29.3%	24.2%	27.0%	28.3%	32.1%	33.4%	32.7%	32.1%
	Americas (ex. United States)				1.8%	0.7%	0.9%	1.0%	0.7%	1.7%	1.9%	0.7%	0.7%	0.6%
	Africa and Middle East		16.9%	15.1%	15.9%	15.4%	17.9%	14.8%	2.9%	1.8%	2.0%	0.7%	0.2%	0.3%
	Asia		7.2%	3.1%	3.7%	3.9%	4.3%	4.6%	3.6%	2.9%	2.7%	4.0%	4.2%	4.4%
Lloyds Banking Group	United Kingdom		100.0%	94.0%	90.4%									
	Non-United Kingdom		-	6.0%	9.6%									
ING	Netherlands		34.5%	-	35.6%	36.9%	43.0%	34.0%	33.0%	32.3%	33.5%	34.0%	34.0%	30.2%
	Belgium		21.3%	-	14.9%	14.5%	18.5%	21.9%	21.7%	19.9%	18.2%	17.2%	16.5%	15.9%
	Rest of Europe		39.5%	-	28.8%	28.9%	24.8%	-	-	-	-	-	-	-
	Germany		-	-	-	-	-	10.7%	12.1%	13.5%	14.2%	14.2%	14.7%	15.4%
	Challengers (Australia, Austria, Czech Republic, France, Italy, Spain)		-	-	-	-	-	6.2%	8.5%	8.8%	9.4%	9.2%	9.9%	11.3%
	Growth Market (Poland, Romania, Turkey, the Philippines, other stakes in Asia)		-	-	-	-	-	12.8%	12.4%	10.2%	10.9%	11.0%	11.5%	12.0%
	Asia Pacific		7.0%	0.0%	6.8%	8.3%	7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Rest of World		-	-	-	-	-	16.9%	14.4%	15.6%	12.9%	13.3%	12.3%	12.0%
	North America		(2.7%)	-	13.0%	11.1%	6.2%	-	-	-	-	-	-	-
	Latin America		0.4%	-	1.0%	0.3%	0.4%	-	-	-	-	-	-	-
	Other		0.0%	0.0%	0.0%	0.0%	-0.4%	-2.5%	-2.2%	-0.2%	0.9%	1.2%	1.1%	3.2%
Crédit Mutuel	France		97.8%	88.8%	87.8%	85.7%	86.6%	84.7%	84.6%	83.2%	83.3%	82.3%	80.4%	81.3%
	Rest of Europe		5.4%	10.8%	11.0%	12.3%	12.4%	14.0%	13.5%	15.5%	15.4%	16.6%	18.0%	17.5%
	Other Countries		(3.2%)	0.3%	1.2%	2.0%	1.0%	1.3%	1.9%	1.2%	1.3%	1.1%	1.6%	1.2%
UBS	Switzerland		55.5%	*	*	*	27.1%	24.5%	24.3%	23.5%	24.4%	23.3%	23.5%	23.2%
	Europe, Middle East and Africa (Excluding Switzerland)		29.5%	*	*	*	25.1%	23.8%	24.3%	22.1%	21.6%	20.6%	20.5%	20.1%
	United States		-	*	*	*	34.9%	34.7%	36.1%	34.2%	38.7%	37.8%	38.1%	37.7%
	Asia Pacific		15.0%	*	*	*	13.7%	16.2%	16.4%	16.6%	15.0%	16.2%	16.2%	16.3%
	Americas (Excluding USA)		-	*	*	*	2.4%	2.2%	2.1%	2.3%	1.7%	2.7%	3.6%	3.8%
	Global		-	*	*	*	(3.1%)	(1.4%)	(3.2%)	1.3%	(1.4%)	(0.7%)	(2.0%)	(1.0%)
	* Data not disclosed													
	# 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.													
	Data obtained from S&P Capital IQ (unless otherwise indicated)													

Appendix 7 – Table 2 (1/2) – Geographic Segmentation

	Geographic Segment	Revenue For Fiscal Period Ending	12 months Dec-31-2008	12 months Dec-31-2009	12 months Dec-31-2010	12 months Dec-31-2011	12 months Dec-31-2012	12 months Dec-31-2013	12 months Dec-31-2014	12 months Dec-31-2015	12 months Dec-31-2016	12 months Dec-31-2017	12 months Dec-31-2018	12 months Dec-31-2019
UniCredit	Italy		*	*	36.9%	38.3%	40.8%	44.1%	44.2%	48.5%	47.2%	46.9%	46.9%	46.8%
	Germany		*	*	18.3%	17.6%	14.7%	16.1%	15.4%	18.7%	21.6%	21.1%	21.2%	21.4%
	Austria		*	*	9.9%	8.9%	8.9%	8.7%	9.0%	10.8%	9.8%	9.6%	9.5%	9.2%
	Western Europe (ex. Italy, Germany, Austria)		*	*	7.0%	7.3%	6.2%	5.1%	5.2%	2.5%	1.4%	2.0%	1.8%	1.2%
	Central and Eastern Europe		*	*	26.0%	26.7%	28.2%	24.6%	24.9%	19.5%	19.9%	20.3%	20.6%	21.5%
	America		*	*	0.7%	0.9%	1.1%	1.2%	1.1%	(0.0%)	0.1%	0.0%	0.0%	0.0%
	Asia		*	*	1.1%	0.3%	0.2%	0.1%	0.1%	0.0%	(0.0%)	(0.0%)	(0.0%)	-
	Rest of the World		*	*	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-
Intesa Sanpaolo	Italy		81.8%	78.7%	*	77.0%	80.2%	79.8%	78.9%	77.8%	76.5%	77.7%	79.5%	79.4%
	Europe (ex. Italy)		18.9%	19.0%	*	19.5%	16.7%	17.0%	17.4%	16.8%	17.0%	18.0%	16.6%	16.3%
	Rest of The World		(0.7%)	2.2%	*	3.5%	3.1%	3.2%	3.7%	5.4%	6.5%	4.3%	3.9%	4.3%
Royal Bank of Scotland	United Kingdom (UK)		67.4%	67.9%	58.6%	62.3%	68.1%	74.4%	78.7%	88.0%	92.0%	92.7%	90.9%	90.4%
	United States of America (USA)		13.1%	20.0%	25.8%	21.6%	13.4%	10.0%	7.5%	1.8%	1.7%	1.5%	1.9%	1.4%
	Europe		8.7%	6.2%	11.2%	11.3%	12.8%	10.5%	9.2%	6.7%	4.0%	4.2%	6.0%	7.3%
	Rest of the World		10.8%	5.8%	4.4%	4.7%	5.7%	5.1%	4.6%	3.6%	2.3%	1.5%	1.2%	0.8%
Credit Suisse	Switzerland		138.9%	31.2%	29.3%	33.0%	37.1%	31.1%	31.4%	35.9%	41.5%	37.2%	36.5%	37.5%
	Europe, Middle East and Africa (EMEA)		(40.7%)	19.9%	23.6%	24.8%	13.7%	18.3%	16.6%	16.2%	10.2%	5.9%	8.1%	8.7%
	Americas		(8.1%)	41.7%	40.9%	35.5%	41.3%	41.8%	42.3%	35.6%	35.5%	42.7%	41.7%	40.5%
	Asia Pacific		10.0%	7.2%	6.2%	6.7%	7.8%	8.8%	9.7%	12.3%	12.9%	14.2%	13.7%	13.3%
BBVA	Spain		55.6%	47.2%	42.1%	41.3%	37.5%	33.9%	31.0%	25.3%	21.5%	17.4%	18.1%	17.6%
	Europe (ex. Spain)		0.0%	4.6%	3.5%	3.5%	3.1%	2.2%	1.6%	1.6%	1.1%	1.4%	1.9%	1.7%
	Rest of World (ex. Europe)		44.4%	48.2%	54.3%	55.2%	59.5%	63.9%	67.4%	73.1%	77.4%	81.2%	80.0%	80.7%
Standard Chartered	Greater China & North Asia (inc. Hong Kong)		32.5%	35.8%	36.0%	37.8%	37.5%	35.9%	37.9%	49.4%	43.7%	41.8%	43.3%	41.7%
	ASEAN & South Asia		37.6%	33.7%	33.8%	32.0%	29.7%	32.0%	28.9%	20.8%	29.2%	24.3%	26.1%	25.5%
	Middlea East & Africa		19.3%	17.5%	20.3%	19.7%	19.8%	19.2%	21.0%	18.3%	19.2%	18.8%	16.7%	16.7%
	Europe & Americas		10.6%	13.1%	9.9%	10.6%	13.0%	12.9%	12.1%	15.8%	10.2%	11.4%	11.4%	11.2%
	Other		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-4.4%	-2.3%	3.6%	2.6%	4.8%
Rabobank**	Netherlands		67.4%	59.3%	60.7%	63.5%	67.5%	69.8%	69.8%	76.0%	74.0%	73.9%	66.9%	65.5%
	Europe (ex. Netherlands)		14.6%	17.2%	17.6%	15.6%	12.2%	10.4%	10.9%	6.8%	7.5%	6.8%	10.3%	9.5%
	North America		7.9%	9.9%	14.5%	13.1%	13.5%	12.3%	9.9%	7.5%	9.1%	9.4%	12.8%	14.6%
	Latin America		3.5%	3.1%	4.0%	3.9%	3.8%	3.0%	2.8%	2.4%	2.1%	2.3%	2.1%	2.3%
	Asia & Australia		5.0%	5.9%	6.2%	4.3%	4.4%	4.6%	6.7%	7.3%	7.2%	7.7%	7.9%	8.0%
	Other		1.6%	4.6%	-2.9%	-0.4%	-1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nordea	Sweden		19.1%	19.1%	*	*	*	*	23.6%	25.5%	30.4%	28.0%	33.6%	25.9%
	Finland		26.8%	18.5%	*	*	*	*	17.9%	20.6%	19.3%	21.0%	19.8%	20.0%
	Norway		19.3%	17.3%	*	*	*	*	17.3%	16.7%	16.1%	17.9%	18.2%	19.5%
	Denmark		24.5%	35.1%	*	*	*	*	31.1%	27.5%	30.1%	30.9%	28.9%	28.2%
	Russia		1.9%	2.3%	*	*	*	*	2.0%	1.8%	1.6%	1.0%	0.7%	
	Europe (Other)		3.8%	3.5%	*	*	*	*	2.0%	5.5%	8.3%	8.4%	6.2%	
	United States		-	-	*	*	*	*	-	-	1.5%	1.2%	0.9%	6.3%
	Asia Pacific		0.0%	0.0%	*	*	*	*	0.0%	0.0%	0.5%	0.5%	0.4%	
	Other		4.6%	4.2%	*	*	*	*	6.1%	2.3%	-7.8%	-8.9%	-8.9%	
	* Data not disclosed													
	# 2008 numbers not available for Groupe BPCE as the bank was only formed in 2009 through the merger of Caisse Nationale des Caisses D'épargne and Banque Fédérale des Banques Populaires.													
	** Figures for Rabobank from 2015 onward were obtained directly from Rabobank annual financial statements													
	Data obtained from S&P Capital IQ (unless otherwise indicated)													

Appendix 7 – Table 2 (2/2) – Geographic Segmentation

Appendix 9 – Consolidated List of Sources for Single Case Matrices

9to5Mac.com	9to5's family of sites, are a top influencer in the tech community and are cited by publications like the New York Times, the Washington Post, the Wall Street Journal, the Financial Times, and, Bloomberg. 9to5Mac was established in 2007 and focuses on technology developments.
ADVFN	ADVFN Plc provides comprehensive global stock, crypto, forex and commodity market information to the private investors in the UK, US, Brazil, Italy and other international retail markets. 34 million+ unique global users per Year, 3+ million monthly unique users, 10+ million visitors to the site a month generating 1 billion yearly page impressions. ADVFN Plc is incorporated in the UK and listed on AIM London Stock Exchange. It is a global stocks, shares, Crypto and Forex information website.
AltFi	Founded in 2013, AltFi provides market-leading news, opinion, insights and events for the rapidly-growing alternative finance and fintech community. Its core focus is on disruption to lending, banking and investing. This includes alternative lending, digital banks and digital wealth management.
American Banker	Daily newspaper covering the local, national and international financial services and banking scene. Features industry rankings and statistics.
Arabian Business	ArabianBusiness.com is the Middle East region's premier resource for informed news, features, and commentary. Eighty journalists - based in the Middle East and Europe - write for the site, covering sectors as diverse as construction, banking, technology and leisure in both English and Arabic.
Asia Net Pakistan	AsiaNet-Pakistan is the country's oldest and largest digital content distribution service. AsiaNet-Pakistan is the country's premier press release distribution service.
Asia Pacific Daily	Asia Pacific Daily is an international news and information website focusing on Asia-Pacific Region.
Asian Banking and Finance	Asian Banking and Finance is an industry magazine serving the dynamic business community in Singapore. It has been voted local business magazine of the year several times and is the highest ABC audited circulating business magazine in Singapore.
Banken.nl	Banken.nl is a platform of the Dutch banking sector. A central information point with the latest news and trends in the financial sector. It follows the developments of leading banks and FinTech companies in the Netherlands. The platform attracts more than half a million visitors per year.
Banking Frontiers	Established in 2002, Banking Frontiers is a monthly magazine providing in-depth coverage of the banking, financial services and insurance industry in India.
BBC	BBC News gathers and produces national daily news, business, political and current affairs programmes on BBC television and radio. It is also responsible for the continuous news channels BBC News 24, BBC Parliament, BBC World, interactive services, Ceefax and the web site BBC News Online. BBC News is the largest broadcast news operation in the world with more than 2,000 journalists and 48 newsgathering bureaux, 41 of which are overseas. BBC News is also a global news provider reaching more than 260 million viewers through the international TV news channel BBC World and more than 150 million listeners via BBC World Service. These services are not funded by the licence fee but by grants for the World Service and commercial income for BBC World.
Birmingham Business Journal	The Birmingham Business Journal has steadily grown over the years and has become a major media player in Alabama. Founded by a group of local entrepreneurs, the Business Journal became a part of American City Business Journals in 1999.
Bloomberg	Bloomberg is the global leader in business and financial data, news and insight. One of the world's leading financial news organizations, Bloomberg News produces roughly 5,000 stories a day and has earned more than 800 awards since it was founded in 1990 – including the 2015 Pulitzer Prize for explanatory reporting. Bloomberg News is read by more than 325,000 Terminal subscribers. Bloomberg's stories are also carried on Bloomberg's web, mobile, television, digital video, radio, print and live event platforms, and syndicated to more than 440 publications around the globe.
Bretagne Economique	For more than 50 years, CCI Bretagne has been processing economic information under the Bretagne Economique brand. It provides information on economic news and business life in the Brittany region by distributing free, daily economic information about the territory.
Business Daily Africa	Business Daily Africa, commonly known as Business Daily, is an English-language daily business newspaper published in Kenya. The newspaper is published by Nation Media Group
Business Insider	Business Insider (BI) is an American financial and business news website founded in 2007. In February 2021, the brand was simply renamed Insider. Insider is a global news and lifestyle publication with hundreds of journalists in London, New York, San Francisco, Los Angeles, Singapore and beyond.
Businesswire	Business Wire, a Berkshire Hathaway company, is a global leader in press release distribution and regulatory disclosure. Founded in 1961, Business Wire is a trusted source for news organizations, journalists, investment professionals and regulatory authorities, delivering news directly into editorial systems and leading online news sources via its multi-patented NX Network. Business Wire has 16 newsrooms worldwide to meet the needs of communications professionals and news media.
CB Insights	CB Insights is a private company with a business analytics platform and global database that provides market intelligence on private companies and investor activities. The platform is targeted at private equity, venture capital, investment banking, angel investing, and consulting professionals by providing insights about high growth private companies.
CCN	Capital & Celeb News, also known as CCN, CCN.com, and CCN Markets, was founded in the summer of 2013 in Norway. It focuses on Financial Markets, Gaming, Showbiz, Business, Sports, and Politics.
CNBC	CNBC is a recognized world leader in business news and provides real-time financial market coverage and business content consumed by more than 355 million people per month across all platforms. CNBC also offers content through its vast portfolio of digital products like CNBC.com, which provides real-time financial market news and information to CNBC's investor audience.

Coin Telegraph	Founded in 2013, Cointelegraph is the leading independent digital media resource covering a wide range of news on blockchain technology, crypto assets, and emerging fintech trends.
CoinDesk	CoinDesk is a media platform for the next generation of investors exploring how cryptocurrencies and digital assets are contributing to the evolution of the global financial system. Its mandate is to inform, educate, and connect the global investment community through news, data, events and education. Founded in May 2013, CoinDesk reaches millions interested in digital assets and blockchain technology through its website, social media, newsletters, podcasts, video, research and live events. CoinDesk created the original price reference rate known as the Bitcoin Price Index in 2013 which is widely sourced in the media including The Wall Street Journal, Financial Times, CNBC, and many others.
ComputerWeekly.com	Computer Weekly provides the latest news and analysis through its website and 200,000-subscriber weekly digital magazine, as well as award-winning and exclusive premium content; a dedicated monthly magazine for European IT leaders; independent research studies; and the CW500 Club's exclusive networking events for senior IT managers. From being the world's first weekly IT newspaper in 1966, to today's multi-platform digital publication, Computer Weekly continues to reach millions of IT decision-makers in the UK, Europe and the rest of the world.
ComputerWorld.com	Computerworld focuses on empowering enterprise users and their managers, helping them create business advantage by skillfully exploiting today's abundantly powerful web, mobile, and desktop applications. Computerworld also offers guidance to IT managers tasked with optimizing client systems—and helps businesses revolutionize the customer and employee experience with new collaboration platforms.
Contactless Intelligence	Contactless Intelligence is a B-2-B platform for suppliers and implementers of NFC and contactless technology.
Crunchbase	Crunchbase is a platform and database for finding business information about private and public companies. Crunchbase information includes investments and funding information, founding members and individuals in leadership positions, mergers and acquisitions, news, and industry trends. Originally built to track startups, the Crunchbase website contains information on public and private companies on a global scale.
Daily Telegraph	The Daily Telegraph, known online and elsewhere as The Telegraph, is a national British daily broadsheet newspaper published in London by Telegraph Media Group and distributed across the United Kingdom and internationally. It was founded by Arthur B. Sleigh in 1855 as Daily Telegraph & Courier.
Der Spiegel	Der Spiegel, is a weekly newsmagazine, preeminent in Germany and one of the most widely circulated in Europe, published in Hamburg since 1947.
Der Tagesspiegel	Founded in 1945, Der Tagesspiegel is a German daily newspaper. It has regional correspondent offices in Washington D.C. and Potsdam.
Digital.NYC	Digital.NYC is the official online hub of the New York City startup and technology ecosystem, bringing together every company, startup, investor, event, job, class, blog, video, workspace, accelerator, incubator, resource and organization in the five boroughs. It is the result of a unique public/private partnership between the office of Mayor Bill de Blasio, the New York City Economic Development Corporation, Gust, and over a dozen leading NYC-based technology and media companies.
Dun & Bradstreet	For almost 200 years, Dun & Bradstreet has helped clients and partners grow and thrive through the power of data, analytics, and data-driven solutions.
Ecommerce News	Ecommerce News Europe is an online publication from Dutch internet publisher Eurolutions.
eFinancial Careers	efinancialcareers is an online resource for jobs in finance, banking, accounting, and insurance. The website provides a wide range of news, guides, job postings, and information candidates are looking for in their financial career search.
El Economista	Founded in 2006, El Economista is a Spanish daily newspaper which focuses on economical, financial and business affairs. The daily is headquartered in Madrid, Spain.
Electronic Payments International	Established in 1988, Electronic Payments International (EPI) is an editorially independent briefing service aimed at banks and financial services companies in retail and corporate payments sector.
Euromoney	Euromoney magazine was created in 1969 to cover the re-emergence of the international cross-border capital markets. The euromarket, after which the magazine is named, is the predecessor to today's mainstream global capital markets. Euromoney reported on, and championed, this market and its growth, in the process becoming a prime magazine of the wholesale financial world, its institutions and its users.
Expansión	Expansión is a Spanish economic and business newspaper published in Madrid, Spain. Expansión was established in May 1986. The paper is published in tabloid format and is owned by the Grupo Recoletos. The publisher of the paper is Unidad Editorial. Its sister newspapers are El Mundo and Marca.
Fastmarkets MB	Fastmarkets has over 130 years of specialist commodity expertise and aims to be the world's leading and most trusted data provider. Fastmarkets MB provides access to benchmark price data and market news for the global metals markets.
Finance Feeds	Finance Feeds is an independent real-time news source for the FX and CFD trading industry, fintech, and the wider finance community.
Finance Mag	Finance Mag puts the spotlight on the initiatives and innovative thoughts of personalities in the sector.
Financial News	Financial News is a financial newspaper and news website published in London. It is a weekly newspaper, published by eFinancial News Limited, covering the financial services sector through news, views and extensive people coverage. Financial News was founded in 1996. Financial News is owned by Dow Jones & Company.

Financial Times	The Financial Times (FT) is one of the world's leading news organisations, recognised internationally for its authority, integrity and accuracy. The Financial Times Group, part of Nikkei Inc., provides a broad range of information, news and services to ambitious individuals and organisations. The FT Group includes the Financial Times, FT Specialist - a portfolio of 17 specialist brands - and a number of services and joint ventures. The paper was founded in 1888 as the London Financial Guide before rebranding a year later as the Financial Times.
Finanz Szene	FinanzSzene.de is a leading newsletter for the German banking and fintech industry. Founded in August 2017, FinanzSzene.de had 29,000 subscribers as of July 2020.
Finews	finews.com is a Swiss news site for professionals in the financial sector. finews.com delivers real-time news about the financial industry: breaking news, feature stories, industry developments, opinions plus the latest on people and trends. It was founded in 2009.
finews.asia	Singapore-based finews.asia is an Asia-focused news site for professionals in the financial sector. finews.asia delivers real-time news about the financial industry: feature stories, industry developments, opinions plus the latest on people and trends. It was founded in 2015.
Finextra	Finextra is a leading independent newswire and information source for the worldwide financial technology community. Finextra covers all significant technology news in wholesale and retail banking, the capital markets and insurance. Finextra also publishes a wide range of research articles, features, white papers and case studies.
Fintech Circle	Fintech Circle is a global platform of more than 130,000 fintech entrepreneurs, investors, finance professionals, academic and government representatives, and solution providers.
Fintech Futures	FinTech Futures is a digital publishing platform for the worldwide fintech community.
Fintech Magazine	FinTech Magazine is a digital community for the banking, payments and financial services industry that connects the world's largest banking and finance brands and their most senior executives with the latest trends as the finance industry pivots towards technology and digital transformation.
Fintech News	Fintech News is an on-line magazine dedicated to fintech news.
Fintech News Singapore	Fintech News Singapore provides a source of timely, deep insights and the latest local and global news about Fintech. Launched in 2015. Fintechnews.sg is part of the Fintech News Network.
Fintech Today	Fintech Today is a newsletter that offers to create high-quality, actionable, content for fintech professionals.
Focus Taiwan CNA English News	The Central News Agency (CNA) is the national news agency of the Republic of China (ROC) and the most influential news organization in Taiwan. Established in 1924.
Forbes	Forbes is an American business magazine owned by Forbes, Inc. Published biweekly, it features original articles on finance, industry, investing, and marketing topics. Forbes also reports on related subjects such as technology, communications, science, and law. Headquarters are in New York City. It was founded in 1917.
Global Banking News	Global Banking News provides up-to-the-minute news on all aspects of the global banking and insurance sectors. Published by Electronic News Publishing Ltd.
Global Trade Review	Established in 2002, Global Trade Review (GTR) is a world-class independent publishing and events company, offering a one-stop shop of news, events and services for companies and individuals involved in global trade. GTR's editorial team provides high-quality journalism and unrivalled coverage of the trade, export, commodity and supply chain finance markets, as well as the political risk and trade credit insurance, treasury and fintech sectors.
GlobeNewswire	GlobeNewswire is one of the world's largest newswire distribution networks, specializing in the delivery of corporate press releases financial disclosures and multimedia content to the media, investment community, individual investors and the general public.
Gulf News	GN Media is the publisher of Gulf News, the biggest selling English newspaper in the UAE. It is also home to the most visited news website in the UAE, gulfnews.com. Established in 1978.
Handelsblatt	The Handelsblatt is a German-language business newspaper published in Düsseldorf by Verlagsgruppe Handelsblatt. Handelsblatt was established in 1946.
IBS Intelligence	Established in 1991, UK-headquartered IBS Intelligence is the leading global pure play Financial Technology research, news analysis, and advisory firm. IBSI's Sales League Table is considered the global industry barometer ranking leading banking technology suppliers. It's research reports comprehensively cover global suppliers across all Banking Technology & Financial Technology systems, is also distributed by Thomson Reuters, Bloomberg and S&P Capital IQ.
ideal-investisseur.fr	Founded in 2017, ideal-investisseur.fr is a site that deciphers the economy, related policies, finance, real estate, investments and more generally all subjects that have an impact on purchasing power . It is an independent information site, intended for the general public.
InFinance	InFinance.nl is a Dutch website for financial service providers and financial advisers. Interviews, news and opinion on mortgages, pensions and insurance.

Information Age	Information Age was founded in 1995 as a print magazine. The brand launched a website in 2001 and evolved into a fully digital proposition in 2017. Information Age provides general intelligence for technologists in the information age.
IT Finanz Magazin	IT Finanzmagazin is a German specialist magazine for IT and organization at banks, savings banks and insurance companies
Korea JoongAng Daily	The Korea JoongAng Daily is a leading English newspaper of Korea, first published in October 17th, 2000. It strives to correctly inform the world of the politics, economy, social affairs, and culture of the Republic of Korea.
La French Tech	La French Tech is a global initiative that supports and promotes French communities of startups and entrepreneurs around the world. It assists all the professionals working towards startups' growth and international promotion, including entrepreneurs, investors, engineers, designer, developers, corporate companies, R&D centers, governmentagencies, incubators, co-working spaces, and more. La French Tech was founded in 2013 and is based in Paris, Ile-de-France. It provides an extensive database on French fintechs.
La Tribune	La Tribune is a French weekly financial newspaper founded in 1985.
L'Agefi	L'Agefi, created in 1911, publishes an electronic daily and a French paper weekly specializing in finance.
Le Petit Economiste	Le Petit Economiste is an independent media company created in 2004 focused on economic news in 4 French departments (Deux-Sèvres, Charente, Vienne and Charente-Maritime) of the former Poitou-Charentes region.
Le Soir	Le Soir is a French-language Belgian daily newspaper. Founded in 1887 by Emile Rossel, it is one of the most popular Francophone newspapers in Belgium. It is owned by Rossel & Cie.
Ledger Insights	Ledger Insights publishes global news and features about business and enterprise blockchain.
Les Echos	Les Echos is a leading daily French financial newspaper, founded in 1908 by Robert and Émile Servan-Schreiber.
Macworld	Macworld is a web site dedicated to products and software of Apple Inc., published by Mac Publishing, headquartered in San Francisco, California. It began as a print magazine in 1984.
Market Screener	MarketScreener.com is a financial website owned and is owned by Surperformance SAS which was launched in 2001.
Marketing Interactive	Established in June 2002, Marketing-Interactive is one of Asia's leading source of advertising, marketing and media intelligence reaching out to Chied Marketing Officerss across Singapore, Hong Kong, Malaysia, the Philippines, Indonesia and Thailand. It has a circulation of 24,673 copies and 103,626 readers.
MenA	MenA.nl is a Dutch website that covers mergers and acquisitions, corporate finance, and private equity in the Netherlands.
Mobile Payments Today	MobilePaymentsToday.com is an information resource focusing on mobile payments projects and technology. It covers topics like banking, retail, restaurants, remittance, apps, online gaming and mobile POS.
Mobile World Live	Mobile World Live is a premier destination for news, insight and intelligence for the global mobile industry.
Moody's Analytics BankScope	Moody's Analytics BankFocus is a definitive solution for analyzing banks. It provides an approach to global banking data, combining renowned content from Bureau van Dijk and Moody's Investors Service, with expertise from Moody's Analytics.
New York Times	The New York Times is an American daily newspaper based in New York City with a worldwide readership. Founded in 1851, the Times has since won 130 Pulitzer Prizes (the most of any newspaper), and has long been regarded within the industry as a national "newspaper of record".
NFCW	NFCW provides senior executives and technical experts with news and analysis on the latest developments in payments, transit ticketing, NFC and beyond.
Novobrief	Novobrief is an English language publication covering the Spanish startup ecosystem.
NS Banking	From the expertise of industry-leading business magazine Future Banking comes NS Banking. The one-stop-shop for anyone in the banking industry, the website keeps readers up to date with unique and accessible content, tailored specifically to their business needs.
Oxford Business Group	Founded as a research publishing firm in 1994 by Oxford graduates and originally based in the university town, OBG is today a British company with world-wide reach, employing more than 200 staff and continuing its commitment to producing detailed emerging markets analysis. The Group publishes authoritative reports and online economic briefings covering 34 countries around the world from its offices in Istanbul, Berlin, Dubai and London, and a network of local bureaus in the countries in which it operates.
Pay Space Magazine	PaySpace Magazine Global is an expert digital media about innovative financial technologies. It covers fintech, retail, e-commerce, blockchain, cryptocurrency, banks, and startups.
Payment Eye	PaymentEye is a free-to-access media platform offering critical insight and thought leadership on the fast-moving global payments sector. The site attracts an audience of over 16,000 professionals from across the industry, including merchants, acquirers, issuers, gateways and PSPs.
Payments Cards & Mobile	Payments, Cards & Mobile cuts through the noise to provide hand-picked headline stories, valuable research and practical debate on the industry topics that matter most. Payments, Cards & Mobile magazine is published six times per year in hard copy and online.
Pitchbook	PitchBook is a financial data and software company with offices in London, New York, San Francisco and Seattle. Serving clients in 19 languages, it provides global business professionals with comprehensive data on the private and public markets to help them discover and execute opportunities with confidence. Launched in 2019.
PR Newswire Association	PR Newswire, a Cision company, is a premier global provider of multimedia platforms and distribution that marketers, corporate communicators, sustainability officers, public affairs and investor relations officers leverage to engage key audiences. PR Newswire was founded in 1954. PR Newswire has 35 offices in 18 countries, including 10 in the United States.
Presse Citron	Launched in July 2005, Presse-citron was at its creation one of the very first French-speaking blogs dealing continuously with news and trends on the net, social networks, the digital economy and the mobile internet.

Private Equity Wire	Part of the Global Fund Media Ltd group, founded in 2002 (as Hedgemedia Ltd. when it launched Hedgeweek), Global Fund Media (GFM) now publishes six specialist newswires covering all asset classes within the Institutional Investor market place. These are: Institutional Asset Manager - covering institutional pensions and managed funds, Property Funds World - covering property funds, ETF Express - covering exchange traded funds (ETFs), Hedge Week - covering hedge funds, Private Equity Wire - covering private equity funds, Wealth Adviser - Covering Private client/wealth managers, family offices, trustees and their investment advisers.
PYMNTS	PYMNTS.com is a B2B platform that focuses on the payments industry providing information about “What’s Next” in payments and commerce. PYMNTS.com is owned by What’s Next Media and Analytics, LLC.
Retail Banker International	For the past 35 years, Retail Banker International (RBI) has been a key global editorially independent retail banking briefing service.
Reuters	With unmatched coverage in over 16 languages, and reaching billions of people worldwide every day, Reuters provide trusted intelligence that powers humans and machines to make smart decisions. Founded in 1851, Reuters has remained true to the Trust Principles of independence, integrity and freedom from bias, working relentlessly to bring news from the source and from every corner of the world. Reuters is an international news organisation owned by Thomson Reuters. It employs around 2,500 journalists and 600 photojournalists in about 200 locations worldwide. Reuters is one of the largest news agencies in the world.
S&P Global	For over 160 years, S&P Global has been turning information into insights, providing essential intelligence that accelerates progress in our ever-changing world. It delivers data, research, credit ratings, benchmarks and ESG solutions that governments, companies and individuals depend on to make decisions with conviction. It is the parent company of S&P Global Ratings, S&P Global Market Intelligence, and S&P Global Platts, CRISIL, and is the majority owner of the S&P Dow Jones Indices joint venture.
Singapore Business Review	Singapore Business Review is a business magazine that is published by Charlton Media Group. It has an audited circulation of 26,000 and a readership of 83,088 readers in Singapore and regionally.
Startup Juncture	StartupJuncture is a blog about all things related to Dutch startups. StartupJuncture was founded in September 2012. StartupJuncture is governed by the Stichting Startup Juncture, an official not for profit foundation to support the Dutch startup community.
Sud Ouest	Sud Ouest is a daily French newspaper, the third largest regional daily in France in terms of circulation. It was launched in Bordeaux in 1944. Sud Ouest covers the Gironde, the Charente, the Charente-Maritime, the Dordogne, the Pyrénées Atlantiques and the Lot et Garonne départements.
Sunday Standard	Sunday Standard is a member of the Botswana Press Council. Key among the objectives of the Editorial Policy of the Sunday Standard is to contribute towards an open and democratic Botswana in which government is based on the will of the people.
Taipei Times	The Taipei Times launched on June 15, 1999, with the mission of presenting a voice long absent in the Taiwanese media: an English-language journal of record for national and international readers, presented from a Taiwanese perspective.Part of the Liberty Times group.
Tech Crunch	TechCrunch is an American online newspaper focusing on high tech and startup companies. It was founded in June 2005 by partners of Archimedes Ventures and was acquired in 2010 by AOL.
Telecompaper	Telecompaper is a well respected, independent research and publishing company focussed on the telecommunications industry. Telecompaper employs 15 staff at its headquarters in Houten, the Netherlands, and also employs correspondents in various countries who track their local telecom market. Telecompaper provides international customers with research and advisory services, breaking news, digests, expert analyses, company profiles and research reports. Launched in 2000
The Citizen	The Citizen is an independent English newspaper in Tanzania.
The Financial Brand	The Financial Brand is a digital publication focused on marketing and strategy issues affecting retail banks and credit unions. The Financial Brand was founded in 2008.
The Fintech Times	Established in 2016, The Fintech Times is a global multimedia news outlet centred around the world’s first leading Fintech newspaper. It has 65,000+ unique visitors online every month and 150,000+ copies of the print newspaper circulated around the world every year.
The Guardian	The Guardian is a British daily newspaper. It was founded in 1821 as The Manchester Guardian, and changed its name in 1959. Along with its sister papers The Observer and The Guardian Weekly, The Guardian is part of the Guardian Media Group, owned by the Scott Trust.
The Independent	The Independent is a British newspaper that was established in 1986 as a national morning printed paper and is now an online newspaper only.
The Irish Times	The Irish Times is an Irish daily broadsheet newspaper and online digital publication. The Irish Times was launched in 1859.
The Paypers	The Paypers is the Netherlands-based leading independent source of news and intelligence for professionals in the global payment community. The Paypers provides a wide range of news and analysis products aimed at keeping the ecommerce, fintech, and payment professionals informed about latest developments in the industry.
The Slovak Spectator	The Slovak Spectator is Slovakia’s only English-language newspaper. It is published monthly by The Rock, s.r.o. publishing house and covers local news, culture and business.
The Straits Times	The Straits Times, the English flagship daily of SPH, has been serving readers for more than a century. Launched on July 15, 1845, its comprehensive coverage of world news, East Asian news, Southeast Asian news, home news, sports news, financial news and
The Wall Street Journal	The Wall Street Journal is an American business-focused, English-language international daily newspaper based in New York City, with international editions also available in Chinese and Japanese. The Journal, along with its Asian editions, is published six days a week by Dow Jones & Company, a division of News Corp. The newspaper is published in the broadsheet format and online. The Journal has been printed continuously since its inception on July 8, 1889. The Wall Street Journal is one of the largest newspapers in the United States by circulation, with a circulation of about 2.834 million copies (including nearly 1,829,000 digital sales) as of August 2019. The newspaper has won 37 Pulitzer Prizes (as of 2019).
TNW (The Next Web)	TNW (The Next Web) is a website and annual series of conferences focused on new technology and start-up companies in Europe. The Next Web company was established in 2006 in Amsterdam, Netherlands, and a technology news website of the same name was started in 2009. On 5 March 2019, the Financial Times purchased a majority stake in TNW.
Venture Beat	Founded in 2006, VentureBeat is a leading source for transformative tech news and events that provide deep context to help business leaders make smart decisions and stay on top of breaking news.
WIJ Limburg website	WijLimburg, a brand of Mediahuis Limburg, is the leading news and information platform for enterprising Dutch Limburg.
ZDNet	ZDNet is a business technology news website owned and operated by Red Ventures along with TechRepublic. The brand was launched in 1991.

Appendix 10 – Content-Analytic Meta-Tables

	Acquisition & Investments Modality																			
	Fintech Acquisitions													Divestitures & Initiative Cessation						
	Direct / Online Banking	Asset & Wealth Management	Personal Finance	SME Banking	Payments	Financial Inclusion	Bookeeping / Accounting	Open Banking	Crowd-funding	Customer Loyalty	Lending	Big Data & Analytics	Other	Payments	Crowd-funding	Direct / Online Banking	Fund Management	Crypto-currency	Risk Management	Lending	Other
HSBC																				
BNP Paribas	2 (Compte Nickel in 2017; DAB in 2014)	1 (2017)												1 (Paydirekt in 2019)							
Crédit Agricole			1 (2019)											1 (2014)							
Santander				1 (Ebury in 2019)	1 (2018)	1 (2016)	1 (2018)							2 (Yaap in 2016, Paydirekt in 2019)		1 (2018)					1 (2016)
Deutsche Bank								1 (2018)													
Société Générale			1 (2018)		1 (2018)				1 (2018)												
Groupe BPCE	2 (Fidor in 2016, Oney Bank in 2019)				4 (2016, 2016, 2017, 2017)				1 (2015)	1 (2018)											
Barclays					1 (2014)					1 (2012)											1 (2019)
Lloyds Banking Group																					
ING					1 (2018)					1 (2015)	1 (2018)			1 (Paydirekt in 2019)							
Crédit Mutuel	2 (net-m Privatbank 1891 in 2018; Banque Casino in 2011)				3 (Mangopay in 2015, Pumpkin in 2017, Monext in 2009)				2 (2015, 2017)			1 (2019)		1 (Paydirekt in 2019)							
UBS																	1 (2017)		1 (2017)		
UniCredit														2 (Paydirekt in 2019, e-money division in 2016)		1 (2014)					1 (2014)
Intesa Sanpaolo																					
RBS	1 (2019)						1 (2018)							1 (Worldpay Group in 2013)		1 (2019)					3 (2013, 2013, 2015)
Credit Suisse											1 (2017)										1 (2019)
BBVA	2 (Simple in 2014, Holvi in 2017)				1 (2016)							1 (2014)	1 (2015)	1 (in 2019)						1 (in 2018)	
Standard Chartered																					1 (2019)
Rabobank					1 (2012)									2 (2015, 2018)				1 (2019)			1 (2014)
Nordea	1 (2019)													1 (Swipp in 2016)	1 (in 2018)						

Appendix 10 – Table 1 a: Acquisition & Investment Modality - Fintech Acquisitions Submodality and Divestiture & Initiative Cessation Submodality

	Acquisition & Investments Modality																					
	Fintech Subsidiaries								Fintech Initiatives							Fintech Spinoffs						
	Direct / Online Banking	Payments	Open Banking / Banking as a Platform	Crowd-funding	Lending	Personal Finance	Fintech Platform / Subsidiary	other	Chatbot	Personal Banking	Payments	Blockchain	Lending	Crowd-funding	Other	Payments	Corporate Banking	Personal Finance	Bond Trading	Blockchain	Other
HSBC	3 (First Direct & HSBC Direct 1989; Kinetic 2019)	1 (PayMe from HSBC in 2017)							6 chatbots (4 in 2018, 2 in 2019)	2 (2018, 2018)					1 (2018)							
BNP Paribas	2 (Consors Bank in 2014, Hello Bank! In 2013)								1 (2019)						1 (FX Trading in 2019)							
Crédit Agricole	2 (BforBank in 2010, Findio in 2015)								2 chatbots (2018, 2019)													
Santander	2 (Openbank in 1995, Cahoot in 2000)	1 (OnePay FX / PagoFX in 2018)					1 (Santander Global Platform		1 (2016)													
Deutsche Bank	1 (2012)						1 (Breaking Wave in 2019)		1 (2018)		1 (2017)											
Société Générale	2 (Boursorama Banque in 1989, Prismea in 2019)							1 (2018)	1 (2018)						1 (Financial Inclusion in 2017)							1 AWM (2018)
Groupe BPCE		2 (Natixis Payment Solution in 2006, S-Money in 2011)	1 (Fidor Solutions in 2016)	3 (2015, 2015, 2015)																		
Barclays		2 (Pingit in 2012, bPay in 2012)																				
Lloyds Banking Group	1 (2005)																					
ING	1 (ING Direct in 1997)								4 chatbots (2017)						1 (Research initiative in 2016)	4 (Payconiq in 2015, Twyp, Finn in 2017, BuyRely in 2016)	1 (Cobase)	1 (Yolt)	1 (Katana Labs in 2019)		2 (Data & AI, KYC)
Crédit Mutuel	4 (Monabanq in 2006, Fortuneo Banque in 2009, Max in 2017, KeyTrade Bank in			4 (2015, 2015, 2016,			1	1 (2010)	1 (2018)													
UBS									2 (2018)													
UniCredit	1 (Buddybank in 2018)																					
Intesa Sanpaolo	1 (2016)	3 (2013, 2018, unknown)		1 (2011)																		
RBS	2 (Bó in 2019, Mettle in 2019)	1 (2019)			1 (2016)			1 (2018)	2 (2016, 2017)				1 (2019)	1 (2019)						1 (Emerald Platform)		
Credit Suisse	1 (2019)								1 (2018)													
BBVA	2 (2014, 2017)	1 (Tuyyo in 2017)	1 (2018)					2 (2017, 2018)	3 chatbots (2017)		1 (2017)	3 (corporate lending in 2018, syndicated lending in 2018, bond issuance in 2019)			2 (Business Banking in 2018, Big Data in 2016)							
Standard Chartered	2 (2018, Mox in 2019)		1 (2019)		1 (2019)				1 (2019)													
Rabobank	1 (Rabo Direct in 1994)	1 (2017)			1 (Facturis in 2011)	1 (Peaks)		1		1 (2018)	2 (2016, 2017)		2 (2016, 2019)	1 (2018)	2 (Risk Management in 2015, Digital Identity in 2017)							
Nordea									1 (2017)		1 (2018)				1 (Asset & Wealth Management in 2018)							

Appendix 10 – Table 1 b: Acquisition & Investment Modality - Fintech Subsidiaries Submodality, Fintech Initiatives Submodality, and Fintech Spinoffs Submodality

	Acquisition & Investments Modality																				
	Lead Investments																				
	Payments	Lending	Open Banking / BaaP	Collaboration	Risk Management	RegTech	Big Data / Analytics	Crowdfunding	Financial Inclusion	Credit Scoring	Asset & Wealth Management	Customer Loyalty	Personal Finance	Trade Finance	Direct / Online Banking	Other	Blockchain				
																	R3	SETL	Ripple	TradeIX	Other
HSBC		1 (2019)	1 (2019)		1 (Kyriba in 2015)	1 (2017)	1 (2018)										1 (2017)				
BNP Paribas	1 (2016)	1 (2017)		1 (Symphony in 2017)	1 (Digital Reasoning in 2018)																1 (2017)
Crédit Agricole	1 (Curve in 2017)							2 (2016, 2019)										1 (2018)			
Santander	3 (2013, 2015, 2017)	4 (MarketFinance in 2019, 2018; 2018; 2019)					2 (2017, 2017)		2 (2017, 2017)	1 (2018)						1 (2018)			1 (2015)		
Deutsche Bank	1 (2018)	1 (2016)									1 (2018)					1 (2019)					
Société Générale		1 (2018)	1 (2016)																		
Groupe BPCE	1 (2019)				1 (Kyriba in 2007)						1 (2019)										
Barclays	1 (2017)	2 (MarketFinance in 2019, 2019)	1 (2018)		1 (2019)	1 (2019)						2 (2019, 2017)	1 (2018)								
Lloyds Banking Group			1 (2018)																		
ING	2 (2017, 2018)	4 (WeLab in 2015; 2018; 2018; 2018)								1 (2019)			1 (2017)							1 (2018)	
Crédit Mutuel	2 (2016, 2018)	1 (2011)						1 (2016)			1 (2015)										
UBS																					
UniCredit		1 (2018)											1 (2018)	1 (2019)							
Intesa Sanpaolo	1 (16.09% of MatiPay in 2019)							1 (16.7% Backtowork in 2019)					1 (37.9% Oval Money in 2018)								
RBS	1 (Transferwise in 2018)	1 (2019)																			
Credit Suisse		1 (2016)			2 (AcadiaSoft 2010, Digital Reasoning 2014)			1 (2015)			1 (2014)										
BBVA	2 (2013, 2019)	1 (2019)	1 (2018)										2 (2018, 2018)	1 (2014)	2 (Atom Bank 39% in 2015, Neon in 2018)	2 (2016, 2017)					
Standard Chartered	1 (2016)	2 (Dianrong in 2015; Northern Arc in 2016)		1 (Symphony in 2019)	1 (Digital Reasoning)																
Rabobank	1 (2019)																				
Nordea	1 (2017)		1 (2019)									1 (2017)	1 (2016)								

Appendix 10 – Table 1 c: Acquisition & Investment Modality - Lead Investments Submodality

	Acquisition & Investments Modality								
	Corporate Venture Capital Subsidiaries	Fintech Funds		Internal Innovation Labs, Incubators, and/or Accelerators					
		Own Funds	External Funds	Think Tank	Innovation Lab	Incubator	Accelerator	Outposts	University
HSBC	2 (HSBC Strategic Innovation Investments in 2014, HSBC Venture Capital Coverage Group in 2017)	200 million USD fund launched in 2014							
BNP	1 (BNP Paribas Asset Management)	one fund launched in 2018	3 investments in external funds: Serena Data Ventures in 2017 (France), Viola Fintech in 2018 (Israel), Ventech in 2018 (China)	L'Atelier BNP Paribas (1978, offices in Paris, San Francisco, Shanghai)	2 (BNP Paribas Cash Management Fintech Lab in Europe in 2017 & Asia Pacific in 2019; BNP Paribas Design Factory Asia in Singapore in 2017 focused on wealth management)				
Agricole		Fintech Insurtech Venture (50 million EUR own fund delegated to Breega Capital, launched in 2017)			3 (Mobile Center in France in 2018, Digital Lab by CA in France in 2017, CACD2 in France in 2017)				IFCAM
Santander	1 (Santander InnoVentures in 2014)	200 million USD fund launched in 2014 (100 m in 2014, 100 m in 2016)			4 (Santander Centres of Digital Expertise; Santander Tech Hub in the UK announced in 2018 to open in 2022; Digital Investment Unit launched in 2018; Santander Blockchain Lab launched in 2016)				
Deutsche		one launched in 2017			Deutsche Bank Digital Factory launched in 2016 in Frankfurt; Blue Water Fintech Space launched in 2019 in Shanghai;				
SocGen	1 (Société Générale Ventures)	Societe Generale Ventures Innovation Fund, 150 million EUR fund launched in 2019			1 (ALD Mobility Experience Centre launched in 2016 in Amsterdam)				
BPCE			One investment into Truffle Financial Innovation Fund in 2017		1 internal innovation lab / incubator (Spark Program in 2015 & The BIG Factory launched in France in 2017)				
Barclays	1 (Barclays UK Ventures - BUKV in 2018)	2 (Rise Growth Investments, 10 million GBP per Barclays Accelerator cohort launched in 2018; Barclays Technology Fund, 100 million GBP fund for UK tech startups launched in 2015)							
Lloyds	1 (Lloyds Development Capital - LDC, launched in 1981)				2 (Digital Tech Hub launched in Edinburgh in 2019; Scottish Widows Digital Innovation Lab launched in the UK n 2016)				
ING	1 (ING Ventures, launched in 2017)	2 (ING Ventures Fund I, 300 million EUR fund launched in 2017 to invest in fintechs; ING Innovation Fund, 25 million EUR a year fund for internal acceleration launched in 2013)	2 (Orange Growth Capital & SmartFin Capital, ING invested in them in 2015)			ING Innovation Bootcamp launched in 2015	PACE Accelerator launched in 2018		
Mutuel	2 (NewAlpha Asset Management in 2015, CM-CIC Investissement in 2011)	NewAlpha Fintech (56 million EUR fund from 2015 to 2017)			3 internal innovation labs / incubators (The Square by Credit Mutuel Arkea launched in 2016; Innovation Cube by CMNE by Credit Mutuel Nord Europe launched in 2017; Cognitive Factory launched in partnership with IBM in 2018)				
UBS				UBS Y Think Tank launched in 2014	4 (UBS Wealth Innovation Lab launched in 2014 in Zurich; EVOLVE - UBS Centre for Design Thinking & Innovation launched in Singapore in 2015; UBS Strategic Development Lab focused on investment banking launched in Zurich in 2018; Advisor Technology Research and Innovation Lab, an internal lab launched with fintech SigFig in 2016 in San Francisco)			UBS Wealth Innovation Lab outposts launched in Tel Aviv and San Francisco	
UniCredit	1 (UniCredit EVO in 2016)	UniCredit EVO fund (200 million EUR fund launched in 2016 to invest in fintech)	Anthemis Venture Fund I (60 million USD fund for seed/early stage investments)		HVB Innovation Lab launched by HypoVereinsbank in Munich in 2016				
Intesa	2 (Neva Finventures in 2016; IMI Fondi Chiusi SGR in 2007 which includes the Atlante Seeds & Atlante Ventures funds launched in 2011 & 2007 respectively)	Neva Finventures Fund I (30 million EUR fund launched in 2016)	2 (In 2016, Intesa Sanpaolo invested in Endeavor Catalyst III & Rocket Internet Capital Partners)						
RBS	1 (NatWest Ventures founded in 1987)				.. internal incubator/innovation lab, Ulster Bank StartUp, in Ireland launched in 2018 .. internal incubator/innovation lab, OX (Open Experience), launched in 2016 in Edinburgh & 2018 in London .. Internal innovation lab, RBS Digital Studio launched in London in 2015			RBS Silicon Valley Solutions, outpost in San Francisco established in 2014	
Suisse	2 (Credit Suisse NEXT Investors in 2013; Credit Suisse Entrepreneur Capital in 2010)	3 (NEXT Investors I, 135 million USD fund established in 2014; NEXT Investors II, 261 million USD fund established in 2018; Credit Suisse Entrepreneur Capital, launched in 2010 of which 30 million CHF has been allocated to fintech)		Credit Suisse Research Institute launched in 2008	2 (CS Labs launched in 2015 with labs in London, New York & San Francisco; Credit Suisse Singapore Innovation Hub launched in Singapore in 2014)				
BBVA	2 (Propel Venture Partners which was called BBVA Ventures from 2013 - 2016; BBVA New Digital Business in 2015)	BBVA Ventures I (Jan 2013 - Feb 2016): 100 million fund launched in 2013, brought into Propel Venture Partners Fund (Feb 2016 - present) in 2016 and increased to 250 million USD	4 (In 2018, 50 million USD into the Sinovation Fund IV in China, in 2013 into Ribbit Capital Investment Fund in the US, in 2013 into 500 Startups Seed Capital Fund in China, in 2018 into Anthemis BBVA Venture Partnership Fund in the UK)		.. internal innovation lab/incubator/accelerator, BBVA New Digital Business launched in 2015 in Madrid, London & San Francisco .. internal incubator/innovation lab, BBVA AI Factory launched in Madrid in 2019; .. internal incubator/innovation lab, BBVA Technology Focused Office launched in San Francisco in 2011 .. internal innovation lab, BBVA Cross Industry Development Center in the US launched in 2015 .. internal innovation lab, BBVA Next Technologies launched in Mexico and Spain in 2018 .. internal innovation lab, BBVA Creation Center launched in the US in 2016				
SC	1 (SC Ventures in 2018)	SC Ventures Innovation Investment Fund (100 million USD fund launched in 2018)			.. internal innovation lab/incubator/accelerator, eXellerator launched in 2016 and then incorporated in 2018 into Standard Chartered's innovation unit SC Ventures, launched Sinagpore lab in 2016, Hong Kong and London labs in 2018, 2 Shanghain labs & 1 Kenya lab in 2019, the San Francisco outpost was also incorporated into SC Ventures in 2018 .. internal innovation lab/incubator/accelerator, SC Ventures - Internal Ventures, launched in 2018 .. internal innovation lab, aXess Academy, launched in 2019			SC Studios, launched in San Francisco 2010 then incorporated into SC Ventures 2018	
Rabo	1 (Rabo Frontier Ventures in 2018)	Rabo Frontier Ventures Fund I (Launched in 2018 with 60 million EUR, expanded to 150 million EUR in 2019)	4 (In 2018, 30 million EUR of the Rabo Frontier Ventures Fund I is invested in external funds: Northzone, Speed Invest, Valar & Anthemis).		.. internal innovation lab/incubator/accelerator, Blockchain Acceleration Lab, launched in 2016 .. internal innovation lab/incubator/accelerator, Rabobank Moonshot Campaign, launched in 2015				
Nordea	1 (Nordea Ventures in 2017)	Nordea Ventures Fund launched in 2017			2 internal innovation labs / incubators (LC&Ix launched in 2019 focused on corporate & institutional banking; Nordea Runway launched in 2018)				

Appendix 10 – Table 1 d: Acquisition & Investment Modality - Corporate Venture Capital Submodality, Fintech Funds Submodality, and Internal Innovation Labs, Incubators, and/or Accelerators

	Partnership Modality																																
	Partnerships or Non-Lead Investments in Fintech																												Partnership Cessations				
	Payments				SME Banking	Personal Finance	Asset & Wealth Management	Crowd-funding	Trade Finance		Direct / Online Banking	Collaboration Tools		Lending			Risk Management		Bond Trading	Derivatives Trading	Trading Other	Open Banking	Blockchain			Reg-tech	Crypto-currency	Other	Crowd-funding	Fund Mgmt	Crypto-currency	Blockchain Consortia	Other
	Ripple	Curve	Transferwise	Other					Tradeshift	Other		Symphony	Other	Kabbage	Funding Circle	Other	Acadia-Soft	Other	Netptune Networks				R3	Digital Asset Holdings	Other								
HSBC	Yes			1 (2019)					Yes (2017)			Yes (2014)				2 (2019, 2019)	Yes (2010)	1 (2018)	Yes (2014)			1 (2019)											
BNP				1 (2019)	1 (2017)	1 (2017)	3 (2018, 2019, 2019)	3 (2013, 2015, 2016)				Yes (2017)					Yes (2015)	1 (2019)	Yes (2014)			1 (2018)	Yes (2017)	Yes (2016)		1 (2017)			1 (2018)				
Agricole	Yes (2018)			3 (2017, 2019, 2019)		1 (2017)		1 (2015)								2 (2019, 2019)			Yes (2014)								1 (2017)						
Santander		1 (2019)		1 (2016)			1 (2016)		Yes (2017)					Yes (2016)	Yes (2014)	1 (2019)		1 (2019)	Yes (2014)					Yes (2016)	Yes (2019)			2 (2014, 2019)				1 (R3 in 2016)	1 (2015)
Deutsche						1 (2016)				Yes (2017)		Yes (2014)					Yes (2011)		Yes (2016)				Yes (2017)					1 (2019)					
SocGen		2 (2010, 2016)			2 (2018, 2019)		1 (2018)		2 (2016, 2018)			Yes (2015)					Yes (2015)	1 (2019)	Yes (2014)	2 (2015)	1 (2019)		Yes (2017)					1 (2015)				1 (2017)	
BPCE	Yes		1 (2019	4 (2016, 2017, 2018, 2019)		1 (2018)		2 (2015, 2015)				Yes (2015)				1 (2015)							Yes (2017)							1 (2019)			
Barclays	Yes			3 (2016, 2017, 2019)								Yes (2018)	1 (2012)			1 (2019)	Yes (2015)	3 (2017, 2017, 2018)	Yes (2014)			1 (2019)	Yes (2017)			1 (2017)					1 (Coinbase in 2019)	1 (Marco Polo in 2017)	
Lloyds				2 (2013, 2017)	1 (2019)	1 (2015)													Yes (2016)														
ING				1 (2015, 2019)		2 (2015, 2019)	1 (2017)	4 (2014, 2015, 2015, 2015)						Yes (2015)									Yes (2017)		1 (2018)	1 (2019)						1 (2017)	
Mutuel						2 (2016, 2017)	3 (2016, 2016,	3(2014, 2016, unknown)		1 (2019)																							
UBS	Yes			1 (2014)			3 (2016; 2017;					Yes (2015)				1 (2015)	Yes (2015)		Yes (2015)				Yes (2017)									1 (Ethereum in 2017)	
UniCredit	Yes			1 (unknown)															Yes (2015)			2 (2016, 2016)	Yes (2017)										
Intesa	Yes					1 (2015)		1 (2018)								1 (2017)					1 (2018)		Yes (2017)									1 (Contour / Voltron in 2017)	
RBS	Yes				1 (2019)			1 (2015)							1 (2015)	5 (2016, 2016, 2019, 2019, 2019)			Yes (2019)				Yes (2017)									1 (Contour / Voltron in 2017)	
Suisse							3 (2017, 2018,									1 (2015)		2 (2015, 2018)	Yes (2014)				Yes (2017)									1 (Ethereum in 2017)	
BBVA	Yes (2017)			1 (2014)			1 (2014)	1 (2015)								1 (2014)			Yes (2014)				Yes (2017)				1 (2015)	2 (2019, 2019)				3 (Contour / Voltron in 2017, Marco Polo in 2017, CordaKYC in 2017)	
SC	Yes (2016)									1 (2019)	2 (2019, 2019)							1 (2019)										2 (2017, 2017)				1 (2017)	
Rabo				1 (2016)				6 (2013, 2013, 2015,			1 (2019)					1 (2018)			Yes (2017)						1 (2015)								
Nordea	Yes			1 (2019)		2 (2018, 2019)		1 (2018)			1 (2019)							1 (2019)				1 (2017)	Yes (2017)					1 (2019)					1 (2015)

Appendix 10 – Table 2 a: Partnership Modality - Partnerships or Non-Lead Investments in Fintech Submodality, and Partnership Cessation Submodality

	Partnership Modality																																			
	Partnership with BigTech or Telecommunications Firms																																			
	Payments														Personal Banking								e-Commerce	FX Trading	Corporate Banking	Customer Engagement	Lending	Asset & Wealth Management			General Agreement	Block-chain	Other	
	Apple Pay	Google Pay	Samsung Pay	Paypal	Fitbit Pay	Garmin Pay	M-Pesa	WeChat Pay	Alipay	Nuance	Twitter	Huawei	Other	WeChat	Tencent	Google	Apple	WhatsApp	Telegram	Amazon	Other	Alibaba	WeChat	Tencent	Samsung	eBay	Amazon	WeChat	Apple	Alibaba	Alibaba	Amazon	Uber
HSBC	Yes (2015)	Yes (2016)	Yes (2017)	Yes (2018)				Yes (2016)	Yes (2019)	Yes (2016)				Yes (2019)	Yes (2018)									Yes (2018)	Yes (2018)									
BNP	Yes (2019)	Yes (2017)			Yes (2019)	Yes (2019)		Yes (2017)	Yes (2016)														Yes (2019)										
Agricole	Yes (2018)	Yes (2018)	Yes (2019)																															
Santander	Yes (2015)	Yes (2016)	Yes (2017)		Yes (2018)	Yes (2018)		Yes (2018)	Yes (2018)	Yes (2016)																Yes (2019)								
Deutsche	Yes (2018)		Yes (2019)	Yes (2018)			Yes (2018)	Yes (2018)	Yes (2018)														Yes (2019)											
SocGen	Yes (2017)	Yes (2017)	Yes (2018)			Yes (2019)							Yes (2010, 2016)			Yes (2018)		Yes (2019)			Yes (2008)												
GBPCE	Yes (2016)		Yes (2018)					Yes (2018)	Yes (2018)		Yes (2014)					Yes (2019)																		
Barclays	Yes (2016)			Yes (2018)					Yes (2017)				Yes (2017)				Yes (2017)																Yes (2016)	
Lloyds	Yes (2015)	Yes (2016)																																
ING	Yes (2017)	Yes (2016)		Yes (2018)		Yes (2019)		Yes (2018)	Yes (2018)	Yes (2014)							Yes (2018)	Yes (2017)																
Mutuel	Yes (2017)	Yes (2018)	Yes (2018)		Yes (2018)	Yes (2018)																												
UBS					Yes (2019)	Yes (2019)							Yes (2019)															Yes (2016						
UniCredit	Yes (2017)	Yes (2018)	Yes (2019)						Yes (2017)								Yes (2018)			Yes (2018)		2 (2015, 2018)												
Intesa	Yes (2018)	Yes (2018)	Yes (2019)		Yes (2019)	Yes (2019)																Yes (2014)												
RBS	Yes (2015)	Yes (2016)														Yes (2019)																		
Suisse	Yes (2019)		Yes (2019)										Yes (2019)																Yes (2018	Yes (2018)				
BBVA	Yes (2015)	Yes (2016)	Yes (2016)						Yes (2018)							Yes (2017)	Yes (2017)	Yes (2017)	Yes (2017)															Yes (2019
SC	Yes (2016)	Yes (2016)	Yes (2016)					Yes (2017)	Yes (2016)			Yes (2018)	Yes (several telcos since 2013)											Yes (2017)						Yes (2017)	Yes (2018)		
Rabo	Yes (2019)				Yes (2019)	Yes (2018)										Yes (2018)																		
Nordea	Yes (2017)	Yes (2018)	Yes (2017)		Yes (2018)	Yes (2018)												Yes (2017)																

Appendix 10 – Table 2 b: Partnership Modality - Partnerships with BigTech or Telecommunications Firms Submodality

	Partnership Modality																										
	Partnerships with Other Financial Institutions																										
	Payments											Regulatory / Standards / Industry Body								Risk Management	Corporate Banking	Trade Finance		Trading	Lending	Crypto-currency	Other
	Mastercard (Zapp)	PayM	PayLib	Blik	Lyf Pay	Payconiq	Bizum	Wirecard	Twint	iDeal	Other	Fintech Collaboration Toolkit	FCA Regulatory Sandbox	Open Banking Standards Hong Kong (SWIFT)	Innovate Finance	Global Payments Steering Group	International Association for Trusted Blockchain Applications	France Fintech	Dutch Blockchain Coalition	IHS Markit	Trade Club Alliance	Trade Finance Distribution Initiative	Trade Information Network	CurveGlobal Limited		FD2A French Digital Asset Association	
HSBC	Yes (2014)	Yes (2014)										Yes (2018)	Yes (2016)	Yes (2019)	Yes (2014)					Yes (2015)		Yes (2019)	Yes (2018)		Yes (2018)		Yes (2018)
BNP Paribas			Yes (2013)	Yes (2015)	Yes (2016)	Yes (2018)																	Yes (2018)	Yes (2015)			
Crédit Agricole			Yes (2013)	Yes (2015)				Yes (2018)													Yes (2019)	Yes (2019)				Yes (2017)	
Santander	Yes (2014)	Yes (2014)		Yes (2015)			Yes (2016)					Yes (2018)			Yes (2014)	Yes (2016)				Yes (2015)	Yes (2019)		Yes (2018)				
Deutsche Bank						Yes (2018)	Yes (2016)				Yes (2015)											Yes (2019)	Yes (2018)				2 (2017, 2018)
Société Générale			Yes (2013)															Yes (2015)						Yes (2015)		Yes (2017)	
Groupe BPCE			Yes (2013)		Yes (2017)						Yes (2019)				Yes (2014)							Yes (2019)					
Barclays		Yes (2014)										Yes (2018)	Yes (2016)		Yes (2014)		Yes (2019)			Yes (2015)				Yes (2015)			
Lloyds Banking Group		Yes (2014)										Yes (2018)	Yes (2016)		Yes (2014)							Yes (2019)					
ING				Yes (2015)		Yes (2015)				Yes (2005)									Yes (2017)			Yes (2019)					2 (2019, 2019)
Crédit Mutuel			Yes (2013)		Yes (2016)	Yes (2018)												Yes (2015)									Yes (2013)
UBS									Yes (2014)											Yes (2015)							Yes
UniCredit																Yes (2016)											
Intesa Sanpaolo																	Yes (2019)										
RBS		Yes (2014)										Yes (2018)	Yes (2016)		Yes (2014)					Yes (2015)							
Credit Suisse									Yes (2014)																		Yes
BBVA							Yes (2016)										Yes (2019)			Yes (2015)							
Standard Chartered													Yes (2016)			Yes (2016)						Yes (2019)	Yes (2018)				Yes (2019)
Rabobank						Yes (2017)				Yes (2005)									Yes (2017)			Yes (2019)					Yes (2019)
Nordea											5 (2012, 2013, 2016, 2017, 2017)										Yes (2019)							Yes (2019)

Appendix 10 – Table 2 c: Partnership Modality - Partnerships with Other Financial Institutions Submodality

	Partnership Modality																																			
	Blockchain Consortia …																																			
	Trade Finance															Lending														Payments							
	Hyperledger				R3				Ehereum		FISCO-BCOS (Tencent)	Other	Not disclosed	R3					SETL	Not decided	Hyperledger	Ripple		Hyperledger		Ethereum		Not decided	Not disclosed	Other						
	We.Trade	e-Trade-Connect	IBM/Dubai Customs	dltledgers	Contour (Voltron)	Marco Polo	Standard Chartered / Siemens Bank Guarantees	AIG Trade Finance Transaction	Tradeshift	Trado	WeQChain	Wave	Infocomm Development Authority of	Standard Chartered / Itaú Unibanco Syndicated Lending Project	Barclays / RBS Real Estate Lending Project	ING Money Market Project	Credit Suise Syndicated Lending Project	Fusion LenderComm	NowCP	Auto1 Fintech	Broadridge Financial Solutions Repo Project	Ripple-Net	Ripple for International Money Transfers	SWIFT's Bank-to-Bank Transfers	Automotive transaction platform	Interbank Information Network	Fnality Intl	Iberpay Interbank Payments Initiative	Ant Financial Blockchain for Remittances	D+H Payments Project						
HSBC	Yes (2016)	Yes (2018)			Yes (2018)				Yes (2018)									Yes (2017)																		
BNP		Yes (2018)			Yes (2018)	Yes (2017)				Yes (2019)								Yes (2017)	Yes (2019)					Yes (2018)												
Agricole						Yes (2017)													Yes (2019)						Yes (2018)										
Santander	Yes (2016)		Yes (2017)						Yes (2018)															Yes (2018)		Yes (2018)	Yes (2019)	Yes (2019)							
Deutsche	Yes (2016)																			Yes (2018)				Yes (2018)		Yes (2019)									
SocGen	Yes (2016)																Yes (2016)	Yes (2017)			Yes (2017)			Yes (2018)		Yes (2018)									
BPCE	Yes (2016)					Yes (2017)										Yes (2018)		Yes (2017)	Yes (2019)		Yes (2017)															
Barclays										Yes (2019)		Yes (2015)			Yes (2019)		Yes (2016)									Yes (2019)									
Lloyds																								Yes (2018)		Yes (2019)	Yes (2019)								
ING					Yes (2018)	Yes (2017)										Yes (2018)		Yes (2017)									Yes (2019)									
Mutuel																																				
UBS	Yes (2018)																						Yes (2017)			Yes (2015)									
UniCredit	Yes (2016)																							Yes (2018)		Yes (2018)										
Intesa						Yes (2017)																		Yes (2018)		Yes (2019)										
RBS						Yes (2017)									Yes (2019)		Yes (2016)	Yes (2018)																		
Credit Suisse																	Yes (2016)									Yes (2019)									
BBVA												Yes (2017)					Yes (2016)						Yes (2017)	Yes (2018)			Yes (2019)								
SC		Yes (2018)		Yes (2018)	Yes (2018)	Yes (2017)	Yes (2018)	Yes (2017)		Yes (2019)	Yes (2019)		Yes (2015)	Yes (2018)								Yes (2017)		Yes (2018)				Yes (2018)								
Rabo	Yes (2016)									Yes (2019)						Yes (2018)								Yes (2018)		Yes (2018)				Yes (2016)				
Nordea	Yes (2016)																									Yes									

Appendix 10 – Table 2 d (1/2): Partnership Modality - Blockchain Consortia Submodality

	Partnership Modality																																
	… Blockchain Consortia																																
	Fund Management			Interbank Payments				Commodities						Compliance	Securities Lending	FX		Bond Issuance		Derivatives		Trading	Trade Settlement		Shared KYC				Several Use	Blockchain Standards			
	Ethereum		SETL	Several	R3		Ethereum	Ethereum		Hyperledger		Ethereum & Hyperledger	Not decided	Ethereum	R3	Hyper-ledger	R3	DAML	Ethereum	Ethereum	Not Decided	R3 & Hyperledger	Ethereum		Hyper-ledger	R3		Ethereum	Hyper-ledger				
	Fund-chain	Funds-DLT	Iznes	Project Ubin	Project Jasper	Spunta Banca Project	Project GreenPay	Komgo	VAKT	Natixis / IBM / Trafigura Project	MineHub	Repo:NOW	Force-field	MADREC	HQLAx	CLSNet	Calypso FX Matching	SGX Digital Asset Issuance Platform	Santander Bond Issuance Project	AxCore	Fast Track Listing	Unlisted Company Trading Project Finland	LiquidShare	Paxos Settlement Service	IBM Shared KYC PoC	CordaKYC	Clipeum	LaBChain	Ledger Connect	Post Trade Distributed Ledger	Enterprise Ethereum Alliance	Alastria	Hyper-ledger
HSBC	Yes (2016)			Yes (2016)	Yes (2016)													Yes (2019)							Yes (2017)					Yes (2015)			
BNP	Yes		Yes			Yes		Yes								Yes				Yes	Yes		Yes			Yes		Yes					
Agricole	Yes	Yes				Yes		Yes															Yes			Yes	Yes	Yes					
Santander																			Yes		Yes										Yes (2017)	Yes (2017)	
Deutsche																									Yes	Yes							Yes (2016)
SocGen								Yes	Yes												Yes		Yes	Yes		Yes	Yes	Yes		Yes			
BPCE		Yes						Yes		Yes																Yes	Yes	Yes					
Barclays														Yes (2018)		Yes				Yes									Yes				
Lloyds								Yes																									
ING								Yes	Yes		Yes		Yes		Yes (2018)											Yes					Yes (2017)		
Mutuel			Yes																														
UBS														Yes (2018)	Yes (2018)											Yes				Yes			
UniCredit																											Yes						Yes
Intesa						Yes										Yes																	
RBS							Yes																										
Suisse		Yes		Yes										Yes (2018)	Yes (2018)			Yes		Yes				Yes									
BBVA																	Yes				Yes										Yes (2017)	Yes (2017)	Yes (2016)
SC				Yes																											Yes (2019)		
Rabo								Yes				Yes																			Yes		
Nordea																						Yes (2018)											

Appendix 10 – Table 2 d (2/2): Partnership Modality - Blockchain Consortia Submodality

	Open Innovation Modality																		
	Establishment of Banks' Own External Innovation Labs, Incubators, and/or Accelerators								Participation in Others' External Innovation Labs, Incubators, and/or Accelerators										
	Innovation Lab	Innovation Lab / Incubator	Incubator	Incubator / Accelerator	Accelerator	Innovation Lab / Incubator / Accelerator	Innovation Outpost	Open Innovation Program	Innovation Hub	Incubator		Incubator / Accelerator	Accelerator		Innovation Lab / Incubator / Accelerator		
									Other	The Floor Hub	Other	Other	TechQuartier & FintechEurope	Other	FinTech Innovation Lab	Copenhagen Fintech	Other
HSBC	3 (Hong Kong in 2016, Toronto in 2019, London in 2019)				2 (India in 2018, India in 2018)	1 in Singapore in 2015				Tel Aviv in 2016 and Hong Kong in 2018		3 (1 in Dubai in 2017, 1 in Dubai in 2018, 1 in Australia in 2015)		In Mexico in 2017	In London 2010		2 (1 in London in 2013; 1 in Scotland in 2018)
BNP					3 (2016, 2016, 2016)	1 in France in 2016					1 in Capte Town in 2017		In Frankfurt in 2018	In Italy in 2018	In New York in 2010	In Copenhagen in 2016	
Agricole				2 (1 launched in 2014 in France, Italy & Luxembourg; 1 launched in 2018 in France)			4 (London, New York, Shanghai & Tokyo)					1 in France in 2019					
Santander					1 (Brazil in 2017)				2 (1 in Mexico in 2015; 1 in New York in 2015)	Tel Aviv in 2016 and Hong Kong in 2018				1 in 2017	In London in 2010		1 in Oslo in 2016
Deutsche	2 (1 in Berlin in 2005; Network of Labs in London & Berlin in 2015, Palo Alto in 2016, New York in 2017, Singapore in 2018)								2 (1 in New York in 2015; 1 in 2018)	Tel Aviv in 2016 and Hong Kong in 2018		In Berlin in 2016	In Frankfurt in 2018		In London & New York in 2010		
SocGen		9 (Paris 2018, Paris 2016, London 2018, Luxembourg 2018, Tunisia 2017, Berlin 2017, Dakar 2016, Casablanca 2018, Czech Republic 2017)			1 (1 in Romania & India in 2015)						In Paris in 2018				In London, New York & Hong Kong in 2010		In Italy in 2017
BPCE				2 (in France, 2016, 2017)		1 in France in 2017						1 in France in 2019			In Hong Kong in 2010		
Barclays	2 (1 in New York in 2019; 1 series in New York, London, Tel Aviv & Mumbai in 2015)				2 (1 network of accelerators, London in 2014, New York in 2014, Tel Aviv in 2016; 1 separate accelerator in Egypt)										In New York in 2010		1 in 2014
Lloyds	1 in the UK in 2015											1 in London in 2014		1 in 2017	In London in 2010		1 in Scotland in 2018
ING	1 in 2016	2 (1 in 2015; 1 series in 2018 Turkey, Poland & Germany)	1 in 2019	2 (1 in Belgium in 2015; 1 in Amsterdam in 2015)	1 in 2016	1 series in 2017 in Amsterdam, Brussels, London & Singapore						In Germany/France/ Spain/Italy in 2014	In Frankfurt in 2018		In London in 2010	In Copenhagen in 2016	
Mutuel	1 in France in 2018		1 in 2016 in France			1 in France in 2018					In Paris in 2018	1 in France in 2019					
UBS	2 (1 in London in 2015, 1 in Hong Kong in 2017)											1 in Switzerland in 2015			In London & New York in 2010		
UniCredit				1 in Milan in 2014								1 in Italy in 2019	In Frankfurt in 2018				
Intesa						1 series launched in Italy in 2015, London in 2016, AI Lab in 2018				Tel Aviv in 2016 and Hong Kong in 2018		1 in London in 2014		In Italy in 2018	In London in 2010		
RBS					2 (1 in the UK in 2018; 1 in the UK in 2016)					Tel Aviv in 2016 and Hong Kong in 2018					In London in 2010		
Suisse												2(1 in Switzerland in 2015; 1 in India in 2019)			In London, New York & Hong Kong in 2010		
BBVA	1 series of labs, Madrid, USA & Mexico in 2011; in Colombia 2013	1 launched in 2009		1 in London in 2018	1 in Madrid in 2019			Open Innovation Program launched in 2009				In Germany/France/ Spain/Italy in 2014					
SC						1 series launched in 2019 in Singapore, Hong Kong, United Kingdom, Kenya, Shanghai & San Francisco						2 (1 in Dubai in 2017; 1 in Asia Pacific in 2015)			In Hong Kong in 2010		
Rabo									1 in New York in 2015			3 (1 in London in 2014; 1 in London in 2016; 1 in Switzerland in 2016)		1 in 2017	In London & New York in 2010		2 (1 in the Netherlands in 2014; 1 in the Netherlands in 2017)
Nordea				1 in Helsinki and in Stockholm from 2015 to 2016											1 in London in 2010	In Copenhagen in 2016	4 (1 in Helsinki in 2016; 1 in Oslo in 2016; 1 in Stockholm in 2017; 1 in Stockholm in 2019)

Appendix 10 – Table 3: Open Innovation Modality - Establishment of Banks' Own External Innovation Labs, Incubators, and/or Accelerators Submodality, and Participation in Others' External Innovation Labs, Incubators, and/or Accelerators Submodality

	Open IT Infrastructure Modality					
	Establishment of Open API Portals, Developer Kits, and Sandboxes					Open Innovation Technological Interfaces for Staff, External Developers, and Customers to Co-Innovate
	APIs, Kits & Sandboxes	User Experience (UX) Charter	Innovation Methodology	Proof of Concept Sandbox		
HSBC	Yes (2019)					
BNP Paribas	Yes (2019)					3 (Startup Engagement Kit in 2017; OpenUp in 2016; SCOOP open innovation initiative)
Crédit Agricole	Integrated into CA Store					3 (Startup Mission in 2018; CA Store in 2012; CACEIS Innovation Lab in 2018)
Santander	Yes 2018					SANTANDERideas :) launched in 2014
Deutsche Bank	Yes					Deutsche Bank Pitch Portal
Société Générale	Yes					3 (Societe Generale Open Innovation; Internal Startup Call in 2017; Startup Radar in 2017)
Groupe BPCE	89C3 in 2017	89C3 in 2017				2 (89C3 in 2017; Start-up PASS)
Barclays	Yes (2018)					2 (Launchpad App in 2015; Barclays Ring Community in 2012)
Lloyds Banking Group	Yes					Lloyds Banking Group Fintech Mentoring Scheme in 2016
ING	Yes (2018)		2 (PACE in 2016; Way of Working in 2017)			4 (ING Touchpoint Platform in 2017; Orange Sharing in 2015; ING Web Café in 2013; ING Turuncu Destek in 2014)
Crédit Mutuel	Yes					
UBS	Yes (2019)					2 (UBS Future of Finance Challenge every 2 years since 2015; UBS Innovation Spaces in 2014)
UniCredit	Yes (2019)					
Intesa Sanpaolo	Yes (2019)					
RBS	Yes (2018)					2 (NatWest Labs / Ideas Bank in 2013; Entrepreneur Development Academy in 2015)
Credit Suisse	Yes (2018)					Credit Suisse Private Innovation Circle in 2014
BBVA	Yes (2017)					2 (BBVA Open Marketplace in 2018; BBVA Beta Testers in 2016)
Standard Chartered	Yes (2019)			Yes (2018)		2 (Client Engagement & Co-Creation in 2018; aXess Labs in 2019)
Rabobank	Yes (2018)					Rabobank Innovate With Your Bank (2014)
Nordea	Yes (2017)					Nordea Next (2014)

Appendix 10 – Table 4: Open IT Infrastructure Modality - Establishment of Open API Portals, Developer Kits, and Sandboxes Submodality, and Open Innovation Technological Interfaces for Staff, External Developers, and Customers to Co-Innovate Submodality

Appendix 11 – Taxonomy Generation Process Iterations

Iteration 1

Integrated Internal Innovation Lab/Incubator/Accelerator (early) + External Innovation Lab/Incubator/Accelerator (early) + Corporate Venture Capital Arm (early) + Large Fintech Fund (early) + Participation in Very Few Consortium Innovation Labs/Incubators/Accelerators	Integrated Internal Innovation Lab/Incubator/Accelerator (late) + External Innovation Lab/Incubator/Accelerator (late) + Corporate Venture Capital Arm (late) + Large Fintech Fund (late) + Participation in Few Consortium Innovation Labs/Incubators/Accelerators	Integrated Innovation Unit Internal Innovation Lab/Incubator/Accelerator (early) + External Innovation Lab/Incubator/Accelerator (early) + Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Fintech subsidiaries	External Innovation Lab/Incubator/Accelerator (first) + Internal Innovation Lab/Incubator/Accelerator (after) + Participation in High Consortium Innovation Labs/Incubators/Accelerators	External Innovation Lab/Incubator/Accelerator (first) + Internal Innovation Lab/Incubator/Accelerator (after) + Participation in Few Consortium Innovation Labs/Incubators/Accelerators	External Innovation Lab/Incubator/Accelerator (first) + Internal Innovation Lab/Incubator/Accelerator (after) + Think Tank	Internal Innovation Lab/Incubator/Accelerator (first or same/similar time) + External Innovation Lab/Incubator/Accelerator (after or same/similar time) + Think Tank + Participation in Very Few Consortium Innovation Labs/Incubators/Accelerators	Internal Innovation Lab/Incubator/Accelerator (first or same/similar time) + External Innovation Lab/Incubator/Accelerator (after or same/similar time) + Participation in Few Consortium Innovation Labs/Incubators/Accelerators	Only External Innovation Lab/Incubator/Accelerator (No Internal) - Established Comparatively Early	Only External Innovation Lab/Incubator/Accelerator (No Internal) - Established Comparatively Late + Participation in Many Consortium Innovation Labs/Incubators/Accelerators	Only External Innovation Lab/Incubator/Accelerator (No Internal) - Established Comparatively Late + Participation in Few Consortium Innovation Labs/Incubators/Accelerators	Limited External Innovation Lab/Incubator/Accelerator + Several Internal Innovation Lab/Incubator/Accelerator + Think Tank + Participation in Few Consortium Innovation Labs/Incubators/Accelerators	Limited External Innovation Lab/Incubator/Accelerator + Several Internal Innovation Lab/Incubator/Accelerator + Participation in High Consortium Innovation Labs/Incubators/Accelerators	Only Internal Innovation Lab/Incubator/Accelerator (No External) + Participation in Many Consortium Innovation Labs/Incubators/Accelerators	Very Limited Internal or External Innovation Lab/Incubator/Accelerator + Participation in Few Consortium Innovation Labs/Incubators/Accelerators
BBVA	Standard Chartered	Santander	Deutsche Bank	Crédit Agricole Lloyds Banking Group	BNP Paribas	UBS	Groupe BPCE ING Crédit Mutuel Royal Bank of Scotland	Intesa Sanpaolo Barclays	HSBC	Société Générale	Credit Suisse	Nordea	Rabobank	UniCredit

No Corporate Venture Capital Arm	Early to Establish Corporate Venture Capital Arm + Large Fintech Fund	Early to Establish Corporate Venture Capital Arm + Small Fintech Fund	Late to Establish Corporate Venture Capital Arm + Large Fintech Fund	High Number of Lead Investments in Fintechs - Early to Initiate	High Number of Lead Investments in Fintechs - Late to Initiate	Moderate Number of Lead Investments in Fintechs - Early to Initiate	Moderate Number of Lead Investments in Fintechs - Late to Initiate	Low Number of Lead Investments in Fintechs	Low Number of Lead Investments in Fintechs but Consistently High Stake	No Lead Investments in Fintechs	Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Open Innovational Technological Interfaces	Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + Open Innovational Technological Interfaces	Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No Open Innovational Technological Interfaces
Crédit Agricole	HSBC	Intesa Sanpaolo	Société Générale	Santander	Barclays	Crédit Mutuel	HSBC	Lloyds Banking Group	Intesa Sanpaolo	UBS	Crédit Agricole	BNP Paribas	Crédit Mutuel
Deutsche Bank	Santander	Crédit Mutuel	Rabobank	BBVA		Standard Chartered	BNP Paribas	Rabobank			Groupe BPCE	Deutsche Bank	UBS
Groupe BPCE	Barclays		Nordea	ING		Credit Suisse		Société Générale			BBVA	Société Générale	UniCredit
Lloyds Banking Group	ING							Royal Bank of Scotland			Santander	Barclays	Intesa Sanpaolo
Royal Bank of Scotland	Credit Suisse							Groupe BPCE			Standard Chartered	Lloyds Banking Group	Credit Suisse
UBS	UniCredit							UniCredit				ING	HSBC
	BNP Paribas							Crédit Agricole				Royal Bank of Scotland	
								Deutsche Bank				Nordea	
								Nordea				Rabobank	

No Fintech Acquisitions + Comparatively High Number of Fintech Divestments	No Fintech Acquisitions	1 Fintech Acquisitions + Comparatively High Number of Fintech Divestments	1 Fintech Acquisitions	Low Number of Fintech Acquisitions	Moderate Number of Fintech Acquisitions + Comparatively High Number of Fintech Divestments	High Number of Fintech Acquisitions	Low Participation in Blockchain Consortia - Late to Participate	Low Participation in Blockchain Consortia - Late to Participate + Originated *de novo* Blockchain Platform	Moderate Participation in Blockchain Consortia - Early to Participate	Moderate Participation in Blockchain Consortia - Late to Participate	Moderate Participation in Blockchain Consortia - Late to Participate + Originated de novo Blockchain Platform	Moderate Participation in Blockchain Consortia - Late to Participate + Originated Internal Only de novo Blockchain Platform	High Participation in Blockchain Consortia - Early to Participate	High Participation in Blockchain Consortia - Late to Participate	High Participation in Blockchain Consortia - Late to Participate + Originated de novo Blockchain Platform
UBS	HSBC	Rabobank	Crédit Agricole	BNP Paribas	BBVA	Groupe BPCE	Lloyds Banking Group	Royal Bank of Scotland	HSBC	Santander	UBS	BBVA	Société Générale	BNP Paribas	ING
UniCredit	Lloyds Banking Group		Deutsche Bank	Société Générale	Santander	Crédit Mutuel	UniCredit		Crédit Agricole	Deutsche Bank	Credit Suisse		Groupe BPCE	Standard Chartered	
	Intesa Sanpaolo		Credit Suisse	Barclays			Crédit Mutuel			Barclays					
	Standard Chartered		Nordea	ING			Intesa Sanpaolo			Rabobank					
				Royal Bank of Scotland			Nordea								

Low Number of Partnerships or Non-Lead Investments in Fintechs	Moderate Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Early	Moderate Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Early + Comparatively High Number of Partnership Cessations	Moderate Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Late	High Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Early	High Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Early + Comparatively High Number of Partnership Cessations	High Number of Partnerships or Non-Lead Investments in Fintechs - Initiated Early + >50% in a Single Subsector	Low Number of Bigtech Partnerships, Mostly in the Payments Subsector - Entered Into Early	Low Number of Bigtech Partnerships, Mostly in the Payments Subsector - Entered Into Late	Moderate Number of Bigtech Partnerships, Mostly in the Payments Subsector - Entered Into Early	Moderate Number of Bigtech Partnerships, Mostly in the Payments Subsector - Entered Into Late	Moderate Number of Bigtech Partnerships, Several Subsector - Entered Into Early	Moderate Number of Bigtech Partnerships, Several Subsector - Entered Into Late	Large Number of Bigtech Partnerships, Mostly in the Payments Subsector - Entered Into Early	Large Number of Bigtech Partnerships, Several Subsector - Entered Into Early	Large Number of Bigtech Partnerships, Extensive Partnerships in Several Subsector - Entered Into Early
Lloyds Banking Group	HSBC	BBVA	Crédit Agricole	BNP Paribas	Santander	Royal Bank of Scotland	Lloyds Banking Group	Crédit Agricole	Groupe BPCE	BNP Paribas	Barclays	UniCredit	Santander	HSBC	Standard Chartered
UniCredit	Deutsche Bank		Standard Chartered	Société Générale		Rabobank	Royal Bank of Scotland	Rabobank		Deutsche Bank		Credit Suisse	ING	Société Générale	
Intesa Sanpaolo	Crédit Mutuel		Nordea	Barclays		Groupe BPCE		UBS		Crédit Mutuel				BBVA	
	UBS			ING						Intesa Sanpaolo					
	Credit Suisse									Nordea					

Low Number of Fintech Related Partnerships with Other Banks/Incumbents	Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents, Entered Into Early	Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents, Entered Into Late	Large Number of Fintech Related Partnerships with Other Banks/Incumbents, Entered Into Early	No Fintech Subsidiaries + Low Number of Fintech Initiatives Launched Comparatively Late	1 Fintech Subsidiary (Early) + No or Low Number of Fintech Initiatives Launched Comparatively Late	1 Fintech Subsidiary (Early) + High Number of Fintech Initiatives + High Number of Fintech Spin-Offs	Low Number of Fintech Subsidiaries - Only One Subsector + No or Low Number of Fintech Initiatives Launched Comparatively Late	Low Number of Fintech Subsidiaries - Several Subsectors + No or Low Number of Fintech Initiatives Launched Comparatively Late	Moderate Number of Fintech Subsidiaries - Early + High Number of Fintech Initiatives	Moderate Number of Fintech Subsidiaries - Early + No or Low Number of Fintech Initiatives Launched Comparatively Late	Moderate Number of Fintech Subsidiaries - Late + No or Low Number of Fintech Initiatives Launched Comparatively Late	Moderate Number of Fintech Subsidiaries - Late + High Number of Fintech Initiatives + Fintech Initiative Spin-Off/Open-Sourced	High Number of Fintech Subsidiaries - Early + No or Low Number of Fintech Initiatives Launched Comparatively Late	High Number of Fintech Subsidiaries - Late + High Number of Fintech Initiatives Launched Comparatively Early
UBS	BNP Paribas	Crédit Agricole	HSBC	UBS	Lloyds Banking Group	ING	BNP Paribas	Deutsche Bank	HSBC	Intesa Sanpaolo	Standard Chartered	Royal Bank of Scotland	Groupe BPCE	BBVA
UniCredit	Groupe BPCE	Standard Chartered	Santander	Nordea	UniCredit		Crédit Agricole	Société Générale	Rabobank	Santander			Crédit Mutuel	
Société Générale	ING	Deutsche Bank			Credit Suisse		Barclays							
Intesa Sanpaolo	Crédit Mutuel	Barclays												
Credit Suisse	Nordea	Lloyds Banking Group												
BBVA	Rabobank	Royal Bank of Scotland												

Iteration 2

Integrated Internal Innovation Lab/Incubator/Accelerator (early) + External Innovation Lab/Incubator/Accelerator (early) + Corporate Venture Capital Arm (early) + Large Fintech Fund (early) + Participation in Very Few Consortium Innovation Labs/Incubators/ Accelerators + High Number of Lead Investments in Fintechs - Early to Initiate + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Moderate Number of Open Innovational Technological Interfaces	Integrated Internal Innovation Lab/Incubator/Accelerator (late) + External Innovation Lab/Incubator/Accelerator (late) + Corporate Venture Capital Arm (late) + Large Fintech Fund (late) + Participation in Few Consortium Innovation Labs/Incubators/ Accelerators + Moderate Number of Lead Investments in Fintechs - Early to Initiate + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Moderate Number of Open Innovational Technological Interfaces	Integrated Innovation Unit Internal Innovation Lab/Incubator/ Accelerator (early) + External Innovation Lab/Incubator/ Accelerator (early) + Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Fintech subsidiaries + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Low Number of Open Innovational Technological Interfaces	External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No or Low Number of Open Innovational Technological Interfaces	External Innovation Lab/Incubator/ Accelerator + Internal Innovation Lab/Incubator/ Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + High or Moderate Number of Open Innovational Technological Interfaces	External Innovation Lab/Incubator/ Accelerator + Internal Innovation Lab/Incubator/ Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High or Moderate Number of Open Innovational Technological Interfaces	Internal Innovation Lab/Incubator/Accelerator + External Innovation Lab/Incubator/Accelerator + Think Tank + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/ Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No Open Innovational Technological Interfaces	Internal Innovation Lab/Incubator/ Accelerator + External Innovation Lab/Incubator/ Accelerator + Think Tank + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High Number of Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in Low Number of Consortium Innovation Labs/Incubators/ Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No or Low Number of Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/ Accelerator (No Internal) + Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + No Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High Number of Open Innovational Technological Interfaces	Only Internal Innovation Lab/Incubator/Accelerator (No External) + Participation in Many Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + Low Number of Open Innovational Technological Interfaces
BBVA	Standard Chartered	Santander	Deutsche Bank Lloyds Banking Group Crédit Mutuel	Crédit Agricole Groupe BPCE	ING Royal Bank of Scotland	UBS Credit Suisse	BNP Paribas	Intesa Sanpaolo UniCredit Barclays	HSBC	Société Générale	Nordea Rabobank

No Corporate Venture Capital Arm + No Lead Investments in Fintechs	No Corporate Venture Capital Arm + Low Number of Lead Investments in Fintechs	Early to Establish Corporate Venture Capital Arm & Fintech Fund + Low Number of Lead Investments in Fintechs	Early to Establish Corporate Venture Capital Arm & Fintech Fund + Moderate Number of Lead Investments in Fintechs	Early to Establish Corporate Venture Capital Arm & Fintech Fund + High Number of Lead Investments in Fintechs	Late to Establish Corporate Venture Capital Arm & Fintech Fund + Low Number of Lead Investments in Fintechs	0-1 Fintech Acquisitions + 0-1 Fintech Subsidiaries + Low Number of Fintech Initiatives Launched Comparatively Late	0-1 Fintech Acquisitions + Moderate Number of Fintech Subsidiaries - Early + No or Low Number of Fintech Initiatives Launched Comparatively Late	0-1 or Low Number of Fintech Acquisitions + Low Number of Fintech Subsidiaries + Low Number of Fintech Initiatives Launched Comparatively Late	0-1 Fintech Acquisitions + Moderate Number of Fintech Subsidiaries - Early + High Number of Fintech Initiatives	0-1 Fintech Acquisitions + Moderate Number of Fintech Subsidiaries - Late + Low Number of Fintech Initiatives Launched Comparatively Late	Low Number of Fintech Acquisitions + Low to Moderate Number of Fintech Subsidiaries + High Number of Fintech Initiatives + High Number of Fintech Spin-Offs	Moderate Number of Fintech Acquisitions + Moderate Number of Fintech Subsidiaries - Early + Low Number of Fintech Initiatives Launched Comparatively Late	Moderate Number of Fintech Acquisitions + High Number of Fintech Subsidiaries - Late + High Number of Fintech Initiatives Launched Comparatively Early	High Number of Fintech Acquisitions + High Number of Fintech Subsidiaries - Early + No or Low Number of Fintech Initiatives Launched Comparatively Late
UBS	Crédit Agricole	UniCredit	Crédit Mutuel	Santander	Société Générale	UBS	Intesa Sanpaolo	Crédit Agricole	HSBC	Standard Chartered	ING	Santander	BBVA	Groupe BPCE
	Deutsche Bank	Intesa Sanpaolo	Credit Suisse	Barclays	Raboban k	UniCredit		Deutsche Bank	Rabobank		Royal Bank of Scotland			Crédit Mutuel
	Groupe BPCE		HSBC	ING	Nordea	Lloyds Banking Group		BNP Paribas						
	Lloyds Banking Group		BNP Paribas			Credit Suisse		Société Générale						
	Royal Bank of Scotland					Nordea		Barclays						

Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia + Originated de novo Blockchain Platform	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia + Originated de novo Blockchain Platform	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia + Originated de novo Blockchain Platform	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	High Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Moderate Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations + Moderate Participation in Blockchain Consortia + Originated Internal Only de novo Blockchain Platform	High Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations + Moderate Participation in Blockchain Consortia
UniCredit	UBS	Barclays	Royal Bank of Scotland	BNP Paribas	Société Générale	ING	Standard Chartered	HSBC	BBVA	Santander
Intesa Sanpaolo	Credit Suisse	Rabobank		Groupe BPCE						
Lloyds Banking Group										
Crédit Agricole										
Deutsche Bank										
Crédit Mutuel										
Nordea										

Iteration 3

BBVA	Standard Chartered	Santander	Deutsche Bank Lloyds Banking Group Crédit Mutuel	Crédit Agricole Groupe BPCE	ING Royal Bank of Scotland	UBS Credit Suisse	BNP Paribas	Intesa Sanpaolo UniCredit Barclays	HSBC	Société Générale	Nordea Rabobank
Integrated Internal Innovation Lab/Incubator/Accelerator (early) + External Innovation Lab/Incubator/Accelerator (early) + Corporate Venture Capital Arm (early) + Large Fintech Fund (early) + Participation in Very Few Consortium Innovation Labs/Incubators/Accelerators + High Number of Lead Investments in Fintechs - Early to Initiate + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Moderate Number of Open Innovational Technological Interfaces + Moderate Number of Fintech Acquisitions + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations + Moderate Participation in Blockchain Consortia + Originated Internal Only de novo Blockchain Platform	Integrated Internal Innovation Lab/Incubator/Accelerator (late) + External Innovation Lab/Incubator/Accelerator (late) + Corporate Venture Capital Arm (late) + Large Fintech Fund (late) + Participation in Few Consortium Innovation Labs/Incubators/Accelerators + Moderate Number of Lead Investments in Fintechs - Early to Initiate + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Moderate Number of Open Innovational Technological Interfaces + No or Low Number of Fintech Acquisitions + No, Low or Moderate Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	Integrated Innovation Unit Internal Innovation Lab/Incubator/Accelerator (early) + External Innovation Lab/Incubator/Accelerator (early) + Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Fintech subsidiaries + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Low Number of Open Innovational Technological Interfaces + Early to Establish Corporate Venture Capital Arm & Fintech Fund + High Number of Lead Investments in Fintechs + Moderate Number of Fintech Acquisitions + Moderate Number of Fintech Subsidiaries + Low Number of Fintech Initiatives + High Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations + Moderate Participation in Blockchain Consortia	External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No or Low Number of Open Innovational Technological Interfaces	External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + High or Moderate Number of Open Innovational Technological Interfaces	External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High or Moderate Number of Open Innovational Technological Interfaces	Internal Innovation Lab/Incubator/Accelerator + External Innovation Lab/Incubator/Accelerator + Think Tank + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High Number of Open Innovational Technological Interfaces	Internal Innovation Lab/Incubator/Accelerator + External Innovation Lab/Incubator/Accelerator + Think Tank + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in Low Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No or Low Number of Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + No Open Innovational Technological Interfaces	Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High Number of Open Innovational Technological Interfaces	Only Internal Innovation Lab/Incubator/Accelerator (No External) + Participation in Many Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + Low Number of Open Innovational Technological Interfaces

No Number of Corporate Venture Capital Arm + No Lead Investments in Fintechs + No or Low Number of Fintech Acquisitions + No, Low or Moderate Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives	No Corporate Venture Capital Arm + Low Number of Lead Investments in Fintechs + High Number of Fintech Acquisitions + High Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives	Corporate Venture Capital Arm & Fintech Fund + Low or Moderate Number of Lead Investments in Fintechs + High Number of Fintech Acquisitions + High Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives	No Corporate Venture Capital Arm + Low Number of Lead Investments in Fintechs + Low Number of Fintech Acquisitions + Low to Moderate Number of Fintech Subsidiaries + High Number of Fintech Initiatives + High Number of Fintech Spin-Offs	Corporate Venture Capital Arm & Fintech Fund + High Number of Lead Investments in Fintechs + Low Number of Fintech Acquisitions + Low to Moderate Number of Fintech Subsidiaries + High Number of Fintech Initiatives + High Number of Fintech Spin-Offs	Corporate Venture Capital Arm & Fintech Fund + Low or Moderate Number of Lead Investments in Fintechs + No or Low Number of Fintech Acquisitions + No, Low or Moderate Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives	Corporate Venture Capital Arm & Fintech Fund + Low or Moderate Number of Lead Investments in Fintechs + No or Low Number of Fintech Acquisitions + Moderate Number of Fintech Subsidiaries + High Number of Fintech Initiatives	Corporate Venture Capital Arm & Fintech Fund + High Number of Lead Investments in Fintechs + No or Low Number of Fintech Acquisitions + No, Low or Moderate Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives
UBS	Groupe BPCE	Crédit Mutuel	Royal Bank of Scotland	ING	UniCredit	HSBC	Barclays
Crédit Agricole					Intesa Sanpaolo	Rabobank	
Deutsche Bank					Credit Suisse		
Lloyds Banking Group					BNP Paribas		
					Nordea		
					Société Générale		

Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia + Originated de novo Blockchain Platform	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia + Originated de novo Blockchain Platform	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia	Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + High Participation in Blockchain Consortia + Originated de novo Blockchain Platform	High Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Moderate Participation in Blockchain Consortia
UniCredit	UBS	Barclays	Royal Bank of Scotland	BNP Paribas	Société Générale	ING	HSBC
Intesa Sanpaolo	Credit Suisse	Rabobank		Groupe BPCE			
Lloyds Banking Group							
Crédit Agricole							
Deutsche Bank							
Crédit Mutuel							
Nordea							

Iteration 4: Taxonomy of Banks' Strategies of Interdependence

Integrated Internal Innovation Lab/Incubator/Accelerator (early) & External Innovation Lab/Incubator/Accelerator (early) & Corporate Venture Capital Arm (early) & Large Fintech Fund (early) + Other Internal Innovation Lab/Incubator/Accelerator (early) + Other External Innovation Lab/Incubator/Accelerator (early) + Participation in Very Few Consortium Innovation Labs/Incubators/Accelerators + High Number of Lead Investments in Fintechs + High Number of Fintech Subsidiaries + High Number of Fintech Initiatives + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Moderate Number of Open Innovation Technological Interfaces + Moderate Number of Fintech Acquisitions + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Bigtech Partnerships + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations + Moderate Participation in Blockchain Consortia + Originated Internal Only de novo Blockchain Platform	External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + No Corporate Venture Capital Arm + Low Number of Lead Investments in Fintechs + No or Low Number of Fintech Acquisitions + Low or Moderate Number of Fintech Subsidiaries + No or Low Number of Fintech Initiatives + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia
BBVA	**Crédit Agricole** **Deutsche Bank** **Lloyds Banking Group**

Low or Moderate Number of Fintech Subsidiaries + Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + Low or Moderate Number Open Innovation Technological Interfaces + High Number of Bigtech Partnerships		
Participation in Few Consortium Innovation Labs/Incubators/Accelerators + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Participation in Blockchain Consortia	Participation in High Number of Consortium Innovation Labs/Incubators/Accelerators + Corporate Venture Capital Arm & Fintech Fund + High Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Participation in Blockchain Consortia	
Low or Moderate Number of Lead Investments in Fintechs + No Fintech Acquisitions + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs	High Number of Lead Investments in Fintechs + Moderate Number of Fintech Acquisitions + High Number of Partnerships or Non-Lead Investments in Fintechs + Comparatively High Number of Partnership Cessations	Low or Moderate Number of Lead Investments in Fintechs + No Fintech Acquisitions + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs
Integrated Internal Innovation Lab/Incubator/Accelerator (late) & External Innovation Lab/Incubator/Accelerator (late) & Corporate Venture Capital Arm (late) & Large Fintech Fund (late) + No or Low Number of Fintech Initiatives	Integrated Innovation Unit (Internal Innovation Lab & Low Number of Fintech Subsidiaries) + Other Internal Innovation Lab/Incubator/Accelerator + Low Number of External Innovation Lab/Incubator/Accelerator (early) + Low Number of Fintech Initiatives	Only External Innovation Lab/Incubator/Accelerator (No Internal) + High Number of Fintech Initiatives
Standard Chartered	**Santander**	**HSBC**

<table>
<tr><td colspan="3">Corporate Venture Capital Arm & Fintech Fund
+
No or Low Number of Fintech Acquisitions
+
Low or Moderate Number of Fintech Subsidiaries
+
Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators
+
Adopted Open-APIs to Meet PSD2 & Open Banking Requirements
+
Moderate or High Number of Open Innovation Technological Interfaces
+
No or Low Number of Fintech Initiatives
+
Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents
+
High Number of Partnerships or Non-Lead Investments in Fintechs</td></tr>
<tr><td>Internal Innovation Lab/Incubator/Accelerator
+
External Innovation Lab/Incubator/Accelerator
+
Think Tank</td><td colspan="2">Only External Innovation Lab/Incubator/Accelerator (No Internal)</td></tr>
<tr><td colspan="2">Low or Moderate Number of Lead Investments in Fintechs
+
High Participation in Blockchain Consortia</td><td>High Number of Lead Investments in Fintechs
+
Low or Moderate Participation in Blockchain Consortia</td></tr>
<tr><td>Low or Moderate Number of Bigtech Partnerships</td><td>High Number of Bigtech Partnerships</td><td>Low or Moderate Number of Bigtech Partnerships</td></tr>
<tr><td>BNP Paribas</td><td>Société Générale</td><td>Barclays</td></tr>
</table>

External Innovation Lab/Incubator/Accelerator
+
Internal Innovation Lab/Incubator/Accelerator
+
Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators
+
No or Low Number of Fintech Initiatives
+
No or Low Number of Lead Investments in Fintechs
+
Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents
+
Low or Moderate Number of Bigtech Partnerships
+
High Number of Fintech Acquisitions
+
High Number of Fintech Subsidiaries
+
Moderate to High Number of Partnerships or Non-Lead Investments in Fintechs

Embraced Open-APIs Beyond Requirements of PSD2 & Open Banking + High or Moderate Number of Open Innovation Technological Interfaces + No Corporate Venture Capital Arm + High Participation in Blockchain Consortia	Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No or Low Number of Open Innovation Technological Interfaces + Corporate Venture Capital Arm & Fintech Fund + Low or Moderate Participation in Blockchain Consortia
Groupe BPCE	**Crédit Mutuel**

Adopted Open-APIs to Meet PSD2 & Open Banking Requirements
+
No or Low Number of Open Innovation Technological Interfaces
+
Corporate Venture Capital Arm & Fintech Fund
+
Low or Moderate Number of Lead Investments in Fintechs
+
No or Low Number of Fintech Acquisitions
+
Low or Moderate Number of Fintech Subsidiaries
+
Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents
+
Low or Moderate Number of Bigtech Partnerships
+
Low or Moderate Participation in Blockchain Consortia

Only External Innovation Lab/Incubator/Accelerator (No Internal) + Participation in Low Number of Consortium Innovation Labs/Incubators/Accelerators	Only Internal Innovation Lab/Incubator/Accelerator (No External) + Participation in Many Consortium Innovation Labs/Incubators/Accelerators

No or Low Number of Fintech Initiatives + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs	High Number of Fintech Initiatives + High Number of Partnerships or Non-Lead Investments in Fintechs

Intesa Sanpaolo **UniCredit**	**Nordea**	**Rabobank**

Internal Innovation Lab/Incubator/Accelerator + External Innovation Lab/Incubator/Accelerator + Think Tank + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + No Open Innovation Technological Interfaces + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Number of Partnerships or Non-Lead Investments in Fintechs + Low or Moderate Participation in Blockchain Consortia + Originated de novo Blockchain Platform + Low Number of Fintech Initiatives	
No Corporate Venture Capital Arm + No Lead Investments in Fintechs + No Fintech Acquisitions + No Fintech Subsidiaries	Corporate Venture Capital Arm & Fintech Fund + Low Number of Lead Investments in Fintechs + Low Number of Fintech Acquisitions + Low Number of Fintech Subsidiaries
UBS	**Credit Suisse**

External Innovation Lab/Incubator/Accelerator + Internal Innovation Lab/Incubator/Accelerator + Participation in Low or Moderate Number of Consortium Innovation Labs/Incubators/Accelerators + Adopted Open-APIs to Meet PSD2 & Open Banking Requirements + High or Moderate Number of Open Innovation Technological Interfaces + Low Number of Fintech Acquisitions + Low to Moderate Number of Fintech Subsidiaries + High Number of Fintech Initiatives + Low or Moderate Number of Fintech Related Partnerships with Other Banks/Incumbents + High Number of Partnerships or Non-Lead Investments in Fintechs + Originated de novo Blockchain Platform	
Corporate Venture Capital Arm & Fintech Fund + High Number of Lead Investments in Fintechs + High Number of Fintech Spin-Offs + High Number of Bigtech Partnerships + High Participation in Blockchain Consortia	No Corporate Venture Capital Arm + Low Number of Lead Investments in Fintechs + Moderate Number of Fintech Spin-Offs + Low or Moderate Number of Bigtech Partnerships + Low or Moderate Participation in Blockchain Consortia
ING	**Royal Bank of Scotland**