DISSERTATION for the PROGRAMME

EXECUTIVE DOCTORATE IN BUSINESS ADMINISTRATION DE L'UNIVERSITÉ PARIS-DAUPHINE

"Value Creation of Mergers & Acquisitions in the Defence Industry"

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Abbreviations

Anova: Analysis of Variance

Coface: Compagnie Française d'Assurance pour le Commerce Extérieur

DoD : Department of Defense (of the USA)

EADS : European Aeronautic Defence and Space Company

EDA : European Defence Agency

EMH : Efficient Market Hypothesis

EMT : Efficient Market Theory

EU : European Union

FMS : Foreign Military Sales

GAO : General Accounting Office (of the USA)

MARM: Mean Adjusted Return Model

M&A : Mergers and Acquisitions

MDAP : Major Acquisition Programs (of the USA)

Nato : North Atlantic Treaty Organization

NPV : Net Present Value

OCCAR: Organisation Conjointe de Coopération en Matière d'Armement

OCO : Oversea Contingency Operations

P&L : Profit and Loss

P/E : Private Equity

R&D : Research & Development

RfP : Request for Proposal

RoW : Rest of World

RUSI : The Royal United Services Institute

SIPRI : Stockholm International Peace Research Institute

TSR : Total Shareholder Return

UAV : Unmanned Aerial Vehicle

UK : United Kingdom

USA : United States of America

1. Introduction

1.1. Motivation of research

The global defence industry is at a crucial turning point, as "cost pressure and a contracting defence market will drive consolidation".[1] The recent merger announcement of the two largest European tank producers has been commented as "an overdue contribution to consolidate the European defence industry".[2] This assessment expresses the main-stream opinion of defence industry leaders, policy makers and most industry research institutes.[3]

Despite these strong arguments in favour of defence industry mergers, the majority of management and financial researchers are less enthusiastic about mergers and acquisitions (M&A). It is a common belief that that M&A transactions destroy company value and that M&A is a "lose-lose" game for the involved companies and their shareholders.[4] Almost two thirds of mergers are said to fail in bringing the expected economic benefits.

Indeed, shareholder wealth of the acquiring firms is said to be already destroyed at the time of the M&A announcement because of shrinking share prices.[5] According to most researchers, the value destruction appears across almost all industries, regions, and periods of observation. Investors mostly base their negative outlook on a poor strategic rationale of the merger, overpayment, integration problems, and cultural mismatch. Furthermore, high integration costs will cause profitability to deteriorate, while managers' synergy assumptions are often considered to be too optimistic.

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[1] Thisdall, D. (2014): "Forget orders - M&A is the measure of a robust industry", *Flight International, vol. 27, pp. 32-35*

[2] Hoppe, T. (2015): "We are open for further partners", interview with KMW's CEO Frank Haun after the merger of France's Nexter, *Das Handelsblatt , release date 05th October 2015*

[3] Chuter, A. (2013): "Top 100 Europe: Mergers Find Little Traction", *Defence News, 21st July 2013* and Hartley, K. et al. (2017): "Defence industrial links between EU and US", *Report, The Armament Industry European Research Group (Ares Group) September 2017*

[4] Meeks, G. (1977): "Disappointing Marriage: A Study of the Gains from Merger", *Cambridge University Press, Cambridge.* Meeks compares pre- and post-merger company performance against an industry sample. While pre-M&A performance has been positive for the acquirer (at least 20% better than average), the acquirers underperform in the period of 2-4 years after the merger.

[5] Müller-Stewens, G. and Voss, I. (2004): "Die Umsetzung von Wachstumsstrategien durch (inhaltlich) verbundene Akquisitionsserien", *pp. 6-10*. 50%-70% of studies show that single acquisitions are not beneficial for the acquiring company. McKinsey (1987) mentions a failure rate of 77%, Mercer Management Consulting (1995) roughly 50%, and according to Booz Allen Hamilton (1998) two thirds of acquisitions fail to generate value for the acquirer.

M&A transactions are today one of the most important strategic management levers, with an ever-increasing importance for the corporate world.[6] Despite the high relevance of M&A for strategic management and the broader economy, there is still a broad dis-alignment among academics regarding the evaluation of M&A transactions.[7] Even more so, there is a lack of industry specific research. The academic knowledge about value creation of M&A transactions in the defence industry can be described as insufficient.

In order to shed light on this subject, the underlying dissertation will test the value creation of defence-industry mergers from the investors' point of view. This dissertation does not stop at examining *if* M&A transactions are beneficial for external shareholders. It also attempts to answer the more practical managerial question as to which M&A strategy increases company and shareholder value and which strategies have shown to contribute to value destruction. The center piece of this dissertation is an event study. The field of observation are 174 hand-selected M&A transactions of US American and European defence companies in the 25-year time period from 1992 until 2016.

1.2. The research question

Merger and Acquisition activities are expected to have a negative impact on a firm's value; this dissertation aims to determine whether this holds true within the defence industry.

Furthermore, the value creation impact of defence industry relevant M&A motives and strategies will be tested. The results of the event study will help to answer the following questions:

1. Do M&A transactions in the defence industry create value for equity investors, or do they destroy shareholder wealth?
2. Which specific M&A strategies should managers in the defence industry follow in order to increase shareholder value?, and
3. To what extent are value-enhancing or value-destructive M&A strategies dependent on timing, geography or other external factors?

[6] Reeves, M. et al. (2016): "Using M&A to Increase Your Capacity for Growth", *Harvard Business Review*
[7] Zollo, M. and Singh, H. (2004): "The INSEAD-Wharton Alliance on Globalizing: Strategies for Building Successful Global Businesses - Globalization through acquisitions and alliances: An evolutionary perspective", *Cambridge University Press*

The theoretical framework of this dissertation is grounded in the Efficient Market Hypothesis (EMH), which was developed by Nobel laureate Eugene Fama in the 1960s and 1970s.[8] The Efficient Market Hypothesis is based on the assumption that available information is correctly and instantly reflected in the market price (i.e. share price) of a publicly listed company. The central tenet of the EMH is the fair reflection of a company's value in the stock price.

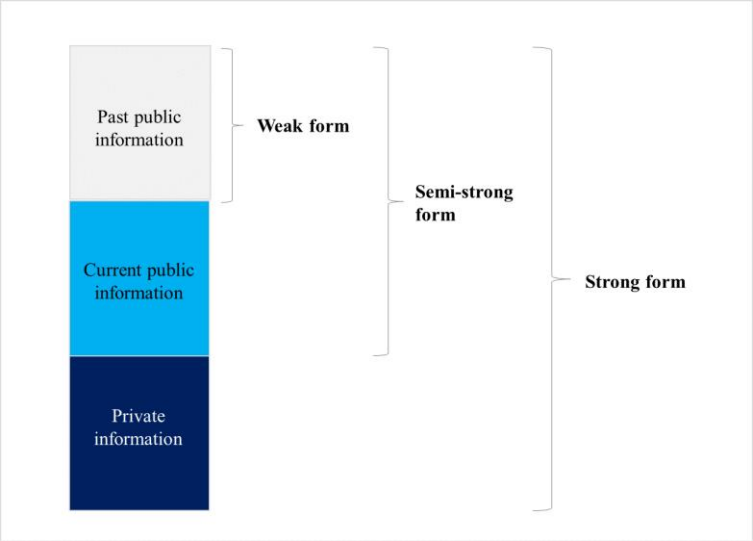
The fair value of a share is defined by the current net value of available future cash flows for investors.[9] According to the EMH, only substantial new information, which ultimately changes the future cash flow expectations of investors, could result in abnormal returns. Without new information, the abnormal return on each trading day is expected to be zero.[10]

As a consequence, positive abnormal stock market returns following a merger announcement should only occur when the M&A transaction creates sustainable value for the shareholders. The opposite also holds true: according to the EMH, a negative strategic decision should be correctly evaluated by the market and, ceteris paribus, result in a value deterioration of the company's share price. Besides assuming that the share price is a fair reflection of value, the EMH claims that capital markets are efficient, too.

There are three forms of market efficiency: the weak, the semi-strong and the strong form. These forms distinguish between the types of information that is reflected in the stock market price. The weak form implies that only past information is taken into account by investors. The semi-strong form claims that both, past and new information are instantly reflected in the share price. According to the strong form of the EMH, market participants trade securities based on non-public[11] information, too. These non-public information are therefore reflected by the stock prices.

[8] Fama, E. (1969): "Efficient Capital Markets: A Review of Theory and Empirical Work", *The Journal of Finance New York*
[9] The future cash flows are discounted by the investors' expected rate of return
[10] Strong, N. (1992): "Modelling abnormal returns: A review article", *Journal of Business Finance & Accounting, Volume 19, Issue 4, pages 533–553*
[11] This is also known as insider information.

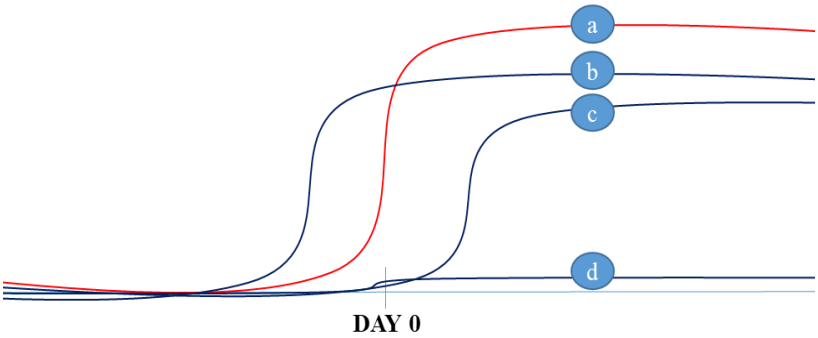
Figure 1: The Efficient Market Hypothesis



Source: Own representation based on Ross

The event study concept implies that all public information (both past and current) is instantly included in the stock prices. Event studies therefore adhere to the semi-strong form of market efficiency.[12] The stock market is expected to react immediately to a relevant M&A announcement (see graph A) on DAY 0.[13]

Figure 2: Stock market reactions and the EMH



Source: Own representation based on Cable and Holland

[12] Cable, J. and Holland, K. (1999): "Modelling Normal Returns in Event Studies: A Model-Selection Approach and Pilot Study", *European Journal of Finance*

[13] The market reaction is expected to happen at DAY 0, or in the case of already closed markets, at DAY 1 given the presumption that future cash flows are impacted by the transaction.

On the contrary, the absence of significant abnormal returns, whether positive or negative, after the announcement of an M&A transaction would indicate that capital markets are either not efficient or that the information is not relevant enough to change the NPV assumptions of investors (see graph D).

An abnormal market reaction prior to the M&A announcement on DAY 0 is a signal that trading activities are based upon insider information (see graph B). This would be an indication for the existence of the strong form of market efficiency.

A delayed market reaction would, however, reveal that market participants do not immediately act upon the announcement of new information (see graph C). Further, this time-lag indicates that traders need time to evaluate the new information. In general, this type of reaction advocates for the existence of the weak form of market efficiency.

To this end, this dissertation will also test the validity of the three different levels of the EMH through the event study on market price reactions to an M&A announcement.

1.3. Structure of the dissertation

The dissertation is structured into seven Chapters: (1) Introduction, (2) Introduction to the defence industry, (3) M&A research, the theoretical foundation and identified gaps, (4) Motives for M&A transactions, (5) Measuring M&A value creation through an event study, (6) Empirical analysis: Value effects of M&A in the defence industry, and finally (7) Summary and implications of the research.

After the introduction, chapter 2 introduces the context of the global defence market and the US and European industry structures, and discusses the main differences of the defence industry and civil industries. A special focus is set on the influence of the national governments on the defence industry and subsequent implications on industry consolidation. The chapter ends with a summary of the structural and political impacts on M&A activity in the defence industry.

Chapter 3 defines the term Mergers & Acquisitions in the context of this dissertation, and presents the theoretical foundations of the field from different schools of thought and prior M&A research. The identification of potential gaps in the academic literature is the basis for

the formulation of intended academic and practical research advancements by this dissertation.

Chapter 4 identifies the motives for executing an M&A transaction. Strategic, financial, personal, and defence industry-specific M&A motives are presented and discussed. The chapter concludes with the formulation of M&A hypotheses for empirical testing in Chapter 6.

Chapter 5 introduces the event study research methodology which is the foundation of empirical testing carried out in Chapter 6. The design options for event studies are discussed in detail in order to determine the most contextually useful research set-up for this study. The statistical testing methodologies are introduced, too, as they complement the quantitative analysis of value creation analysis.

The empirical analysis in Chapter 6 is the key pillar of the dissertation. After the introduction of the selected data sample, the testing methodology is applied to the previously formulated hypotheses, and the results are statically evaluated. The summary of the empirical results provides an overview of the value creation and value destruction characteristics.

Chapter 7 summarizes and critically evaluates the results of the empirical research. A comparison of the findings with relevant literature prior publications expands the perspective of assessment.
The dissertation concludes with the suggestion of further fields of research to complement and advance the findings of this dissertation.

2. Introduction to the defence industry

The defence industry differs strongly from civil industries. One of the reasons is that defence programmes are tailor-made to specific customer needs rather than “off the shelf” industrial products with little adaption. The programme duration lasts over several decades, from the first research contract to the final end of service. Despite the strong competition of defence contractors, oligopolistic market structures lead to close industrial cooperation.

The defence market is also characterised by a very strong political influence. Sales are often concentrated on one or a few key customers, with more than 70% of sales coming from the military of the home market. Additionally, the home countries often have special shareholder rights.

This chapter describes the major differences between the defence industry and civil industries, and seeks to understand its effects on defence industry M&A transactions.

2.1. Defence industry characteristics

2.1.1. Defence programme and contract characteristics

Defence industry programmes comprise the acquisition of a "defence industry solution" rather than just a single "off-the-shelf" product. Defence programmes typically have three project phases: the development phase, the production phase and the maintenance phase. Large defence programmes often last for several decades.

The life-cycle of a classical defence programme starts with the initial definition of programme capabilities and requirements. Those requirements are adjusted or even completely altered during the procurement process. In order to develop the initial requirements, the programme usually starts with a Research & Development (R&D) contract award. The appointed company then develops a feasible technical solution. These results form the basis for a potential future programme. The R&D programmes are, in almost all cases, paid for by the customer as the research is very customer specific.[14] For this reason, it would not be financially viable for a defence company to bear the high development costs given the insecurity of being awarded a future contract. Customer-financed R&D contracts a major difference of the defence industry from civil industries, where the companies finance R&D themselves and bear the risk of refinancing later throughout the product life-cycle.

A further characteristic of defence programmes is the difficulty to adhere to normal market pricing mechanisms. In an efficient market, the price point is set at the market through the push and pull of demand and supply. In the defence market, the demand and also the supply side is often comprised of just one party on each side. In order to compensate for the lack of

[14] Reppey, J. (2000): "The Place of the Defence Industry in National Systems of Innovation", *Cornell University Peace Studies Program*

market pricing, the predominant contract type of the 1970s - 80s (and part of the 1990s) were so-called "cost plus" contracts, whereby companies accrued costs during the development, production, and maintenance phase of a defence programme and these costs were then paid by the customer plus an additional profit margin. A pricing policy which might sound fair in theory has led to suboptimal results in practice. For one, defence companies had an incentive to accumulate costs; additionally, they needed to be controlled tightly by the customer and their business structure often became inefficient as a result. These inefficiencies have been partly reduced since the inception of fixed price contracts, but also this cannot prevent high cost overruns.

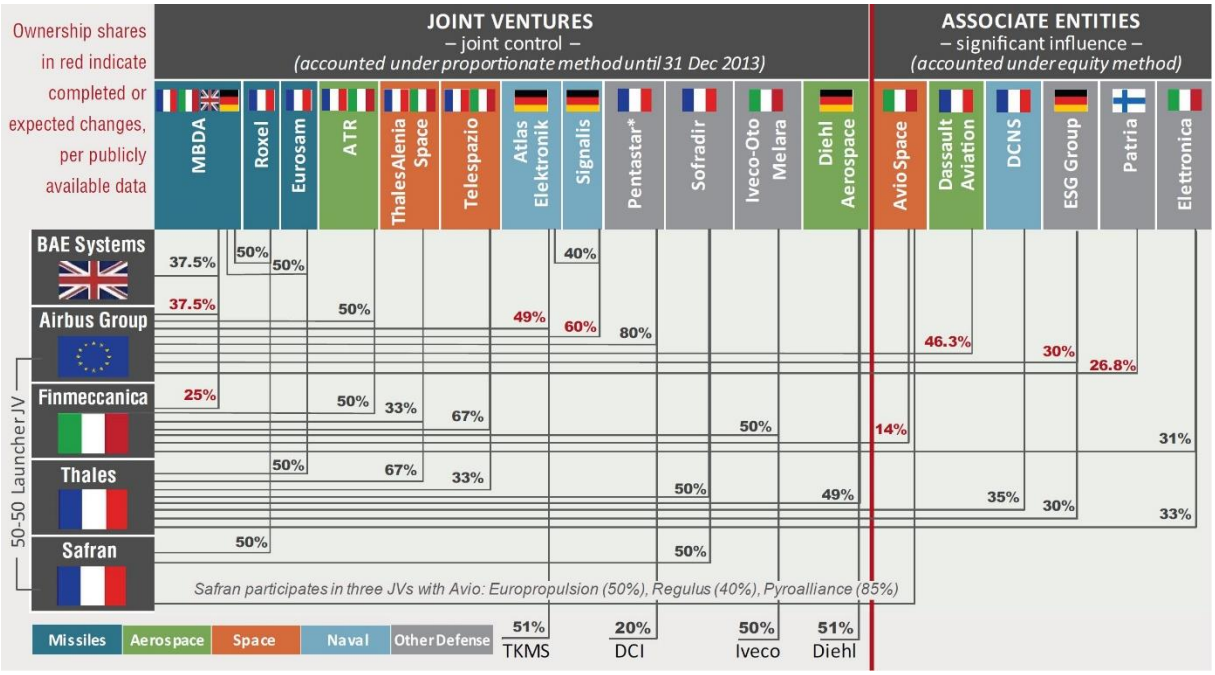
Over the last 30 years, it can be observed that defence programmes have become increasingly complex, time-intensive, and expensive, often accruing cost overruns. Cost overruns and time delays are omnipresent in the defence industry, and are a subject for regular debate. In the USA alone, the "Major Defense Acquisition Programs" (MDAP) had a collective cost overrun of $402 billion and an average delay of two years.[15] In fact, public procurement projects seem to overrun their estimated costs and time regularly and significantly. There is little objective proof, but available evidence suggests that tight budgets and low profit margins are bypassed by hefty price increases for each single change request. The profit margins in the maintenance and service phase are generally higher than for the production phase.

Additionally, the competition between defence companies can be harsh. From a global, export-oriented perspective, a handful of companies compete for a few billion Euro contracts which become available each year; these companies are mostly from Europe, North America and Russia. The competition for home market contracts is generally lower, but due to the characteristics of the defence market there are also only a few large domestic contracts. Governments and military leaders are aware of the necessity to award military contracts to all defence companies if they want to keep the industry structure alive; however, due to the large size of contracts, it is neither possible nor practical to distribute each single contract to one company. For this reason defence companies form consortia in order to win large contracts. The cooperation has different forms, they range from a classical subcontractor relationship over licensing agreements to joint ventures and equity partnerships. Increasing complexity and stronger international co-operations have raised the importance of alliances between

[15] Bertau, D. et al. (2011): "Cost and Time Overruns for Major Defense Acquisition Programs", *Center for Strategic and International Studies (Washington, D.C.). Defense Industrial Initiatives Group,* pp. 6-11

competing defence contractors. These cooperative initiatives are, unlike a full merger, not a permanent legal linkage but may be the start of closer industrial cooperation.

Figure 3: Key Joint Ventures by European Aerospace & Defence Companies



Source: Avascent analysis[16], 2014

Currently, the largest European defence companies in UK, France, Germany and Italy are working together on a combined European Unmanned Aerial Vehicle (UAV) study.[17] These alliances are of temporary nature - they are initiated for a specific programme and cease to exist after the programme is finalized. At the same time these firms are strong competitors on other programmes.

2.1.2. Political interest in the defence industry

The political interest in the defence industry goes well beyond other civil industrial sectors. In addition to the economic perspective, the defence industry is a crucial pillar of a country's security concept, and serves as an instrument for geopolitical influence.

[16] Balis, C. (2015): "Consolidation Ahead: Europe's Defense Industry Verges on a Historic Market-Led Transformation", *Avascent White Paper*
[17] Tran, P. (2015): "Combat, Surveillance UAV Projects Thrive in Europe", *DefenceNews Online Edition*

2.1.2.1. Economic interest

The state has an economic interest in the defence industry. The defence industry is a large employer, innovator and tax payer. In some areas, the defence industry is the main employer providing high-technology jobs. Despite the fact that most defence companies are not state-owned, politicians can influence it to a greater extent than other industries. The influence is based on the close customer and regulatory relationship of the state with the defence industry.

The effect of state spending on employment has always been a crucial argument for the defence industry, which lobbies hard for the quest of governmental contracts. Lobby groups regularly promote the positive effects of budget increases and warn against the negative impact on employment in case of budget cuts.[18] This often happens in an unlikely alliance between the management of defence contractors with the unions.

The job creation argument is also used in export campaigns. In bidding for the €32 billion contract for the renewal of the Australian submarine fleet, The German submarine manufacturer Thyssen-Krupp touted the creation of 2,000 jobs in Australia as a key pillar of the export campaign: "We want to build in Australia, we want to use Australian people, Australian resources, Australian shipyards […]".[19] The same strategy was used by Airbus in the attempt to bid for the Air tanker contract in the USA; as the New York Times pointed out, the envisaged local manufacturing sites were all located in the home states of influential Republican Governors.[20]

Offset businesses are another route to re-distribute economic value to an export country. Offset practices are used when the local production contribution is low, and the defence contractor needs to ensure that goods and services are sourced from the export country. This business practice has often been criticized as an inefficient use of resources, though, and offset businesses have also come under the scrutiny of the World Trade Organization. [21]

The economic effect of governmental spending is not limited to wealth creation and employment. Investments in high tech industry are said to have positive spin-off effects with

[18] Ackermann, S. (2011) "Defense Industry: Keep Paying Us or the Economy Dies", *Wired Online Edition*
[19] Bourke, L. (2015): "German shipbuilder ThyssenKrupp would use Australia as regional hub under submarine contract", *The Sydney Morning Herald*
[20] Wayne, L. (2005): "New Boeing – Airbus Rivalry: Tanker Contracts", *The New York Times Online Edition*
[21] IFBEC Forum (2013): "Offsets in the Aerospace and Defence Industry", *International Forum on Business Ethical Conduct*

a positive impact on the whole economy.[22] Mostly these are related to "technological change" that is transferred from the defence industry to civil industries; this transfer of know-how can then foster innovative product developments.

For example, the Global Positioning System (GPS), which is known to most consumers as a driving assistance tool, was developed by the US Army for military operations. American firms in the private sector have in fact benefited from this innovation and were at the forefront of commercialising GPS. A senior official of the US Department of Defense (DoD) informed the US American Congress about the economic value of the GPS system stating that "equipment sales represent only the tip of the economic iceberg. As with personal computers, the true value of GPS is not in the cost of the equipment, but in the productivity and growth it enables."[23] And in fact, today commercial GPS applications exceed the revenue share of military applications of the GPS system by far.

While these spin-off effects should not be neglected, they are usually of secondary importance. The fundamental interest of the state in the defence industry is to ensure a nation's security and ability to actively defend itself.

2.1.2.2. National security and foreign policy interest

The defence market is largely determined by the security considerations of the respective "home country". It is the primary goal of a state to ensure its current and future sovereignty and the security of its inhabitants. The defence industry is a major pillar of the national military and defence concept, as military missions in foreign countries are used to achieve political goals and to prevent future security concerns.

The quest for a self-sufficient industry in order to remain independent from foreign political influence has become less important during the last decades. The recent example of France withholding the delivery of a frigate to Russia due to the conflict in Ukraine has revived the goal of a strong and autarchic defence industry base for many countries.[24] Even in a closely

[22] Steinbock, D. (2014): "The Challenges for America's Defense Innovation", *Information Technology and & Innovation Foundation*
[23] Morris, E. (2006): "Hearing on Space and U.S. National Power", *the statement of Edward Morris, U.S. Department of Commerce, on June 21, 2006 before the Committee on Armed Services Subcommittee on Strategic Forces U.S. House of Representatives*
[24] British Broadcasting Corporation (2014): "Ukraine crisis: France halts warship delivery to Russia", *BBC Online Edition*

aligned and cooperating industrial environment, there are clear advantages for a country to obtain a capable defence industrial base. A country can only take the role of a serious military power when it possess defence capabilities.[25]

Historically, most countries had an independent defence industry. The issue for politicians is therefore not to support the build-up of a new industry, but rather to decide upon maintaining or withdrawing from local defence technologies. Most politicians fear making this ultimate decision and instead prefer to support a broad range of niche industries on a low level rather than to concentrate the contract award on a few core sectors.[26]

In contrast to other industries, politics enjoys special rights with regards to the limitation of competition and subsidies for the defence industry. The European Treaty regulates the common economic rules within the European Union. It fosters a single market policy and forces national states to procure goods and services (of a certain value) in a European wide procurement process, and it is aimed at stopping the discrimination against foreign-country firms. But with respect to the defence industry, the European Treaty makes an exception; specifically, Article 296 of the European Treaty allows national governments to source sensitive military equipment without the general procurement rules of the European Treaty.[27] In practice, these exceptions allow a state to keep defence firms alive with the help of national contracts and subsidies, even if their existence is not viable from a pure economic point of view. Similar exceptions apply in an international context where defence procurement is exempted from free trade agreements.

A country's defence industrial base is not only a crucial part of the national defence and security concept; it is also an instrument for active foreign policy and political influence. Despite international weapon export embargos, national governments are relatively free to sell defence products to foreign countries. Most democratic countries have a weapon export council that takes the decision how to respond to purchase request.[28]

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[25] Tellis, A. et al. (2000): "Measuring National Power in the Postindustrial Age: Measuring Military Capability", *RAND Institute, pp. 133-176*

[26] Gansler, J. (2011): "Democracy's arsenal, creating a twenty-first-century defense industry", *The MIT Press, pp. 307-319*

[27] The legal basis for defence procurement exemptions is Article 296: "The majority of defence contracts are exempted from Internal Market rules and awarded on the basis of national procurement rules […]", for further reading see http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:52006DC0779

[28] For further reading, please see: Dunne (1995) in "Handbook of Defense Economics", *Volume 1, pp. 399-430;* Morth (2000): "Competing frames in the European Commission - the case of the defence industry and equipment issue", *Journal of European Public Policy*; Doward, J. (2017) "Does UK's lucrative arms trade come at the cost of political repression?", *The Guardian, 12th February 2017*; Dial, J, and Murphy, K. (1995) "Incentives, downsizing, and value creation at General Dynamics", *Journal of Financial Economics, pp. 261-314*

The export of military goods to critical countries who are not natural allies can be interpreted as a reward for their politics and a sign of mutual trust. In contrast to this sort of approval, the decision not to ban weapons exports to a country is an open sign of disapproval with its politics and signals general mistrust. Often, the delivery of weapons to unstable regions or regimes in doubt are bound to specified conditions. The Defence Ministry of the United Kingdom confirmed this general view, noting in a white paper that "defence exports support defence diplomacy and in some countries may act as a key enabling activity for a bi-lateral defence relationship."[29] The US Administration also uses military export as a mean to support defence policy interests: "The United States and Saudi Arabia are working together […] including resolving the crisis in Syria, preventing Iran from obtaining a nuclear weapon, counterterrorism efforts […] Saudi Arabia is the largest U.S. Foreign Military Sales (FMS) customer […]."[30] The US government's politics is not an exception but rather the rule for the way how Western countries deal with weapon purchase requests from a few countries with doubtful political and legal systems.

An even stronger form of showing support is by providing military aid. This has been a foreign political tool in the United States and Europe for decades.[31] The US uses this form of foreign policy very actively supporting primarily two countries in the Middle East, Egypt and Israel.[32] The effectiveness of military aid to fulfil long term political goals is questioned by researchers.[33] European countries like the UK, France and Germany also use military aid as a tool of foreign politics.

National governments can only successfully "play this card" when their respective country produces state of the art military goods which are of interest for other governments. For example, the US has supported Israel with $38 billion in military aid for a ten year period from 2016-2026.[34]

[29] The Secretary of State for Defence (2005): "Defence Industrial Strategy", p. 46, *Defence White Paper*
[30] Foreign Policy News (2014): "President Obama meets with King Abdullah of Saudi Arabia", *The White House*
[31] Morgenthau, H. (1962): "A Political Theory of Foreign Aid", *The American Political Science Review, Vol. 56, pp. 301-309*
[32] Thomson, N. (2015): "Seventy-five percent of U.S. foreign military financing goes to two countries", *CNN Online*
[33] Sullivan, P., Tessman, B., and Li, X. (2011): "US Military Aid and Recipient State Cooperation", *Foreign Policy Analysis, pp. 275–294*
[34] The Guardian (2016): "US pledges record $38 billion military aid to Israel over next 10 years", *The Guardian Online Edition*

2.1.3. Political influence on the defence industry

The previous sub-chapter discussed the motivations of a state to maintain a healthy defence industrial base under the restriction of budget cuts. As mentioned, the interests of industry and the state can sometimes clearly differ from each other. The following section will elaborate how the state can influence the strategic direction of the defence companies. There are four primary mechanisms by which the state imposes their influence on defence companies: influencing governance through state ownership and extraordinary control rights, directing economic influence as per their role as the main customer, influencing production through export support and restrictions, controlling industry structure through the restriction of M&A.

2.1.3.1. State ownership, control rights and M&A restrictions

In the 1950s-1980s, most European defence companies were fully or partially owned by the state. They were often part of an industrial conglomerate with the state as the majority shareholder.[35] In the 1980s and 1990s, most European countries liberalised formerly state-controlled markets. This wave of liberalisation often started with former state monopolies like airlines, rail services, postal and telecommunication services. But also large parts of the defence industry have been liberalised. Each country had a different pace but it can be stated that the defence industry has been liberalised relatively slowly and late.[36]

Today, the national states still own about 20% of the largest defence firms in Europe. This ownership, through various direct or indirect holding structures, often makes the state the largest shareholder. In practice, the governments take the role of an "active investor" and openly influence the strategic direction of many defence firms. Defence industry consolidation and M&A is on top of the industry political agenda, as the fear of losing national influence very often leads to the government's veto of M&A attempts. This is especially true for cross-border M&As. After the successful creation of EADS in the early 2000s, there has not been any further major cross-border M&A in Europe for almost 15 years.

[35] Avascent (2013): "State ownership in the European defence industry: Change or continuity?", *European Defense Industrial base forum, Occasional paper*

[36] Markusen, A. (2003): "The Case Against Privatizing National Security", *Study Group on the Arms Trade and the Transnationalization of the Defense Industry, Council on Foreign Relations*

While the French state is generally known to be very active in "protecting" national interests with regard to M&A transactions, it was the German government that refused the defence mega-merger of the Airbus defence business with BAE Systems in 2012.[37] The Airbus shareholder agreement gave Germany (and the other home countries) the right to stop the M&A transaction. The German government feared that influence on the defence unit would be lost, and that crucial capabilities would be bundled in the UK instead of Germany. The concern of losing control may have resulted from a very liberal approval during the acquisition of HDE shipyard, a global technology leader in submarine manufacturing, by the American private equity firm One Equity Partners in 2003. Shortly afterwards the government reacted and a law was passed which granted the German government a veto right in the case that a foreign investor attempted to acquire a company that was critical for the German security. The UK's Secretary of Defence also made clear that he is "concerned about large shareholdings held by other countries".[38] The demise of the envisaged mega-merger left the European defence industry with a huge strategic challenge.

In July 2017, the French administration actively used their veto right to avoid a French military shipyard acquisition by an Italian competitor. The government intervened and nationalised the shipyard in order to be able to directly negotiate the conditions of the potential sale.[39]

How can consolidation in Europe happen if most attempts are initially stopped by politics? European countries do not seem to be willing to compromise on control rights or governmental influence as this would mean a loss of defence industrial sovereignty.[40] Even without shareholder rights, M&A transactions cannot be executed without the consent of the local government; this holds true for the USA and Europe alike.[41] There are a variety of M&A restrictions that apply. Anti-trust laws[42] limit the market power of defence companies. Further M&A restrictions due to security considerations are a classic barrier for foreign firms to enter

[37] Milmo, D. (2012): "BAE-EADS: Angela Merkel blamed for collapse of £28bn merger", *The Guardian Online*
[38] Inman, P. (2012): "German veto blocked BAE/EADS merger, says George Osborne", *The Guardian Online*
[39] Topham, G. (2017): "France nationalises strategic shipyard to thwart Italian ownership", *The Guardian Online*
[40] Major, C. (2017): "Credible EU Defense Means Rethinking Sovereignty", *Carnegie Europe Online*
[41] Jones, S. (2006): "The Rise of a European Defense", *Political Science Quarterly*
[42] For the United States the Hart-Scott-Rodino Antitrust Improvements Act (HSR or Hart-Scott-Rodino) and for European countries the EU or local regulations apply

a foreign market. While merger activity is often regarded critically by national politicians, licensing, joint ventures, or alliances are regularly accepted and even actively supported.[43]

Presumably, most cross-border M&A deals would be favourable for a defence firm's level of competitiveness; however, the huge governmental influence on M&A decisions severely limits the free flow of capital.

2.1.3.2. Economic influence as the main customer

The strong ties and dependency of defence companies on their national customer is also reflected in the source of their revenues: all defence companies make the largest part of their sales (25-80%) in their home market.[44] The proportion of home market business is much larger for US companies compared to their European counterparts. In the US, the national market accounts for more than two thirds of revenues for large American defence contractors; accordingly, potential national defence budget cuts is the major business risk that almost each defence company bears.[45]

Practically speaking, defence M&A transactions can be stopped by the major customer, which is in almost all cases the home country. In addition to economic pressure, all large defence contracts contain a "change of ownership" clause, which grants the right of withdrawal from a contract or compensation payments to the local customer in case of an ownership change.[46] As defence firms heavily rely on these long-term development and production contracts, they must also ask their respective home country for merger approval.

On the other hand, the home country also strongly supports a defence firm and provides business stability. The national procurement agencies have an interest in keeping the defence industry at a stable and foreseeable business level. Many small and fewer large contracts are awarded in a timely manner to keep the utilization stable. On top of the national contract award, the governments are keen to support the export and international cooperation business.

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[43] Kopac, E. (2006): "Defense Industry Restructuring: Trends in European and U.S. Defense Companies", *Volume 13, Issue 2, pp 283–296, Transition Studies Review*

[44] Bitzinger, R. (2009): "The Modern Defense Industry: Political, Economic, and Technological Issues", *p. 5, Praeger Security International*

[45] Raytheon describes this risk in a section of their Annual Report (2016): "*We depend on the U.S. government for a substantial portion of our business, and changes in government defence spending and priorities could have consequences on our financial position, results of operations and business*.", p. 31

[46] Kluth, M. (2009): "Cross Border EU Defence Industry Consolidation between Globalization and Europeanization", *ECPR Lisbon*

2.1.3.3. Political export support and restrictions

Due to a government's budgetary constraints, export sales compensate a defence contractor for lower demand from the home country.[47] Export contracts are not only regarded as a means to bring in new sales but also serve as a major driver for a firm's profitability. The experience curve for the production of complex technology is high, and thus the extra production increase yields high profits.[48]

The national governments also participate from exports through a re-compensation scheme. Exports also ease economic pressure for local administrations. As the French economic daily paper *Les Echos* comments on the sale of the fighter jet Rafale to India and Egypt: "The export success is like an oxygen balloon as for the French defence budget […] now the government is not obliged anymore to buy the full production capacity of the Rafale from Dassault Aviation."[49]

The success of large export contracts can best be described as a cocktail of product capabilities, competitive pricing and political export support. The effort of the exporting country's government definitely plays a vital role, be it the initial development contract, financial help to the acquiring government, political benefits or even political pressure.

Defence export contracts are often part of a larger deal or industrial cooperation. For the French export of the Rafale, the national export bank Coface is said to have given credit to the Egyptian government without asking for tangible collateral, a practice which requires political goodwill. Furthermore, the French President Hollande mentioned that the government has put full effort into the negotiations in order to make the contract happen.[50] In the event that a contract is not awarded, diplomatic waves occur in opposite direction.[51] The public gained a glimpse of the full political dimension of the defence export business when the British government stopped the fraud investigations against BAE Systems and Saudi officials in the context of the Al-Yamamah contract for the sale of weapons against oil in 2007. The British

[47] Der Spiegel (2010): "Germany Considers Loosening Arms Export Controls", *Online Edition*
[48] Henderson, B. (1973): "The Experience Curve—Reviewed (Part II)", *The Boston Consulting Group – BCG Perspectives Online Edition*
[49] Commenting on the €5 billion contract award of the Indian government in Les Echos (2015): "Rafale : les dessous d'un succès", *Les Echos Online Edition*
[50] Miglani, S. (2016): "France's Hollande pushes for fighter deal in India", *Reuters Online Edition*
[51] Political dissent as the Eurofighter/Typhoon was not awarded for the contract by the Indian government, see: Clements, R. (2012): "India's MMRCA fighter jet deal: illusion and disillusion on the losers' side", *The Aviatonist Online Edition*

government said that it was "Britain's national interest to halt the investigation" and then Prime Minister Tony Blair took full responsibility of this decision.[52] The strong influence of governmental actions on the defence industry shows that M&A decisions need to be closely aligned with the governmental bodies of the home country of the acquirer and the target firm.

The US is also very strong at "persuading" allies to buy weapons from their own industry. In exchange for the granting of military and political support, the US government almost expects the acquisition of US military goods.[53] The US government handles most export contracts directly through the Defense Security Cooperation Agency which takes the role of the seller towards the buying country. These contracts are called Foreign Military Sales (FMS) which contain a handling fee for the US Ministry of Defense.[54]

The home country's administration can also entirely stop export business due to political or security concerns. As an example, the German export regulations sound very defensive and restrictive: "The central aim is to prevent threats to Germany or its allies by conventional arms and other weapons of mass destruction. German exports should neither enhance conflicts in crisis areas nor contribute to internal repression or other serious human rights violations […]."[55] Despite this strict-sounding declaration, Germany is ranked as one of the largest global weapon exporters, counting Saudi Arabia as a major customer. This example shows that there is a wide berth for political decision-making in the practical interpretation of these statutes.[56] In the specific case of exports to Saudi Arabia, the new German government followed a policy to reduce sales to "critical countries"[57] but in the end did not fundamentally change the expert legislation of defence goods. This decision may be grounded in the threat of the defence industry to create jobs elsewhere if the new restrictions are applied.[58]

[52] Leigh, D. and Evans, R. (2007): "The BAE files - BAE accused of secretly paying £1bn to Saudi prince", *The Guardian Online Edition*
[53] McNaughter, T. (1989): "New Weapons, Old Politics: America's Military Procurement Muddle", *Brookings Institution Press*
[54] Legally the US government is the contractual seller and not the producer
[55] Federal Office of Economics and Export Control (2013): "Licensing requirements, application procedure, information sources", *Brief Outline on Export Controls*
[56] The Economist (2014): "Political pressure and bribery allegations are unlikely to hurt Germany's exporters of military equipment", p. 37, *The Economist Press*
[57] Alessi, C. (2015): "German Defense Industry Under Pressure as Berlin Limits Arms Exports", *The Wall Street Journal Online Edition*
[58] Sheahan, M. (2014): "Germany Treats Defense Companies Like 'Smut,' Says The CEO Of Airbus", *Reuters Online Edition*

This described pattern is not an exception, but rather the rule in the international defence business and also holds true for the US defence business. The Obama administration has initially called for fewer US arms exports and more stringent controls. Economic pressure seem to be one reason why this doctrine has been loosened, and no major change in the approval of weapon exports can be stated.[59]

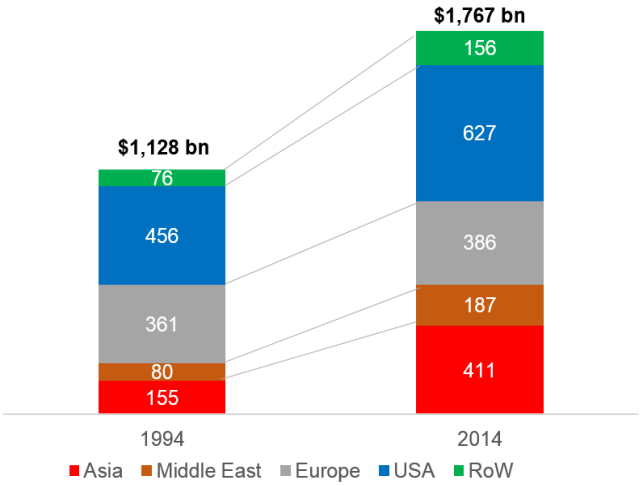
2.2. The global market for defence goods and services

2.2.1. Overview of the global defence spending

The total global defence spending amounts to $1.7 trillion in 2016 according to the Stockholm International Peace Research Institute (SIPRI).[60] In order to put this figure into perspective, this amount is almost equal to all revenues of the global travel industry.[61]

The budget has increased by 55% (at constant exchange rates) over the last 20 years. This increase corresponds to 2.2% per annum, which is moderate compared to the global economy growth by over 3% per annum during the same period. The total defence spending is mainly constituted by four regions: North America, Europe, Asia, and the Middle East.

Figure 4: Defence spending by regions from 1994-2014 (in constant $ billion)



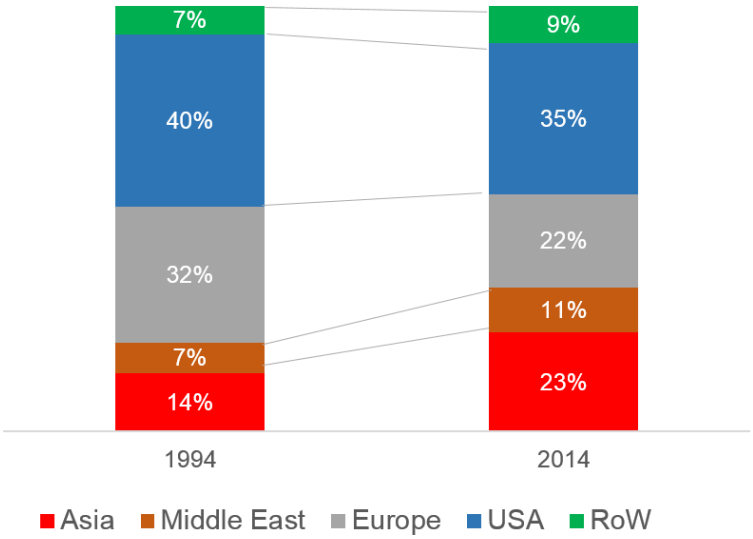
Source: Own representation based on SIPRI 1990-2015

[59] Currier, C. (2013): "In Big Win for Defense Industry, Obama Rolls Back Limits on Arms Exports", *ProPublica Online Edition*
[60] Data based on SIPRI Military Expenditure Database 2016
[61] IBIS World (2017): "Global Tourism: Market Research Report"

The regional composition of the global defence spending is remarkable. The dominance of the USA has remained in place over the last decades. Europe's military budgets have remained stable in absolute terms, but have lost in importance on a relative basis. Especially Western European countries have de-prioritised defence spending compared to increasing social security budgets.[62]

In contrast to Western Europe, many countries in Asia and the Middle East have increased their budgets due to soaring economies and global political ambitions. Not surprisingly, China is at the crest of this trend, with a 10-fold increase during the last decade. Chinese defence spending soared from $22 billion in 2004 to $216 billion in 2014. This drastic spending increase has led to the build-up of the latest defence technology and mean a further shift of military power from the US to China.[63]

Figure 5: Defence spending by region 1994-2014 (normalised)

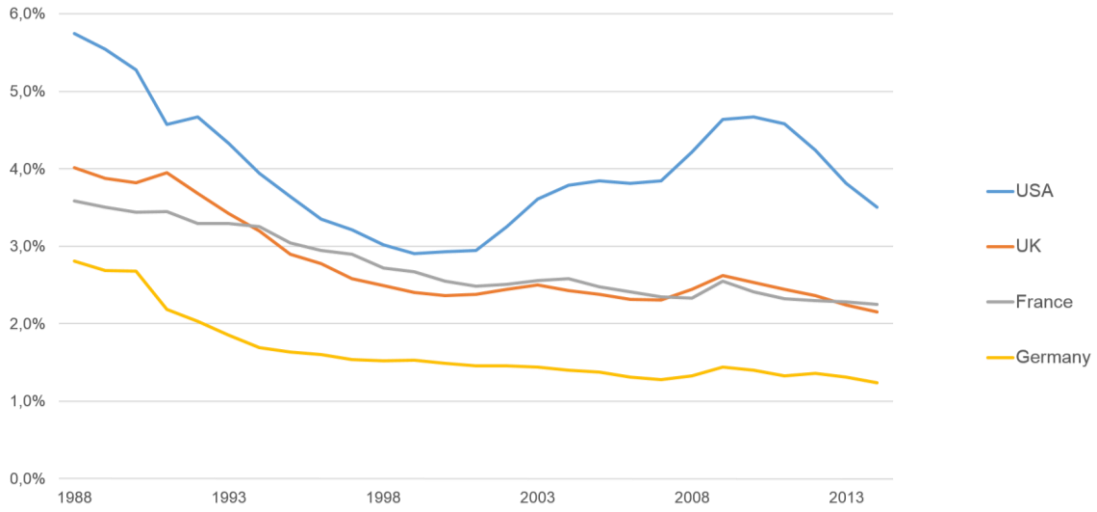


Source: Own representation based on SIPRI 1990-2015

While the absolute spending strongly differs between the US and Europe, it follows the same pattern. From the late 1980s until the beginning of the 2000s the relative defence spending of Western countries decreased sharply by almost 50%.

[62] Eurostat (2016): Budgets for defence expenditure and social security, *European Commission*
[63] Perlez, J. (2015): "China's Naval Buildup Starts to Yield Results, U.S. Report Says" *New York Times*

Figure 6: Defence budget development in relation to GDP



Source: Own representation based on SIPRI 1988-2014

The next paragraphs will have a closer look into the focus regions of this dissertation, the United States and Europe.

2.2.2. The United States defence spending

The United States have the world's largest defence budget of $600 billion per year,[64] which corresponds to 35-40% of the global defence spending.[65] The US defence budget marks a spending priority of the US government; it is the third largest item and represents around 20% of the total US Federal budget.[66]

During the entire 20th century and still today, the United States have played a major economic and political role as a world power. Until the end of the 1980s the USA had been constantly confronted with the threat of a war against the Warsaw Pact States. This lead to an increase of the US defence budget to 6% of GDP.[67] The decay of the Soviet Union in the early 1990s resulted in an abrupt change in general defence policy and the resulting budgets. Within one decade, the budget was radically reduced by half, causing a harsh reorganization of the US

[64] U.S. Department of Defense (2015): "DoD Releases Fiscal Year 2016 Budget Proposal", *Release No: NR-031-15*

[65] The Economist (1999): "A survey of NATO - Armies and arms", *The Economist*

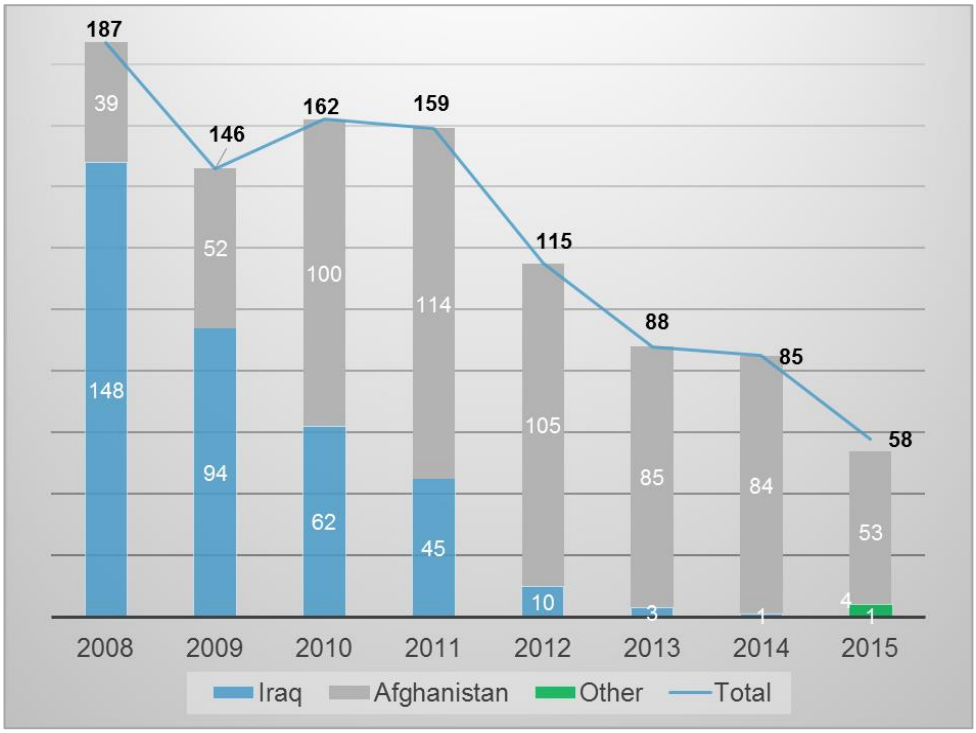
[66] Average over the years 2010-2014, for details, see Plumer, B. (2013): "America's staggering defense budget, in charts", *The Washington Post*

[67] Higgs, R. (1988): "U.S. Military Spending in the Cold War Era: Opportunity Costs, Foreign Crises, and Domestic Constraints", *Lafayette College, Cato Institute Policy Analysis No. 114*

defence industry. This reorganization was the start of a major consolidation wave and a strong increase of M&A transactions in the USA.[68]

There is a high correlation between the US defence budget and the involvement of the US in armed conflicts. Figure 6 shows the budget for Overseas Contingency Operations (OCO), a budget reserved for military operations outside the United States.[69] With the official end of the war in Iraq, followed by a massive withdrawal of troops, the US defence spending decreased by almost $140 billion from 2008 to 2011.

Figure 7: Budget spending for Oversea Contingency Operations (OCO) in $ billion



Source: Own representation based on US Department of Defense[70]

[68] Deutch, J. M. (2001): **"**Consolidation of the U.S. Defense Industrial Base." Acquisition Review Quarterly, *p. 137*

[69] Transcript of the Statement of Cindy Williams from the Massachusetts Institute of Technology (MIT) before the Committee of the Budget United States Senate (2010): "The U.S. Defence Budget"

[70] Office of the Under Secretary of Defense (Comptroller), Chief Financial Officer (2015): "Fiscal Year 2015 Budget Amendment", *United States Department of Defense*

2.2.3. The European defence spending

The combined European defence budget amounts to $300 billion, which is about half the size of the US budget. It is, however, misleading to speak about the "European defence budget", as it consists of almost 40 independently administrated budgets. The single countries' budgets range from below $100 million to $65 billion per year.[71] The three largest EU economies Germany, France and the UK are also the major defence spenders. The combined budget represents over 50% ($169 billion combined) of Europe's total defence budget.

Despite strong political ties[72], a common European defence market or industry does not exist in practice. Due to the sovereignty and specific interests of each EU member state, the EU regulations have exempt defence procurement from the free market paradigm. The Article 346 (formerly Article 296) clearly points out that "national security remains the sole responsibility of each Member State […]".[73]

Certainly, European governments are aware of the downsides of national sourcing. It leads to inefficiencies, duplication of development programmes, and intra-European competition for export contracts. These disadvantages ultimately reduces the competitiveness of the European defence industry as a whole.[74]

The European jet fighter programmes serve as a good example: three competing jet fighter programmes within the European Union[75] are inefficient and a waste of resources.[76] The development costs for a jet fighter aircraft are extremely high, so large production volumes are essential to achieve economies of scale. Despite the participation of four European countries, the largest of the European programmes only has a production volume of 747 jets

[71] Data based on SIPRI Military Expenditure Database 2010-2016
[72] Most countries on the European continent are part of the European Union and member states of the NATO at the same time, Norway is member of the NATO but not of the EU, Austria, Finland, Ireland, Malta and Sweden are members of the EU, but not NATO members.
[73] EU law and law publications (1999): The Article 346 (formerly Article 296), *European Parliament, Council of the European Union*
[74] Edwards, J. (2011): "The EU Defence and Security Procurement Directive: A Step Towards Affordability?", *Chatham House, The Royal Institute of Foreign Affairs*
[75] Italy, Germany, Great Britain, and Spain are partners in the Eurofighter programme along with Austria as a European export customer. Sweden and France have their own programmes with the Gripen and Daussault's Rafale respectively. Counting in Norway's and the UK's participation in the US-led Joint Strike Fighter programme the number of programmes amounts to four.
[76] Dickow, M. and Buch, D. (2012): "Europäische Rüstungsindustrie: Kein Heil im Export", *Deutsches Institut für Internationale Politik und Sicherheit*

as of July 2017.[77] This production volume must be regarded as sub-scale in comparison to the US-led Joint Strike Fighter programme which currently plans with at least 3,100 jets.[78]

In order to overcome the disadvantages of non-binding defence procurement directives, EU defence procurement institutions have been established. In 1996, France, Germany, Italy and Great Britain founded the Organisation Conjointe de Coopération en matière d'Armement (OCCAR), which regulates and helps to manage defence projects between its member states. The mechanism of "juste retour" was intended to compensate each member state with work packages that correspond to at least two-thirds of their financial contribution. Today, OCCAR is responsible for managing 11 programmes such as the military transport aircraft A400M, with an overall procurement value of €20 billion.[79]

In 2004 a further initiative was started to harmonise defence procurement within the European Union. The European Defence Agency (EDA) was founded under the patronage of the EU's defence ministers. All current EU countries, except for Denmark, are members of the EDA. The agency's aim is to promote European defence procurement cooperation, to strengthen the capabilities of the European defence industry ("the defence industrial base"), to harmonise and to finally open defence markets within Europe.

The EDA's code of conduct is not binding but relies and a voluntary adherence,[80] which is the weak spot of European defence institutions and directives. And in fact, the European joint defence procurement initiatives have not reached their own goals. Only 16% of the European defence equipment budget is spent on inner-European collaborative defence projects; an eight year low. The largest part of defence budgets in Europe, almost 80%, has been awarded to national firms during the last years.[81]

Despite the knowledge about the inefficiencies, each member state tries to optimize its position; therefore, a binding agreement for opening the defence markets in the EU has not been successful yet.[82] The political dimension of this subject is part of a larger debate and

[77] Airbus (2017): "Orders, Deliveries, In Operation Military aircraft by Country – Worldwide", *Airbus Defence & Space*
[78] Reuters (2014): "The 11 countries expected to buy F-35 fighter jet", *Thomson Reuters Online edition*
[79] Occar (2016) programme overview at http://www.occar.int/programmes
[80] Edwards, J. (2011): "The EU Defence and Security Procurement Directive: A Step Towards Affordability?", Programme Paper pp. 4-6
[81]European Defence Agency (2015): "European defence data 2013", Presentation, p. 20
[82] European Defence Agency interview with Stéphane Mayer (2016): "European consolidation is an efficient way to achieve competitiveness and interoperability", *European Defence Matters*

goes beyond the scope of this dissertation. For further reading see Sperling and Kirchner (1997) and the recent publication of Kluth (2017).[83]

The relevant fact in this context is the relatively low degree of defence industry consolidation in Europe which mainly caused by government imposed market barriers and M&A restrictions.

2.2.4. Drivers of defence spending

The three main drivers of a country's defence spending are the previous defence budgets, the availability of funds, and a country's self-assessed need for defence and security.

The strongest indicator of future spending is the historical level of defence spending. Soldiers' salaries, maintenance of the existing equipment and long-term procurement projects cannot be adjusted quickly; they almost have the characteristics of fixed costs. The budget for defence operations fluctuates at a much lower level than defence procurement projects.[84] The procurement decisions for future defence programmes can be changed or even stopped entirely; however, the majority of the budget flows into programmes that have been awarded over a decade ago.

The second strongest driver of defence spending is the availability of funds. Only countries with high income can bear high spending. Today around 75% of the global defence budgets is spent by financially strong economies like the USA, European countries, China and Saudi Arabia. Consequently, a country's GDP growth has a strong predictive power the growth of a country's defence budget.[85]

The third driver of defence budgets is a country's self-assessed priority for defence capabilities. In times of war and geopolitical instability, the focus on defence spending naturally increases. Countries in regions with many armed conflicts or countries that aim to play a major role in geopolitical conflicts spend a relatively high share of their funds on

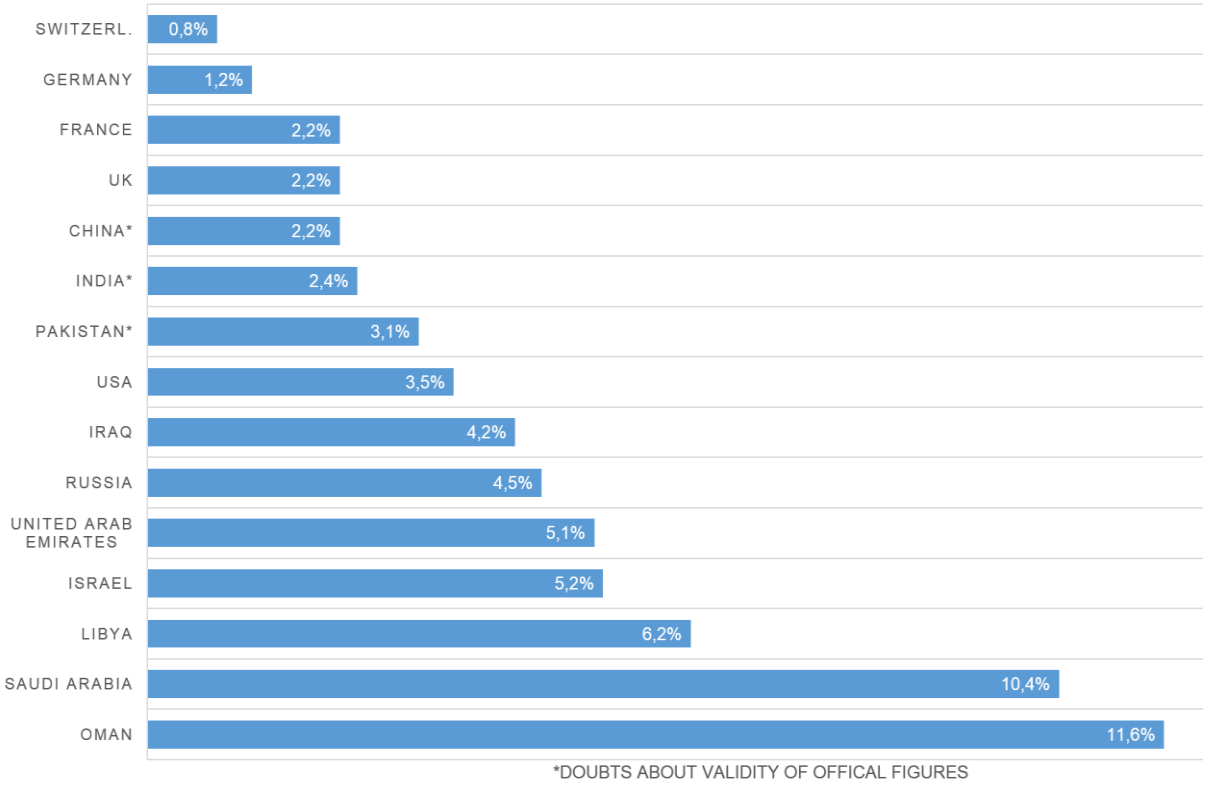
[83] Kluth, M. (2017) "European defence industry consolidation and domestic procurement bias", *Defense & Security Analysis, Volume 33, pp. 158-173*; Sperling, J. and Kirchner, E. (1997): "Recasting the European Order: Security-Architectures and Economic Cooperation" *Manchester University Press*; Sperling, J. et al. (2012): "NATO's Post-Cold War Trajectory: Decline or Regeneration", *Palgrave Macmillan*; and Guay, T. (2005): "The European Defense Industry: Prospects for Consolidaton", *UNISCI discussion papers, Pennsylvania State University*

[84] Jerrold Lundquist, J. (1992): "Shrinking Fast and Smart in the Defense Industry", *p. 2, Harvard Business Review*

[85] The McKinsey report "Southeast Asia: The next growth opportunity in Defense" has calculated a strong coefficient of determination of 0.8.

defence budgets.[86] The relative size of a country's defence budget varies strongly from below 1% of the annual GDP (e.g. Switzerland) to a level above 10% (e.g. Oman or Saudi Arabia). Not surprisingly, in the Middle East, a region with currently most military conflicts[87], the relative defence spending are significantly higher than in the rest of the world.[88]

Figure 8: Defence budgets in % of GDP (for selected countries)[89]



Source: Own representation based on SIPRI 2015

But also Western European countries react to threats with an increase of defence spending. The first terrorist attacks in Paris in early 2015 have led to a response of the former President Hollande by increasing the defence budget instead of realizing the planned budget cuts.[90]

[86] Measured as % of GDP
[87] SIPRI Military Expenditure Database 2016
[88] It is difficult to separate the cause and effect of military conflicts and defence spending. The author of this thesis will take a neutral view and not mix the economic side of the defence industry (which is in the focus of this thesis) with the moral or political dimension which.
[89] Figures for the year 2014; it is worth noting the statistical data from China is doubtful and might be higher that stated here.
[90] Barriaux, M. (2015): "Paris Attacks Spur France To Boost Budget", *Defense News*

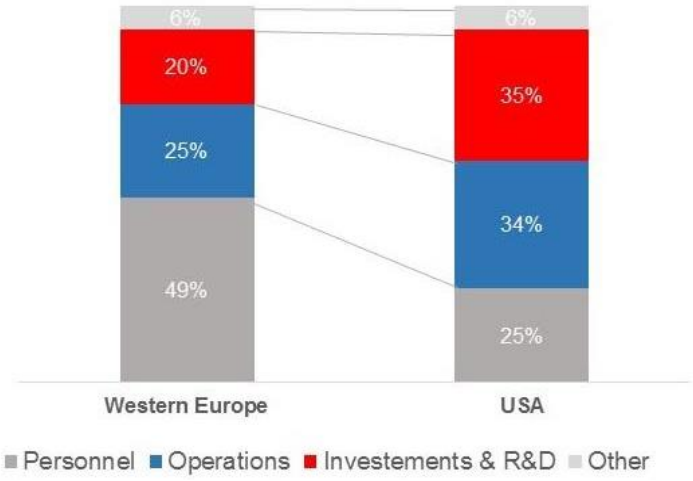
2.2.5. The impact of defence spending on the defence industry

The previous chapters provided an overview of the defence spending patterns, especially for the focus regions of this dissertation. While defence budgets are a good indicator of the industry's market size, they cannot be translated one-to-one into sales potentials for the defence industry. This comparison falls short, as many budget items are not spent externally.

For all discussed regions, the general composition of the defence spending consists of four major cost items[91]:

- Personnel[92]: Pay for soldiers and civil military personnel. It often includes pension payments.
- Operations and maintenance: Costs of running the day-to-day operations including ammunition, general material, food, electricity, housing, and maintenance of the armed forces' equipment and assets.
- Investments: Costs for investments in machinery and equipment. These include all major acquisition programmes such as aircraft, tanks, ships but also larger IT and communication systems.
- Research & Development: Costs for the Research and Development (R&D) of new programmes and military capabilities.

Figure 9: Structural defence budget comparison

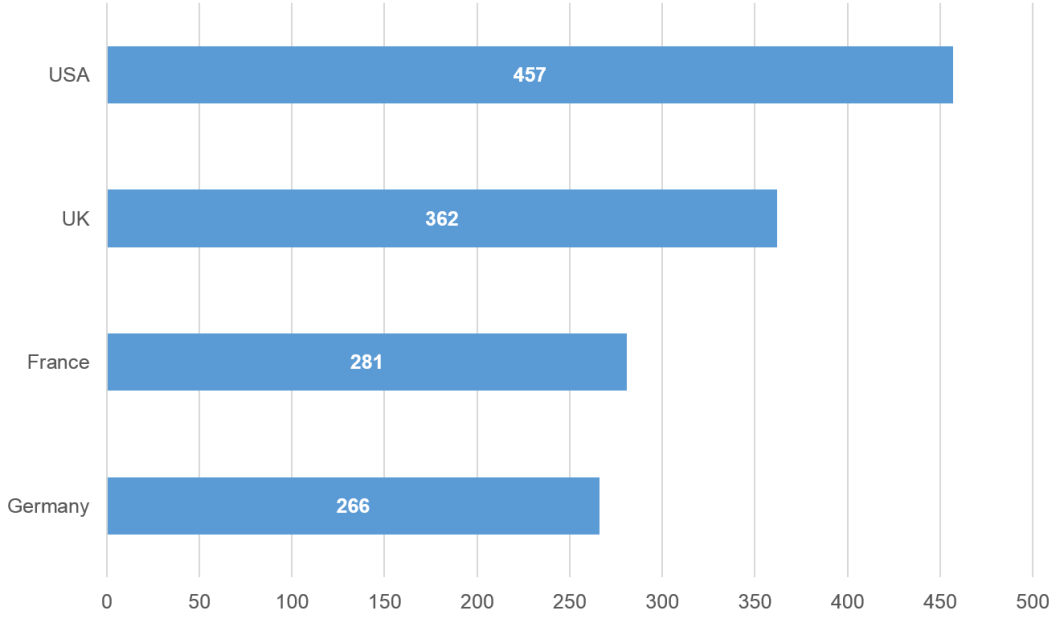


Source: Own representation based on data from the European Defence Agency and US public spending data[93]

[91] The exact terminology differs between the various defence budgets but these items
[92] Sometimes excluding long term obligations for veterans and pension payments
[93] European Defence Agency Yearbook (2013), p. 16; for the U.S. budget, Oversea Contingency Operations (OCO not included).

Figure 8 displays the structural differences between the allocation of defence funds in Western Europe and the USA. One defining feature is that the European budgets lean heavily towards personnel payments; this is generally regarded as an "old fashioned" allocation of resources and criticized by military think-tanks.[94] In contrast, the US budget is more focused on military operations and investments. The US military almost spends double the amount per soldier than the German military forces. The high investments in external research projects underline this focus on defence technology by the US military.[95]

Figure 10: Military spending per active military personnel in 2013 (in $1,000)



Source: Own representation based on public defence spending and employment data[96]

From the defence industry's point of view, only the external defence spending is relevant. The industry can only generate revenues from funds which are spent for industrial partners and service providers.

[94] Berteau, D. and Ben-Ari, G. (2012): **"**European Defense Trends Budgets, Regulatory Frameworks, and the Industrial Base", page 4, *Center for Strategic & International Studies*
[95]Clevenger, A. (2016): "Pentagon Budget Seeks To Leverage R&D Investments", *DefenseNews Online Edition*
[96] Ministry of Defence (2013): "UK Defence Statistics Compendium: 2013", *UK Statistics Compendium*; Ministère des Armées (2013): "Les Chiffres Clés de la Défense 2013"; Planungsamt der Bundeswehr (2013): "Die Verteidigungspolitischen Richtlinien 2013"

Almost 70% of the US defence budget is spent on external investment spending[97] and operational costs. The European budget equivalent only amounts to 45% due to the high spending on personnel. Therefore, the US American defence budget is not only twice as large as the combined European budgets but also a much higher share of the budget is spend externally; funds from which the US defence industry benefits directly.

2.3. The global defence industry

The defence industry comprises companies which produce goods and deliver services to military customers. The global defence industry (excluding China)[98] generates approximately $450 billion in revenue per year. This sales volume has been relatively stable over the past 10 years, and changes in accordance with global defence budget.[99] In order to put the market size in perspective, the defence industry has approximately the same size as the global commercial aircraft manufacturing industry.

The top 100 defence companies (excluding China) account for approximately 90% of global defence sales. Thirty-eight of the 100 largest defence companies are from the US, 24 are from Western Europe, 11 from Russia, and the remaining 27 companies are split among other countries (here called "Rest of World", RoW[100]). New entrants into the top 100 are mostly from Russia and India, but also to a minor extent from Eastern Europe. The state controlled consolidation of the local defence industry has created new national champions in these regions.[101]

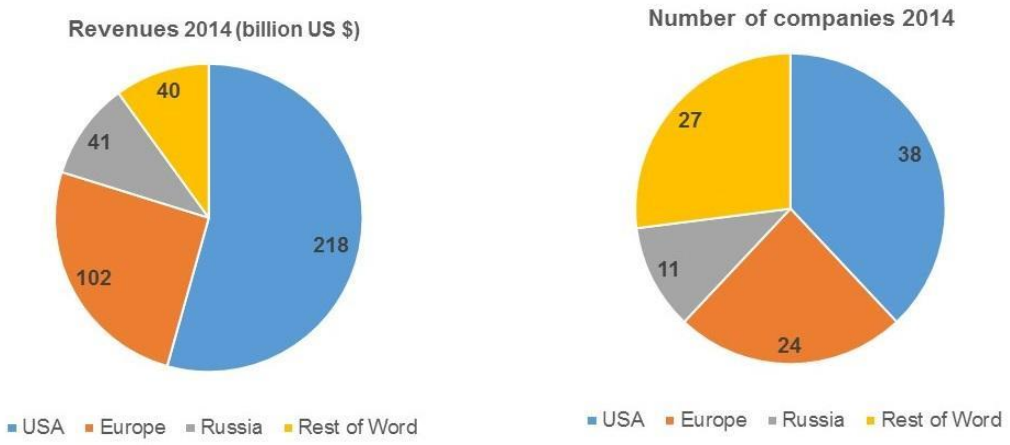
The domination of US and Western European defence companies is still very evident, and is mainly based on the size of the home defence market and their technological leadership. The concentration of revenues towards the USA and Western Europe is even stronger than is suggested by the number of companies (62) in the top 100 ranking. Around 80% of total

[97] Amadeo, K. (2017): "U.S. Military Budget: Components, Challenges, Growth", *TheBalance.com*
[98] Chinese firms are excluded from this ranking due to insufficient data transparency. SIPRI states accordingly: "Although several Chinese arms-producing companies are large enough to rank among the SIPRI Top 100, it has not been possible to include them because of lack of comparable and sufficiently accurate data." As this thesis is concerned with Western Europe and the USA the results are not limited.
[99] SIPRI Yearbooks 2005-2014
[100] The 27 RoW companies come from the following countries. Six from South Korea, five from Japan, three from Israel, three from India, two from Turkey, two from Switzerland, two from Australia, and one from each from Singapore, Poland, Ukraine, and Brazil.
[101] Fleurant, A. et al. (2015): "The SIPRI Top 100 Arms Producing and Military Services Companies, 2015", *SIPRI Fact Sheet, SIPRI Arms and Military Expenditure Programme*

revenues are generated by firms from these two regions, and all of the largest 10 defence companies are either from the USA (7) or Western Europe (3).

During the last 30 years, the defence industry has been faced with severe market adjustments, mostly deriving from geopolitical changes. The end of the Cold War, strict military budget cuts thereafter; the rise of asymmetric terrorist threats, and a shift of political and military power to Asia have had a major influence.[102] Moreover, the rise of very large international projects and technological changes have brought further challenges to managers in the defence industry.

Figure 11: Regional allocation of top 100 defence companies



Source: Own representation based on SIPRI 2014

A considerable amount of sales derives from the export of military goods and services. The export ratio varies strongly between 15-50%. European defence firms have a much higher export ratio than their American competitors thanks to their technological edge in certain fields and due to the economic dependency on financial resources from outside their home market.[103]

Most of the top 100 defence companies have various lines of business and offer multiple defence products. Their product offerings ranges from fighter jets to military shipbuilding and

[102] Bitzinger, A. (2009):"The Modern Defense Industry: Political, Economic, and Technological Issues", Praeger Security International, pp. 21-31
[103] SIPRI Arms Transfers Database (2015): "The United States leads upward trend in arms exports, Asian and Gulf states arms imports up, says SIPRI", *SIPRI Press Release*

cyber-security solutions.[104] Most large defence companies do not have a clear technology focus.[105] This strong product diversification is a specific pattern of the defence industry and is very uncommon in civil industries, where conglomerates have mostly been streamlined during the past 30 years. The common denominator for defence companies is the strong relationship to their end-customer; the military and security institutions of their home market.

The diversification of defence companies does not stop within the defence product portfolio: almost half of the leading defence firms make at least 50% of their sales with civil customers.[106] Twenty-three of the top 100 defence companies even make 75% or more of their sales outside the defence sector. This pattern can be observed for both, US and Western European firms. Only one-third (17 of 62) of the US and Western Europe defence firms within the top 100 ranking are so-called pure defence companies, with more than 75% defence related revenues.

Another important aspect of the defence industry is the level of consolidation. The concentration ratio has considerably grown in the past 25 years, with the 5 largest contractors generating 30% of revenues and the top 20 firms combined 58% of global sales.[107] This level may seem high, but given the industry characteristics it is relatively low. In a technologically comparable field, the large aircraft industry, a duopoly of Airbus and Boeing dominates the global market.

2.3.1. The United States defence industry

The US is not only the largest defence market, it is also home to the largest defence industry worldwide. The dominant position of the US defence industry is substantiated by the yearly top 100 ranking of defence firms.[108] Thirty eight of the largest 100 defence companies and even 7 of the top 10 defence companies are of US origin. The firm size has been achieved by a number of mega-mergers, which are part of the empirical analysis.

[104] The defence product portfolio of each top 10 defence firm encompasses at least three different business units which are based on different technologies
[105] Exceptions are aerospace companies like Boeing, Airbus and Embraer, which produce military products and are mostly focused on aerospace applications such as aircraft and helicopters.
[106] This figure is 49% for the 38 US companies within the ranking and 51% for the 24 Western European companies. The median value for civil business activity is also around 50% and confirms the average value.
[107] This is based on SIPRI 2014 figures. McKinsey calculates a higher concentration ratio with the top 10 companies achieving 58% of total sales, see the McKinsey publication (2013): "Managing a downturn: How the US defense industry can learn from its past". As a comparison, within the automotive industry the top five companies achieve 50% of global revenues
[108] SIPRI (2015): "Top 100 defence ranking 2014"

In total, the 38 largest US defence companies achieved combined revenues of $218 billion with defence products and services. Almost all defence companies have diversified into civil industries, and only 11 of the 38 largest defence contractors make 75% or more of their revenues in the defence industry. On average, the largest US defence firms make 61% of their sales in the defence sector and the remaining sales in civil industries. Diversification is highest in industries with strong civil application overlap, or so-called dual-use products. This is especially the case for the aerospace industry, with Boeing generating 31% defence sales and the engine maker Pratt & Whitney 20% of sales with defence customers.[109]

Some industrial conglomerates only have a few defence-related businesses left in their portfolio, like General Electric with a military sales share of 2%, down from around 20% in the late 1980s. Others, such as General Motors, have completely withdrawn from military markets. On the contrary, also new players have also entered the stage, mostly through IT services or intelligence software. These are often IT outsourcing firms like Booz Allen Hamilton, realizing revenues of $4 billion per year through US military and security contracts.[110] And even young companies like Palantir are strongly engaged in business with the US security organizations.[111]

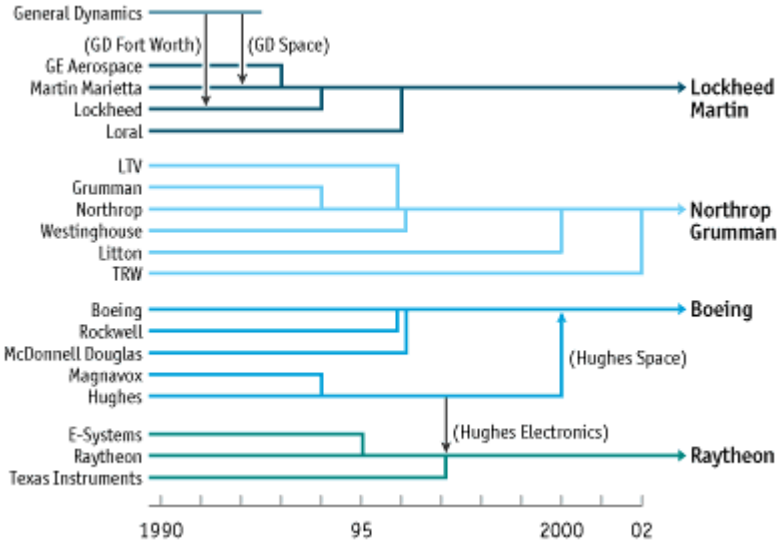
The US defence industry is highly dependent on contracts from the US army. More than 80% of sales of the two largest US defence companies are either directly or indirectly related to the US military or governmental organizations. Overall, the export ratio of the US defence ratio is low, at a rate of around 15%.[112] Today, BAE Systems is the only large prime contractor to the US military without a US origin.

The US defence industry has experienced two major politically encouraged restructuring and consolidation waves[113] between 1992 and 2004. The starting point was a defence budget cut of 40% after the end of the Cold War. In a meeting that became known as "Last Supper" the

[109] The Boeing Company (2017): "The Boeing Company 2016 Annual Report", United Technologies (2016): "United Technology Annual Report 2016", *excerpt for Pratt & Whitney*
[110] Booz Allen Hamilton (2017): "Investor Day 2017", *Presentation in Washington D.C.*
[111] Peretti, J. (2017): "Palantir: the 'special ops' tech giant that wields as much real-world power as Google", *The Guardian Online Edition*
[112] Nicks, D. (2015): "The U.S. Is Still No.1 at Selling Arms to the World", *The Time Magazine, Vol 186 No 25 & 26*
[113] The Economist (2002): "America's defence industry - On manoeuvres", *The Economist Newspaper Ltd., 6th July 2002, Business section p. 1-4*

Clinton administration urged the major US defence contractors to either merge or withdraw from the US defence market.[114] The results of the US defence industry consolidation had been substantial with approximately 50 significant mergers.[115] The number of large prime contractors went down from over 15 to 5 companies. In sub-sectors of the defence industry, the number of prime contractors has been reduced harshly, too.[116]

Figure 12: The consolidation of the US industrial base in the 1990s



Source: Merrill Lynch and Goldman Sachs, published in The Economist

Today, General Dynamics, Lockheed Martin, Northrop Grumman Boeing, and Raytheon are the top US prime contractors, with a combined sales volume of more than $100 billion to the US government per year. The sales volume of these top 5 US contractors equals the combined defence sales of the 24 largest European defence contractors.

[114] Gravel, M. (2011): "A Political Odyssey: The Rise of American Militarism and One Man's Fight to Stop IT", pp. 216-218, Seven Stories Press

[115] The Economist (1997) "Global Defence Industry - Land of giants - Why America is out in front", *The Economist Newspaper Ltd., 12th June 1997*

[116] United States General Accounting Office (GAO) (1998): "Defense Industry Consolidation - Competitive Effects of Mergers and Acquisitions", *Statement of David E. Cooper, Associate Director, Defense Acquisitions Issues, National Security and International Affairs Division Report, pp. 10-12*

Table 1: Overview of US defence industry consolidation from 1990-1998

System	No. of companies 1990	No. of companies 1998	Reduction in %
Tactical missiles	13	4	-69%
Fixed-wing aircraft	8	3	-63%
Expandable launch vehicles	6	2	-67%
Surface ships	8	5	-38%
Tactical wheeled vehicles	6	4	-33%
Tracked combat vehicles	3	2	-33%
Strategic missiles	3	2	-33%
Torpedoes	3	2	-33%
Rotary wing aircraft (helicopters)	4	3	-25%
Total	**54**	**27**	**-50%**

Source: Own representation based on Gansler "Democracy's Arsenal"

The aim of the US government is to promote small and medium-sized defence companies[117] but the trend to award contracts to very large prime contractors continues unabated. Only very large and financially viable companies can handle the scope of large and complex defence programmes, both operationally and in terms of risk.[118]

[117] Small and medium-sized defence companies are defined as US companies with annual sales below $35.5 million and less than 1500 employees. The exact regulations vary strongly by industry. See also United States International Trade Commission (2010): "Small and Medium-Sized Enterprises: Characteristics and Performance", *Investigation No. 332-510 USITC Publication 4189*

[118] Tan, A. (2010): "The Global Arms Trade: A Handbook", page 242, Routledge International Handbooks

While there is broad consensus among researchers that consolidation has led to a reduction of underutilized production capacity[119], the potentially harmful impact of a further consolidation is consistently debated. In the later years of the 1990s there seemed to be a policy shift, when the US administration started to see signs of an over-concentration in the defence industry by two planned mergers. The General Accounting Office (GAO) claimed that "consolidation carries the risk that the DOD will no longer benefit from the competition that encourages defence suppliers to reduce costs, improve quality, and stimulate innovation."[120]

Almost a decade later, the multi-billion dollar acquisition of Sikorsky, a leading military helicopter maker, by Lockheed Martin has raised new concerns about a dominant position of a defence prime contractor.[121] Although the deal was smaller and finally approved, it shows that a further market consolidation will likely be opposed by the US administration.

2.3.2. The European defence industry

The European defence industry operates within a completely different market environment compared to their US rivals. The European defence industry encompasses 24 companies in the global top 100 ranking, with a combined yearly defence sales of $100 billion. Three European defence contractors - BAE Systems, Airbus, and Finmeccanica - are even in the top 10 ranking of the largest global defence firms. The average European defence company in the top 100 ranking makes 59% of its sales in the defence sector. Seven firms make at least 75% of their revenues from defence products and services. However, another seven firms make less than 25% of their sales with military customers; among them is also the second largest European defence contractor, Airbus.

European defence firms are faced with severe challenges when they try to grow their business. Due to much lower national defence budgets and high intra-European trade barriers, they rely heavily on international exports.[122] For example, Thales, the largest French public defence company, makes 75% of revenues outside France.[123] Due to the much smaller home market, this diversification of the customer base by European defence companies is a vital

[119] Deutch, J. M. (2001): **"**Consolidation of the U.S. Defense Industrial Base." *Acquisition Review Quarterly*, 137
[120] United States General Accounting Office (1997): "Defense Industry - Trends in DoD Spending, Industrial Productivity, and Competition", *p. 21, Report to Congressional Requesters*
[121] Miller, J. (2015): "DoD's concerns about industry consolidation may hold water for all of government", *statement published by Frank Kendall in Federal News Radio*
[122] The European Parliament (2015): "The extra-EU defence exports' effects on European armaments cooperation", *pp. 10-19, Study, Policy Department, Directorate - General for External Policies*
[123] Thales Group (2017): "Half-Yearly Financial Report 2017"

prerequisite for business growth, if not for economic survival. A further strategy is external growth by acquisitions of national, European, or American competitors. This strategy has been successfully implemented by Europe's largest defence contractor BAE Systems. BAE is the only major defence company with a strong base in both European (40%) and US (36%) business.[124]

Despite a few lighthouse companies such as BAE Systems, Airbus, KNDS or Finmeccanica, the results of European defence consolidation have been disappointing.

While the European countries which founded Airbus agreed to merge the civil aerospace business, most parts of the defence business were not included in the new company. Following Airbus' unsuccessful merger attempt with BAE Systems in the late 1990s, a second attempt failed in 2014. The planned merger to become the largest European defence contractor did not materialize for a second time. This time, the deal had been halted by the German administration, who feared a loss of influence in the German-dominated defence arm. Today, Airbus' civil business is about the same size as its main rival Boeing with more than $50 billion of annual sales. Boeing's defence business is however, almost three times larger than Airbus', mainly due to external acquisitions.

European defence industry consolidation attempts have been on the political agenda for decades, with few tangible results during the last decade.[125] The role of national governments is generally viewed critically as European industry consolidation has intensified. Industry experts criticise the intent of European countries to form "national champions" instead of building an efficient, integrated, and economically successful European defence industry.[126]

The conflicts between the EU member states concerning a defence policy and competition framework is also the subject of a controversial debate along national interests and political lines.[127] Keith Hartley from the Centre of Defence Economics concludes that "European defence policy has been dominated by politics" rather than by economic considerations. If this

[124] BAE Systems (2017): "Annual Report 2016"
[125] Balis, C. and Heidenkamp, H. (2014): "Prospects for the European Defence Industrial Base", *The Royal United Services Institute (RUSI)*
[126] Kluth, M. (2009): "Consolidation between Globalization and EU Defence Industry", *Roskilde University*
[127] Bratonava, Elena (2004): "Legal Limits of the National Defene Privilege in the European Union", *Bonn International Center for Conversion (BICC), paper 34*; The study mainly identifies conflicts between Great Britain and France about the scope of the defence market framework. Great Britain supports a global solution while France favours an inner-European competition without opening the defence markets on a transatlantic scale.

does not change drastically, there is little chance for the consolidation of the European defence industry and reduction of inefficient duplications.[128]

A transatlantic mega-merger is not a realistic option either, especially because the US is reluctant to open its large market to European companies without expected compensation. On the other hand, European countries fear a loss of national autonomy and are also wary of awarding military contracts to US firms. Europe and the US may well be political partners, but mutual distrust concerning the defence industry have led to "little progress in opening up their markets to each other."[129] The only major exclusions from this status quo are strong British-American ties that have paved the way for BAE Systems to rigorously develop its business with the US.

2.3.3. Financial characteristics and value drivers of defence companies

The defence market's specifications have led to an adaption of the defence industry's business model and the financial characteristics of defence companies. The underlying business value drivers of defence companies and the factors impacting the stock market value of defence companies are partly identical, but also differ in some respects from other industries.

2.3.3.1. Financial characteristics of defence companies

Defence companies are highly influenced by the market environment of the defence industry and the business practices of governmental clients. The main difference compared to industrial firms in civil industries are the stability of revenues, a high level of pre-orders and pre-payments, customer financed R&D expenses, and the moderate, though not excessive, profit margins.

Defence companies have relatively stable sales with almost no short-term fluctuations. The top 10 defence companies have increased their defence revenues by only 1.8% from 2015 to 2016[130] while at the same time the 10 largest global companies have grown by over 10%.[131]

[128] Hartley, K. (2003): "The future of European defence policy: An economic perspective", *Centre for Defence Economics, University of York, Defence and Peace Economics Vol. 14*
[129] Adams, G. et al. (1999): "Europe's defence industry: a transatlantic future?", *Research Paper, CER Centre for European Reform*

[130] DefenseNews (2017): "Top 100 Defense Companies", *DefenceNews Online Edition*
[131] Referring to the growth of the top 10 companies

But even in times of general economic downturn the revenues and profit margins of defence companies remain stable.[132] The minor revenue fluctuations derive from long-term contracts and a stable customer base. Even if the order intake changes drastically, revenues follow slowly with a time lag of 2-3 years. These effects are reinforced by significant pre-orders. The book-to-bill ratio[133] of defence companies like General Dynamics corresponds to about 3 years of revenues.[134]

The cost base of defence companies is strongly impacted by a high fixed costs, mainly through personnel expenses due to a highly educated workforce. Despite the high level of research and engineering, the actual R&D costs that defence companies have to bear are meagre. The undertaken research efforts are performed for one specific government-based client, who in return pays for this service. Therefore, the R&D costs are treated as "customer-financed R&D" in the financial accounts. General Dynamics only accounted for 1.2% of R&D costs, while large automotive companies had R&D expenses of over 6% in relation to their revenues.[135]

The profit margins of defence companies are only moderate[136] and not excessively high compared to other sectors. If they were, major customers would intervene during the next programme award phase, at the latest, and ask for significantly lower prices.

However, the governmental agencies often pay defence contractors prior to contract completion. In accounting terms, these advance payments are equivalent to credits that do not bear an interest rate. This mechanism of early payment is the result of the annual budget allocation logic of governmental organizations. It is beneficial for the financial situation of the defence companies that it can finance their operations with these funds and do not need to raise further external capital.[137]

This funding scheme has a very favourable financial impact for defence companies. For one, they are able to generate substantial value by realizing profits without investing high amounts of capital. The KPI metric used for measuring the relationship of profits to invested capital is

[132] The revenue growth of Raytheon for the years 2008-2010 (+ 8.6%) serves as an example
[133] The book-to-bill ratio measures the level of pre-orders divided by annual sales
[134] General Dynamics (2017): "General Dynamcis Annual Report 2016", *page 10*
[135] Daimler AG (2017): "Daimler Annual Report 2016"
[136] Thomson, L. (2013): "Defense Industry Profits Are Not Impressive", *The Forbes Magazine Online Edition*
[137] Besser, L. (2010): "Defence blows millions in budget rort", *The Sydney Morning Herald Online Edition*

the return-on-equity ratio. They rank among the highest of all industrial sectors according to CSIMarket, a financial market intelligence firm.[138]

2.3.3.2. Long term value drivers of defence companies

According to the value based management concept, the three fundamental generic strategies that drive a firm's value are business growth, the increase of profitability, and the reduction of a firm's cost of capital.[139]

The consulting firm BCG has ascertained that large stock market-listed defence companies have created substantial shareholder and firm value over the last ten years.[140] The value contributors do not significantly differ from other industry sectors; for example the key factor contributing to shareholder value is the growth of revenues. The top Aerospace & Defence companies have gained over 50% of their value from organic and inorganic revenue growth. Internal growth of defence companies is often limited by the main customer's budget constraints. The quest for growth in adjacent technologies and within new markets is therefore mostly executed by external growth strategies - namely, M&A transactions. In order to be considered "value-enhancing", external growth should occur in profitable business areas. These strategies will be further evaluated in the course of this dissertation.

The second largest impact comes from the increase of defence firms' free cash flow. These effects are strongly related to programme pre-payments, a form of pre-financing by large governmental customers. A further source of free cash flow comes from project efficiencies and negotiation power leveraged towards suppliers, who are in return paid at a later point in time.

A further positive contribution to the total shareholder return (TSR), derives from the growth of a defence firm's profit margin. In the defence industry, profitability primarily originates from two sources: operational efficiencies and increasing product specialisation. One key

[138] CSI Market (2017): "Aerospace & Defense Industry – Management Effectiveness", Key Performance Indicators
[139]Ehrhard, M. and Brigham, E. (2013): "Corporate Finance: A Focused Approach", *p. 448, Finance Titles in the Brigham Family*
[140] Schaar, D. et al. (2017): "Defense Grows while Commercial Aerospace slows", *The Aerospace And Defense Value Creators Report 2017, The Boston Consulting Group*

strategy to attain higher profit margins is to focus on higher margin businesses by abandoning unprofitable and "out of focus" business units entirely. The process of gaining competitive advantages through specialisation is not very far reached in the defence industry. Many defence contractors still regard themselves as the one-stop-shop for their national military, a strategy which is supported by national governments as well.

The concept of downsizing a business has been followed by various defence contractors, some of which have left the defence industry entirely (such as General Motors from the USA or Saab of Sweden). Others sold large parts of their business that they did not regard as core components of their business agenda; for example, when General Dynamics disposed of its Space Business Unit to the predecessor of Lockheed Martin. Both strategies help to shape a more focused core business that achieved significantly higher margins than the previous defence conglomerate structure.[141]

2.3.3.3. Short term stock market value drivers of defence companies

Based on the findings of fundamental business value drivers, it is worthwhile to compare these with the stock market value drivers for defence companies. A study on defence industry stock market value drivers helps to assess the differences compared to civil industries. The major findings underline that the differences between defence companies and other civil industries are not fundamental - this is also reflected from a stock value perspective. In other words, defence companies' stock prices are mainly influenced by the same factors as the general stock market.

Capelle-Blancard & Couderc (2006)[142] analysed over 500 events that had a statistically significant impact on the stock market price of a major defence company. While they could not find an explanation for about one-third of the events, they found that news about a company's finances and implementation of new business strategies were the key reasons for abnormal returns. Specifically, earning announcements (16.2%), bids (14.5%), contract awards or losses (13.5%), analyst coverings (11.8%), and investor warnings (8.4%) were the top five reasons for either positive or negative abnormal returns.

[141] Lundquist, J. (1992): "Shrinking Fast and Smart in the Defense Industry", *Harvard Business Review*
[142] Capelle-Blancard, G. and Couderc, N. (2008): "What Drives the Market Value Firms in the Defense Industry?", *Review of Financial Economics, Volume 17, Issue 1, pp. 14-32*

Defence companies' stock prices can be strongly impacted by news of political leadership changes. On the day Donald Trump was elected as President in November 2016, defence and aerospace stocks rose by 7.6% (more than 6% over the general market).[143] Generally, investors believed that as President Trump would increase defence spending and would be less likely to set a peace agenda during his Presidency.[144] The strong impact on defence stocks also prevails when the news is related to a negative geopolitical event like terrorist attacks or wars. This has been especially true of pure defence companies that are focussed on the US market. These findings are confirmed by McDonald & Kendal (1994) and Berebbi & Klor (2008) who analysed the Israeli and US defence market. Shapiro et al. (2011) has also contributed to this area of study by examining the effects of news about war on stock prices within the defence industry. Their study confirms that defence stocks rose with news reports of war and terrorist attacks. On the contrary, peace events have a negative impact on defence stocks.[145]

Classical stock market news like earning announcements, dividend payments or market environment news are the most relevant for evaluating defence stocks; similarly, political changes can have a significant influence on defence industry stock prices.

2.4. Summary of major findings and implications

The defence industry is strongly influenced by national governments; they can support the defence industry through spending initiatives and political help for export contracts, but also restrict M&A activities through veto rights or the reduction of contract awards.

After the end of the Cold War, the defence industry saw a major fall in revenues and drastic restructurings. A US government-enforced consolidation wave resulted in even larger defence firms, while consolidation attempts in Europe were only partially successful and done at a much smaller scale.

There were some bold moves in the aerospace industry, but many cross-border M&A attempts were abandoned due to national governments' apprehension to lose political influence over

[143] The S&P 500 Aerospace & Defense rose by 7.6% (from 796.7 points to 856.9 points) from Election Day (08 November 2016) throughout the next 4 days. The general S&P 500 stock index only rose by 1.4% in the same period. See: The Wall Street Journal Online Edition, historical stock prices at http://quotes.wsj.com/index/SPX

[144] Thomson, L. (2016): "For the defense industry, Trump's win means happy days are here again", *The Forbes Magazine Online Edition*

[145] Shapiro, D. et al. (2011): "War and Peace: The Reaction Of Defense Stocks", *pp. 21-36, The Journal of Applied Business Research, Volume 15, Number 3*

the respective firm. As a result of lower investments and higher regulatory complexity, many conglomerates left the defence market completely, while other defence companies stayed in the industry but diversified into civil industries.

Today, the largest defence companies make 40% of their sales on average outside the defence industry. The impact of national governments on defence companies is fundamental. Most large defence companies achieve 50-85% of their sales with or through their home country's military or security agencies. In order to be successful in the market, it is almost mandatory for defence contractors to establish a national footprint. Several European companies have tried to enter the US market though takeovers; the de-facto veto right of the US government has prevented most M&A attempts, while some (predominantly British firms) were successful.

Overall, business and stock market value drivers of defence companies do not significantly differ from civil industries. The main difference is the fact that news about war and terrorist attacks may lead to an appreciation of defence company shares, while civil industry tend to lose value. The growth of sales is the single most important value lever for defence companies, and external growth is regarded as the key strategy to achieve this growth.

3. M&A research, theoretical foundation and identified gaps

For a better understanding of this dissertation, the theoretical research foundation in the domain of M&A value creation is introduced. A comprehensive review of the most relevant academic literature will make it possible to identify areas in which this dissertation could contribute to further research.

3.1. Definition of Mergers and Acquisitions (M&A)

The term Mergers and Acquisitions (M&A) has been in use in the United States since the late 19th century, when the first companies merged with or acquired a competitor. Today, there is a broad spectrum of definitions for the term M&A. As the smallest common denominator, all

definitions agree upon M&A as the source for external growth[146] as opposed to a company's internal, organic growth. An M&A transaction involves at least two partners, the acquirer and the seller. The acquirer's motives for acquisition, value creation strategy, and integration strategy have been the subject of many academic studies for decades. This dissertation also focuses on these subjects and links the value creation view with the characteristics of the defence industry. It should, however, not be neglected that the seller takes an important role in the transaction as well. The divestiture of a business allows the seller to instantly sharpen and focus his business strategy and thus create value.

3.1.1. Competing definitions of M&A

The definitions of M&A can be categorized as either broad or narrow. Broad definitions of M&A as used by Pictot[147] encompass a wide range of activities that promote external growth. These include loose cooperations, consortia, joint ventures, minority shareholdings, and even corporate restructurings. European academics mostly refer to this broad definition for M&A activities.

In contrast, narrow definitions of M&A exclude these sorts of activities and instead strictly focus on full mergers and majority acquisitions.[148] A further pre-condition of such a "narrow" definition is that there must be a flow of funds or exchange of capital in order to be counted as an M&A transaction.[149]

The US-focused M&A standard literature uses a narrow definition and describes M&A as the "market for corporate control".[150] By this definition, only transactions that will ultimately change the control over the company are considered as M&A transactions. This narrow definition of M&A is well-suited to this dissertation because the change of corporate control inherently influences the strategic influence on a firm; only then is the value creation (or destruction) potential fully exploited.

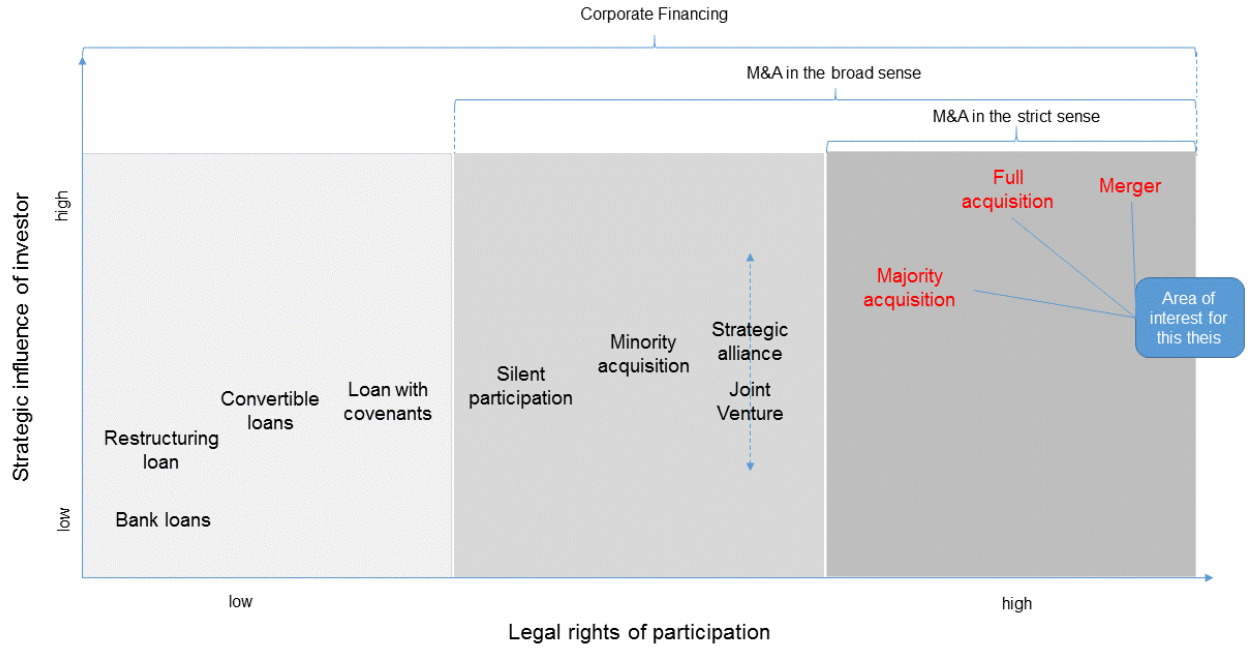
[146] The opposite transaction of the selling firm (i.e. shrinkage in case of sell-offs) will not be explicitly mentioned
[147] Picot, G. (2012): "Handbuch Mergers & Acquisitions: Planung – Durchführung – Integration", *Schaeffer Poeschel Verlag*
[148] Faulkner, D. (2014): "The Handbook of Mergers and Acquisitions", *Oxford University Press*
[149] Das, A. and Kapil, S. (2012): "Explaining M&A performance: a review of empirical research", *Journal of Strategy and Management*
[150] Brealey, R. and Myers, S. and Allen, F. (2007) "Principles of Corporate Finance", p. 940, *9th Edition, Mcgraw-Hill Publishing Company*

Accordingly, this dissertation only takes into account M&A transactions where a change of corporate control has been executed. This means that only deals in which at least 50% of equity is acquired will be considered in the empirical sample. These M&A deals allow us to draw a clearer conclusion on the respective acquisition strategy.

Change of corporate control is mostly, but not always, related to the change of majority shareholdings. There are three predominant cases where this rule does not apply. So-called "golden shares" contain extra-ordinary governance privileges such as veto rights or extended voting power. In the defence industry, these special shareholder rights have often been attributed to the national state during privatizations in order to balance security interests with the benefits of private sector efficiency and market orientation.

The second case is concerned with the attribution of seats on the Board of Directors. These seats are a powerful instrument of influence on public companies. The attribution of these seats does not always reflect the exact shareholdings, but may instead grant rights to other stakeholders (e.g. employees or the state) or active pressure groups. Finally, non-voting shares allows to separate financial rights from strategic influence. Such circumstances can change the balance of corporate control in ways which are not directly related to changes in the majority shareholding.

Figure 13: External investment and resulting strategic influence



Source: Own representation based on Brealy Myers et al.

The major difference between a full acquisition (i.e. 100% of equity or assets) and a merger is the resulting legal structure. In the case of an acquisition, the legal entity is bought and legally owned by the acquirer. It is fully absorbed by the already existing company along with all its assets, employees and contracts.

Mergers, however, are different; the merging entities cease to exist, and a new legal entity is established which consists of the formerly independent companies. While the legal implications between a full acquisition and a merger are different, the strategic and operational challenges are almost identical. Only full acquisitions, majority acquisitions of firms[151] and full mergers are considered for the data sample.

3.1.2. Merger direction and business relatedness

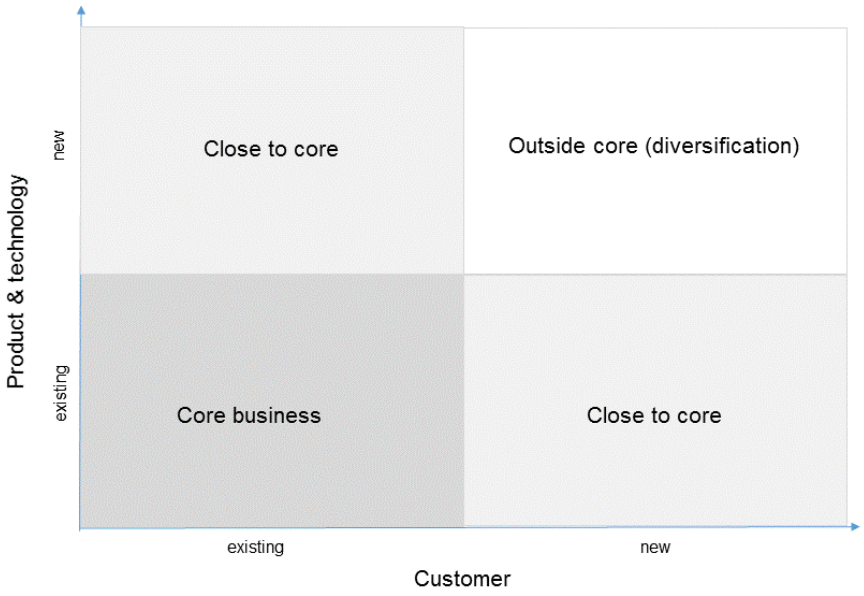
In the M&A literature, the "merger direction" is a main factor of categorization.[152] Within this framework, there are commonly three categories to describe M&A deals.

Horizontal M&A are transactions between two companies which operate within the same industry and at the same value chain position. These companies are predestined for high cost synergies due to existing redundancies and overlaps.
Vertical M&A happen between companies in the same industry, but at different stages within the value chain. The two companies may for example stand in a customer-supplier relationship. Thus, vertical M&A transactions increase the value chain coverage and may close a gap in the market offering. In contrast to horizontal and vertical M&A transactions, conglomerate mergers describe a transaction between companies of different industries. The strategic aim of these mergers is often to reduce risk through portfolio extension. Synergies are very limited because of a missing connection between the businesses and technological overlap.
The determination of "merger direction" focuses mainly on the value chain position of a company within an industry but falls short to capture technological and customer-oriented aspects.

[151] Independent business units of larger firms are also considered
[152] Brealey, R. and Myers, S. and Allen, F. (2007) "Principles of Corporate Finance", p. 940-944, *9th Edition, Mcgraw-Hill Publishing Company*

Neglecting the customer relations makes the concept of “merger direction” almost unusable for this dissertation. While good customer relationships are important in all industries, they have a very special role in the defence industry. The customer base of defence companies is focused on one or two major customers; that is, almost all large defence companies receive over 60% of their contracts from their home country’s military agencies. Furthermore, the home country customer is often a development partner for new technologies and supports the export business of the firm. For this reason, the concept of merger direction does not take the customer relationship into account sufficiently. Therefore, I have decided to use the concept of business model **relatedness**, which also places more of a focus on the special customer relationship in the defence industry.

Figure 14: Definition of business model relatedness



Source: Own representation based on The Boston Consulting Group and Michael Porter

3.2. Theoretical foundations of M&A research

The basis of this dissertation is an event study of financial market reactions to M&A announcements. Accordingly, the theoretical grounding of this dissertation is the neo-classical theory and the Efficient Market theory. These concepts provide a rational and quantitative research approach towards M&A transactions.

Behavioural concepts also offer valuable insights by focusing on the behaviour of human actors during M&A transactions. The key tenets of these theories will only be discussed in brief, as they are not in the main focus of this dissertation.

3.2.1. The emergence of M&A in academic research

In the first half of the 20th century, M&A was regarded as one of the many tasks of the CEO's agenda. M&A had rarely been integrated into corporate processes, nor were resources dedicated to it. From the 1970s onwards, M&A has become an integral part of the Strategic Management and Corporate Finance function in the corporate world.[153] This change happened gradually, and was supported by the spread of US American management philosophy in academic research and business practices.

Along with growing relevance in the corporate world came the interest of academic researchers. M&A research had been widely neglected until the 1970s, when the topic started to become a popular field of research for a variety of disciplines.[154] The theoretical grounding of M&A research is also very rich and diverse, with the majority of contributions coming from the Finance and Strategic Management domain. [155] Academic M&A research started in renowned US business schools as a relatively juvenile domain, with the first fully dedicated M&A research institute, the Cass M&A Research Centre (MARC), opening in 2008.[156] In recent years, the popularity of M&A research has grown substantially which is reflected in the number of publications: in 2014 alone, 295 new M&A focused papers have been added to the SSRN network.[157]

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[153] Ross, S. (2015): "Fundamentals of Corporate Finance", *Franco Modigliani Professor of Finance and Economics at the Sloan School of Management, Massachusetts Institute of Technology, McGraw-Hill Education*

[154] *Academic disciplines like Finance, Strategic Management, Behavioural Management, Organizational Management but also non-business disciplines like Psychology*

[155] Cartwright, S. and Schoenberg, R. (2006): "Thirty Years of Mergers and Acquisitions Research: Recent Advances and Future Opportunities", *pp. S1-S5, British Journal of Management, Volume 17*

[156] "The Cass M&A Research Centre (MARC), founded in 2008, is the only such research centre at any major business school focused on both the research and practice of M&A." http://www.cass.city.ac.uk/faculty-and-research/centres/marc

[157] See: http://ssrn.com/en/ under the keyword "merger" during the period 12 November 2013 until 12 November 2014

3.2.2. The neo-classical theory

The classical economic theory has been majorly defined by the philosopher Adam Smith in the 18th century. His ground-breaking work "The Wealth of Nations"[158] set the academic foundation for the classical economic theory. Half a century later, David Ricardo further shaped the theory through his publications on the functioning of free markets and comparative benefits.[159] Classical economic theory is the common basis of the neo-classical school of thought for microeconomics and the Keynesian school of thought for economics[160]. Despite their differences, both theories subscribe to the assumption that there is a "mechanistic" functioning of the economy and its actors. The actions of economic players are assumed to be rational and therefore predictable within a static environment.

The development from the classical theory to the neo-classical has come gradually. The neo-classical theory sets a stronger emphasis on the flexibility of firms and consumers through market reactions. Firms and consumers fulfil transactions in markets where supply and demand gradually meet through the adjustment of prices.

The leading principle of the neo-classical theory is grounded in the *rationality of economic actors*. These three assumptions are the basis of the neo-classical theory[161]:

- People and firms always act rationally;
- People and firms strive to maximize their utility. There is no conflict of interest between the utility maximization of firms and individuals.
- All people act upon full appreciation of relevant and available information.

These stringent assumptions can also be applied to M&A transactions; that is, it is assumed that companies will only pursue an M&A transaction when the outcome increases the value of the firm. [162] In accordance with the neo-classical paradigm, all rational motives for pursuing an M&A transactions should ultimately fulfil one or all of the following criteria[163]:

[158] Smith, A. (1776): "An Inquiry into the Nature and Causes of the Wealth of Nations", *Oxford University Press*
[159] Ricardo, D. (1817): "On the Principles of Political Economy and Taxation", *Batoche Books*
[160] In "competition" with Milton Friedman's theory of "Free market monetarism"
[161] Weintraub, R (*unknown*): "Neoclassical Econonomics", *Library of Economics and Liberty Online Edition*
[162] The value is defined by the Net Present Value (NPV) of future cash flows.
[163] Cummins, J. D. and Weis, M. (2004): "Consolidation in the European Insurance Industry: Do Mergers and Acquisitions Create Value for Shareholders?", pp. 5-7, *The Wharton Financial Institutions Center*

- Increase future cash flows;
- Allow cash flows to be received earlier; or
- Reduce the uncertainty of receiving these future cash flows, and thus reducing the firm's cost of capital.

In reality we must assert that the assumptions of the neo-classical theory are often not fulfilled. Most importantly, people and firms do not always act rationally, even under full knowledge of all public information in frictionless markets. Personal motives of managers often oppose the assumption of pure profit maximization for firms.

3.2.3. Behavioural economic theories

Based upon the criticisms of neo-classical theory, the "New Institutional Economics" has been established by well-known economists Ronald Coase and Oliver Williamson.[164] A further derivative of the "New Institutional Economics" are the behavioural theories that gained wider popularity in the 1950 and 1960s. Influenced by Ronald Coase, Cyert and March published "A Behavioral Theory of the Firm" in 1963.[165]

The analysis of the human dimension of economic behaviour has paved its way into M&A research via two routes: behavioural economic theories and behavioural finance. In short, behavioural finance addresses the human dimension within financial research. This has led to valuable findings with regard to M&A transactions, such as the discovery of mispricing and irrational herd behaviour.

Behavioural economic theories have strongly increased in academic research popularity since the 1960s and today concepts such as transactions costs, information asymmetries, agency theory, information asymmetries, and moral hazards are undoubtedly known to almost every economics scholar.[166] However, the application of behavioural theories to M&A research is still in its infancy. A major milestone was Roll's study on managerial hubris in M&A decision making, which was published in 1986.[167]

[164] Williamson, O. (1989): "Transaction cost economics", *pp. 135-182, Handbook of Industrial Organization* and Coase, R. (originally 1989): "The New Institutional Economics", *pp. 45-48, The Economics of Contracts*
[165] Cyert, M. and March, J. (1963) "A Behavioral Theory of the Firm", *John Wiley and Sons Ltd.*
[166] Langevoort, D. (2011): "The Behavioral Economics of Mergers and Acquisitions", *Georgetown University Law Center*
[167] Roll, R. (1986): "The Hubris Hypothesis of Corporate Takeovers", *Journal of Business*

The principal-agent theory is mainly concerned with the asymmetric risk and reward schemes between manager and company owners (i.e., shareholders). The manager is the operative decision maker, while the resulting risk of the manager's decision has to be carried by the shareholders (principals). A similar concept is investigate by Jensen's Free Cash Flow hypothesis. [168]

Various researchers have examined the principal-agent conflicts during M&A transactions.[169] The neo-classical theory proposes that the funds of a company should only be invested in projects which have a higher profitability than their cost of capital. All remaining cash flow cannot be used efficiently and is therefore "free" for pay-out to debt and equity-holders.[170] According to Jensen, managers prefer not to pay out the free cash flow but rather to keep it for use at their own discretion. Managers have a personal benefit to use free cash for increasing the size of their company through acquisitions rather than to pay out available funds. This provides them with more independence, lower control by capital markets, and often higher compensation. According to the Free Cash Flow Hypothesis, M&A transactions are therefore often the result of a principal-agent conflict. In order to avoid the inefficient use of free cash flows, the principal (owner) may in return use disciplinary effect of capital market control.[171] The Free Cash Flow Hypothesis has highlighted the importance of introducing effective corporate governance measures in order to "control and direct" the actions of managers in the best interest of the company's owners.

The behavioural economic concepts will be further discussed in the context of M&A motive identification (see chapter 4.4).

3.2.4. Further relevant theories

These classical streams of research have been enlarged by the resource-based view and the learning theory. The resource-based view focuses on the relative fit of the resources that are merged, while the learning theory tries to determine to what extent organizational learning can be achieved during mergers and how this learning can be replicated for use in future

[168] Fama, E. and Jensen, M. (1983): "Agency Problems and Residual Claims.", Harvard University Press, Journal of Law & Economics, Vol. 26, June 1983
[169] Parvinen, P. and Tikkanen, H. (2007): "Incentive Asymmetries in the Mergers and Acquisitions Proces", Journal of Management Studies
[170] Free cash flow is defined as the available cash flow in excess of the cash flow that it needs to pay out to debt holders
[171] de Bodt, E. and Roll, R. and Cousin, J. (2014): "The Hubris Hypothesis: Empirical Evidence", *p. 24, SSRN Electronic Journal*

transactions. There are of course many other research studies about the integration process and the cultural, legal, and economic aspects of M&A transactions; however due to the scope of this dissertation on value creation of M&A transactions, these theories are not discussed in further detail.

3.3. Prior research and literature overview

This background research and literature review presented below is concerned with literature referring to M&A research and research about the defence industry. There is special focus on publications that examine the combination of both subjects, namely M&A in the defence industry.

The body of literature concerning the defence industry is relatively small and is mainly concerned with political or economic research. In contrast, the academic literature regarding mergers and acquisitions seems overwhelmingly large in terms of both size and variety of sub-topics. The subject of M&A is a very well researched field by economic and business studies, further complemented by practical managerial publications. The major stream of research is grounded in finance or strategic management studies. The finance discipline is mostly concerned with the analysis of wealth creation through mergers. The literature surrounding strategic management, on the other hand, focuses on the strategic rationale of M&A transactions and the strategic fit of the merging companies. This dissertation aims to combine and consider both of these research orientations and apply it to the defence industry.

3.3.1. Event studies about M&A announcements

The value effects of M&A transactions can be measured through various methods. This dissertation focuses on the quantitative value effects which can be best measured by event studies.

The publication of Professor Robert F. Bruner (2001) has consolidated the research about M&A value effects.[172] Bruner analysed the results of 130 academic studies which are concerned with the question whether M&A is value enhancing or not. The 130 studies are composed of 110 event studies, 7 profitability studies, and 13 practitioner studies. The studies have been conducted between 1971 and 2001 with varying sample dates. The event windows and the sample sizes are also highly diverse, ranging from a very short period (-1;0 days) up

[172] Bruner, R. (2001): "Does M&A Pay? A Survey of Evidence for the Decision-Maker", *Darden Graduate School of Business, Batten Institute*

to a 5-year timeframe. Most of the studies (60%) lie within a time frame of +/- 20 days around the event date. The sample size of the studies encompasses a broad range, from 17-400 deals. Most studies are based on observations of less than 250 deals (61%). Only a small fraction of the studies are focused on a specific industry. The research results distinguish between the abnormal returns for target shareholders, acquiring shareholders, and the combined shareholder value creation.

The results of the research were more positive than was generally expected. Not surprisingly, the effects on the wealth of the target shareholders are very positive; indeed, Bruner states that "the mass of research suggests that target shareholders earn sizeable positive market returns […]".

The significant, positive returns to target shareholders are confirmed by Jensen and Ruback (1983),[173] who attest abnormal returns of 8-30% for shareholders of the acquiring firm depending on the takeover method. In a further research study, Datta et al. (1992) confirm this viewpoint by identifying significantly positive value effects for target shareholders of 20% on average.[174] The high returns to target shareholders are also confirmed by Roll (1986),[175] who explains these results as a logical consequence of functioning stock markets. The magnitude of wealth creation is remarkable, and shows that a high proportion of the anticipated future value creation is distributed to the target shareholders at the time when the M&A transactions take place.

The wealth effects for acquiring shareholders are evaluated somewhat more critically. Bruner argues that bidding firms are not losing value in acquisitions, and that based upon the results of his studies, the shareholders of acquiring firms "*earn zero adjusted returns*".[176] Jensen and Ruback (1983) draw the same conclusion in their study and conclude that "returns to successful bidding firms […] are zero net present value investments for bidders".[177]

Datta et al. (1992) calculated similar results of a positive, though marginal, return for bidding shareholders of less than 0.5%. Roll (1986) questions these findings, and suggests that the

[173] Ruback, R. and Jensen, M. (1983): "The Market for Corporate Control: The Scientific Evidence*", Journal of Financial Economics, Vol. 11, pp. 5-50*
[174] Datta, D. et al. (1992): "Factors influencing wealth creation from mergers and acquisitions: A meta-analysis", *pp. 67-84, Strategic Management Journal, Volume 13*
[175] Roll, R. (1986): "The Hubris Hypothesis of Corporate Takeovers", pp. 198-199, *Journal of Business*
[176] Bruner, R. (2001): "Does M&A Pay? A Survey of Evidence for the Decision-Maker", *Darden Graduate School of Business, Batten Institute*
[177] Ruback, R. and Jensen, M. (1983): "The Market for Corporate Control: The Scientific Evidence*", Journal of Financial Economics, Vol. 11, p. 9*

study results are influenced by an underestimation of the value deterioration prior to the announcement of the M&A deal. Likewise, Roll interprets bidding returns as lower than zero.

Given a large set of studies it can be concluded that most studies assess returns that tend to fluctuate around zero. A more recent study of European M&A transactions[178] assesses an even distribution of outcomes with positive and negative value creation results. It can be concluded that shareholders of bidding firms realize zero return on average in the typical event study time window. In other words, they often only achieve to reach a break-even with the risk of significant losses.

As a result of positive abnormal returns to target shareholders and break-even (or zero) returns to buying shareholders, the overall returns of the M&A transactions are expected to be positive. And indeed, the value creation of the entire M&A transactions result in positive combined abnormal returns.[179]

Overall it can be stated that M&A transactions do create value, and Bruner concludes that "M&A does pay". These results are more positive than initially expected. The value creation is unequally distributed. It is much higher for target shareholders than for acquirer shareholders who cannot be fully satisfied with the results. For them, M&A deals do not on average achieve significant abnormal returns.

3.3.2. Research about M&A in the defence industry

The defence industry is not the focus of much academic research; literature in this field is limited in scope and volume.[180] Literature that covers M&A transactions in the defence industry, is even less frequently published. In contrast, M&A specific literature is well-covered, with 2,750 publications alone on the Social Science Research Network (SSRN).[181]

The literature regarding M&A and consolidation in the defence industry mainly consists of three, partly overlapping streams of thought: macroeconomic and political literature,

[178] Boesecke, K. (2009) "Value Creation in Mergers, Acquisitions, and Alliances", *p. 117, Jacobs University Bremen*

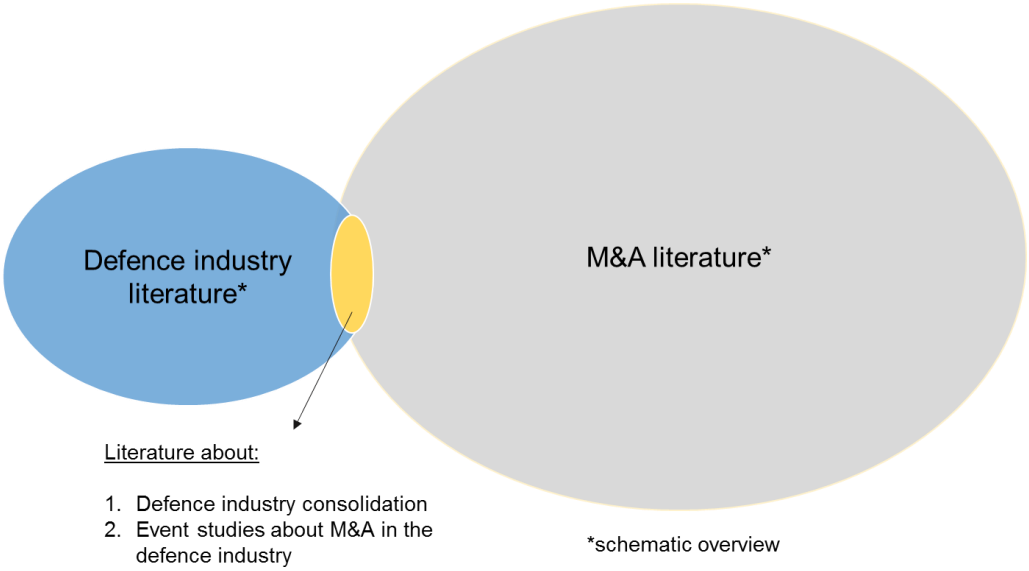
[179] The acquirer is in almost all cases significantly larger than the target company. For this reason the positive value creation for the target shareholders is strongly "diluted" by the much lower value effects for acquirer shareholders.

[180] Only about 60 articles are published on the Social Science Research Network (SSRN) compared to 1,300 articles about the banking industry.

[181] As of July 2017 for the search term "Mergers and Acquisitions"; the number of publications on SSRN can only serve as a proxy for the academic insights that have been gained, though further analysis shows that the defence industry is not a general focus of academic research.

microeconomic and strategy related literature, and event studies of M&A value effects in the defence industry.

Figure 15: Literature overview



Source: Own representation (schematic)

3.3.2.1. Macroeconomic defence industry consolidation research

Most of the defence industry consolidation literature focuses on macro-economic and political subjects. The publications are mainly concerned with the political implications of the defence industry's consolidation. The studies evaluate the political benefits and risks of a changing industry structure for a country's foreign policy and its self-defence capabilities.

The focus areas of "political publications" are international relations, national security considerations, export restrictions and political decision making. This stream of literature covers research about the macro-economic impact of M&A transactions in the defence industry. Considerations of the economic utility of a national defence industry and the effect on employment are popular research subjects, too.

Most publications of the last 25 years have identified the end of the Cold War as the major reason for a required industry restructuring. The consolidation pressure has increased drastically and the aim of the restructuring efforts was to "retain essential industrial base

capabilities in an efficient and cost effective manner as the market significantly declined."[182] Many macroeconomic studies try to simulate the efficient size of the defence industry. Mergers are regarded as an efficient means to reduce overcapacity[183] of the involved firms and to achieve macroeconomic benefits through lower costs.

The vast literature in this field can be distinguished by industry sector or geographical focus.[184] Most publications have a regional focus and deal with the American or the European consolidation strategies. Apart from the general European view on consolidation, there is country-specific consolidation literature which evaluates the specific role and options of the country in question; namely, "Small Countries and the Consolidation of the European Defense Industry: Portugal as a Case Study".[185] The author's advice for Portugal is to either find an attractive niche in the European defence production value chain, or to maximize utility by focusing on offset business for defence procurement. A very similar research paper evaluates the strategic options for Spain on how to preserve most of its defence industry and the associated jobs, despite a foreseeable downturn defence spending.[186]

An exemplary sector analysis is the Stockholm International Peace Research Institute's (SIPRI) research on the consolidation effects of the light-weight military vehicles industry in Western Europe and North America.[187] As SIPRI concludes, the strong increase of global manufacturers from 12 to 55 in the 1990s will most likely be reversed in order to realize efficiencies in this sector. After strong national integration efforts, the Institute recommends cross-border mergers or complete close-downs of defence industry sub-sectors for countries with budget constraints. Governmental policies are seen as the major obstacle to a market efficient restructuring.

[182] Lorell, M. et al. (2009): "Going Global? U.S. Government Policy and the Defense Aerospace Industry", *p. 40, RAND Corporation Project Airforce*
[183] A study of the US Department for Defense found out that the overcapacity of the larger companies was reduced on average by 3-4%. The effect of overcapacity reduction was much larger for the acquired entity. The reductions varied widely between zero and up to 51% p.p. utilization increase. For further reading see: Office of the Secretary of Defense (1997): " Report On The Effects Of Mergers In The Defense Industry"
[184] For example the aerospace, maritime, ground vehicle, electronics, or defence software sector
[185] Barros, C. (2001): "Small Countries and the Consolidation of the European Defense Industry: Portugal as a Case Study", *Peace Science Congress 2001 and Fifth Annual Middlesex Conference on Economics and Security*
[186] Cosidó, I. (2005): "The Spanish Defence Industry in the Face of Sector Consolidation in Europe", *White Paper, Real Instituto Elcano*
[187]Baumann, H. (2003): "The consolidation of the military vehicles industry in Western Europe and the United States", *Background paper for the SIPRI Yearbook 2003*

The US defence industry consolidation is a major research domain within this field. The reason for the researchers' interest is the drastic and profound changes that the consolidation policies brought to the industry. The effects of the consolidations are seen as a fundamental change of the previously stable and protected defence industry landscape in the USA.
The lurid name of "Last Supper" has been chosen for the event of announcing major restructurings of the US defence industry. The whole "story" of industry consolidation has raised the attention of the economic press, academic researchers, think tanks, and government agencies, with many researchers trying to carve out relevant conclusions for a European defence consolidation and for other industry sectors.

The review of over 15 publications on the European consolidation attempts almost entirely draw the same conclusion - that a closer European defence industry cooperation would be beneficial. The positive effect for the industrial base, long-term global competiveness, job creation and economic are mentioned in almost all publications.

The political dimension of US and European industrial cooperation is identified as a means that could, in theory, have benefits for both involved parties. The expected positive economic effects are mentioned by almost all research papers. The RAND Institute's publication "Arming Europe" analyses the state of the European defence industry and draws the conclusion that a closer EU-US American cooperation would be in the political interest of both continents. There is a real concern about the state of the European defence industry, as it has to cope with shrinking markets and has almost no entry to the large US defence market.[188] There is consensus that in practice, the economic benefits of a consolidation are much harder to achieve due to political restrictions. If the political restrictions were lower, a stronger and stronger global integration would be mutually beneficial for the home states and the industry alike.

Almost all publications on defence consolidation are written by political or security institutes. Prominent examples are the RAND Institute of the United States, the Stockholm International Peace Research Institute (SIPRI), and the Institute for Security Studies in Paris. Further publications come from political research institutions like NATO's think tank Stratfor and the Atlantic Council. Political administrative institutions like the "Office of the Secretary of Defense" of the United States have also published M&A and merger reports, though some of

[188] Jones. S. and Larrabee, S. (2005): "Arming Europe", *The National Interest", Volume 82, Winter 2005/2006, pp. 62-68*

these sources have to be used with special caution due to potential political and special interest bias.

3.3.2.2. Microeconomic and strategy related research

Political bias is not a chief concern in publications related to the "microeconomic & strategy" domain of research. A variety of academic researchers from different fields have contributed to this discussion. Publications in this domain also come from consulting firms and investment banks.

The "microeconomic and strategy" M&A literature evaluates the impact of M&A transactions from the perspective of a single firm. The research about value creation at General Dynamics analyses the company's value creation strategy during the major defence industry restructuring, and refers to "a strategy that included downsizing, restructuring, and exit."[189] This case study shows that General Dynamics was able to create significant shareholder value despite a harsh economic environment in a consolidating industrial landscape.[190]

The joint publication from McKinsey and the Harvard Business School[191] explains firm-specific strategies for coping with changes in the industrial environment. The study focuses on US firms like Loral, which was able to downsize quickly and cut out non-core business while simultaneously shifting towards more stable and secure business areas. Company-specific strategy reviews can also be found in macro-market focused studies.[192]

With regard to the European market, EADS' and BAE System's strategy have been covered by academics and the business press. One reason for the attractiveness of these two firms lies in the success of their opposing strategic routes. EADS (today called Airbus) is the pan-European aerospace consolidator with a dominating civil business and a smaller defence business. On the other side stands BAE Systems, a British company that has focused entirely

[189] Dial, J. and Murphy, K. (1995): "Incentives, Downsizing, and Value Creation at General Dynamics", *Journal of Financial Economics, pp. 261-314*
[190] More than 500% shareholder return was achieved between 1991 and 1993
[191] Lundquist, J. et al. (1992): "Shrinking Fast and Smart in the Defense Industry", *Harvard Business Review, November–December 1992 Issue*
[192] The positive results of the US doctrine of further investments in the "War Against Terror" on Lockheed Martin's Hellfire missile sales are laid out by Hartung, W. (2011): "The Military-Industrial Complex Revisited: Shifting Patterns of Military Contracting in the Post-9/11 Period"

on the defence business and sold-off its civil operations. The proceeds of these divestments have been invested in the acquisition of US defence companies. When the planned defence business merger of EADS and BAE Systems failed, McKinsey published a strategy review to evaluate the different options of a European defence consolidation.[193] This review cannot be compared with a sound academic study; however, it serves as a good example of the "standard" in the literature surrounding firm-specific defence industry consolidation literature.

3.3.2.3. Event studies about M&A in the defence industry

Besides the relatively broad body of literature on M&A and consolidation in general, the perspective of investors is almost fully neglected in defence industry literature. After an intense search for event studies of M&A transactions in the defence industry, only five publications appeared to cover this subject. In fact, all five publications strongly differ in their focus, the nature of quantitative analysis, and by the academic rigor of their research from this dissertation. All of the publications bring some insights, but also contain major gaps and shortcomings; in short, none of them are designed to answer the research questions of this dissertation. They are nevertheless presented here in order to understand their focus of research and the major outcome.

James Hasik (2008) published a briefing on M&A performance in the defence industry as a supplement at an industry investor's conference.[194] The analysis aims to answer the question as to whether defence companies that engage in serial M&A acquisitions bring superior total shareholder return.[195] The sample contains 13 US-based hardware and software producing defence companies that are all listed on the stock market. The time horizon of the analysis spans over seven years, from 1999 until 2006; during this time, the companies engaged in 197 M&A transactions. However, only 158 deals have been taken into account as the author has neglected the three largest deals of each company in order to avoid a bias imposed by large transactions. The value creation of the companies varies strongly, ranging from a 65% to over 600% during the period of observation. The study finds that over the 7 year period, "superior returns seem connected with serial acquisitiveness and mid-sized market capitalizations."

[193] Dowdy, J. (2012): "After the demise of "BEADS", what's now for consolidation?", *Jane's Defence Weekly, 24th October 2012, p. 23*
[194] Hasik, J. (2008): "A retrospective on M&A performance in defense: some further (working) results", *Briefing to the SRI Aerospace & Defense Investors Conference on 19 March 2008*
[195] Total shareholder return measures the stock performance plus the re-investment of dividends

Specifically, the companies with a market capitalization below $5 billion and total acquisitions of 7.5-20%[196] of the firm's valuation brought in the highest returns. An interesting case study on General Dynamics shows the effects of a divestment strategy; in 1993 General Dynamics had several major divestments, and the total value yielded a 53% return. This was the highest value in the 7 year long observation period.[197]

However, the positive returns for all sample companies seem flawed upon critical examination. Particularly, the study results are strongly biased due to the chosen time horizon, which includes the terrorist attacks of September 11th 2001. This event lead to a drastic increase of defence stocks. The value increases only materialised in the long run, when the cause-effect relationship of the underlying events was much harder to draw. Further, the sample size is fairly small with just 13 companies, and the statistical confidence test (Mann-Whitney-Wilcoxon) only applies to the full 7-year range. The test of two shorter time frames[198], including the test of superior returns and serial acquisitiveness, are not statistically different from the normal returns.

Weston and Ahern's (2007) "M&A: The Good, the Bad, and the Ugly" discussed whether M&A deals could best be explained by the neoclassical theory (referred to as "the good"), by the re-distribution theory ("the bad"), or by behavioural theories ("the ugly").[199] In order to compare these three competing schools of thought, Ahern and Weston took M&A deals from the "top 5 US defense contractors" between 1990 and 2004.

The study suggests that majority acquisitions in the US defence industry created positive cumulative abnormal returns of 1% for the acquirer around the deal announcement (+/- 5 days). Additionally, M&A is said to be a valuable driver for increasing corporate capabilities in the defence industry. The authors conclude that M&A is a quick method for achieving growth, the benefits are very unique to the acquirer and cannot be substituted easily by competing firms. These factors are said to be the basis for value creation through M&A. The

[196] Excluding the top 3 deals for each company. This might significantly influence the range of transaction values but no information is provided.
[197] Hasik, J. (2008): "A retrospective on M&A performance in defense: some further (working) results", *Briefing to the SRI Aerospace & Defense Investors Conference on 19 March 2008, page 17*
[198] The first period lasts from June 1999 until March 2003, called "Kosovo to Iraq [war]"; the second period lasts from March 2003 to June 2006
[199] Ahern, K. and Weston, F. (2007): "M&As: The Good, the Bad, and the Ugly", *Journal of Applied Finance, 2007, vol. 17(1), pp. 5-20*

final conclusion says that M&A is not a strategic end in itself, but can only be a means to achieving a long term strategic plan.

The general sample choice and the sample definition drawn from this study shows a strong difference from this dissertation. The definition of M&A is very broad, and includes corporate alliances, joint ventures, minority investments, licensing agreements and recapitalizations. 122 classical M&A transactions in the narrow sense (here called "mergers") are included as part of the assessment; however, they only account for about a fifth of the total number of examined M&A activities[200] The sample also does not differentiate by deal or transaction size; all transactions ranging from as low as 5 million up to multi-billion dollar deals are treated equally. Furthermore, the sample size is limited to the five largest US defence companies. Also the timeline of the examination falls into two phases: the time from 1990 until September 11th 2001 and post-2001. Before 2001, negative demand shocked the defence industry as US Defense Procurement budgets continued to decrease and consolidation was enforced by the state. The terrorist attacks of 2001 marked a dramatic change in the US Defense Procurement budget, with a previously unseen 59% increase until 2004. Interesting conclusions could be drawn by distinguishing between these two time frames; unfortunately, the study does not take this into consideration. Finally, it has to be noticed that the specifics of the defence industry have been fully neglected by the author. There is no linkage to strategic M&A motives of the defence industry or to the particularities of the defence business.

The dissertation of David J. H. Wood[201] is also concerned with the consolidation of major defence companies in the United States. The sample consists of 92 deals (or "consolidation events") derived from a 15-year observation period (1992-2006). All deals were performed by one of the top four US defence aerospace companies, namely Boeing (22 deals), Lockheed Martin (26 deals), Northrop Grumman (26 deals), and Raytheon (18 deals).[202] Wood's study tries to determine how the stock market reacts to consolidation announcements and if the market reactions are consistent over a longer period of time. The dissertation identifies abnormal returns in 56 out of 96 observations. Roughly two-thirds of these abnormal returns

[200] A total of 589 corporate transactions have been registered. The majority with 224 transactions are alliances and mergers coming only in third place with 122 transactions. The remainder transactions are divestitures (126), Joint Ventures (103), and asset acquisitions (14).
[201] Wood, D. (2009): "Corporate Consolidation: An event study of historic stock prices in the defense aerospace industry", *Naval Postgraduate School*
[202] It remains unclear if further adjustments to the sample have been made. The author would have suggested to exclude minor deals and non-defence deals in the case of companies with commercial business like Boeing.

are positive, and 17 of the 56 abnormal returns yield a negative abnormal return 40 days after the deal announcement. In only 50% of the cases does the DAY 1 abnormal return correctly predicts the cumulative abnormal return by DAY 40.[203] Obviously there is no consistency in the market evaluation, and the first evaluation does not persist over time. In half of the cases, market participants tended to re-evaluate their first assessment of the transaction.

Although Wood's dissertation is a helpful indication of positive abnormal returns in the US defence industry, the results are statistically weak and not focused on strategic rationales. The study does not attempt to detect a relationship between strategic rationales and value creation effects. The descriptive power of the model is low, and ranges from 0.12 to 0.22 (measured by the average R^2). Furthermore, the event study counts the number of events rather than calculating the weighted total returns. This is a further reason why the insights are very limited.

The same low level of statistical significance applies to findings from a very similar study called "Market Perception of Defense Mergers in the United States, 1990-2006: A Case of Event Studies", which was conducted based on case studies from the top 5 US defence companies from 1990 until 2006."[204] Grant assumes that the public debate around US defence industry mergers has made merger announcements expected occurrences, and that the effects have already been priced into the respective shares. However, the results do not provide clear wealth effects or further statistically relevant insights.

The study "Market Perception of Consolidations in the European Defense Industry From 2001 to 2009"[205] focuses on the European defence market consolidation. Panagiotakopoulos and Tourkantonis (2009), the authors of the study, analyse the reaction of the financial markets on the consolidation announcement from 2001-2009 for the four largest European defence contractors: BAE Systems, EADS, Finmeccanica, and Thales. Out of the 72 analysed events (confusingly, the authors refer to 80 events), only 21 events show a statistically significant reaction. Around half are stock market appreciations and the other half stock market

[203] Wood, D. (2009): "Corporate Consolidation: An event study of historic stock prices in the defense aerospace industry", *Naval Postgraduate School*, p. 48
[204] Grant, J. (2007): "Market Perception of Defense Mergers in the United States, 1990-2006: A Case of Event Studies", *Naval Postgraduate School, Monterey, California*
[205] Panagiotakopoulos, P. and Tourkantonis, K. (2009): "Market perception of consolidations in the European Defense Industry from 2001 to 2009", *Naval Postgraduate School, Monterey, California*

depreciations. The major take-away from this study is that BAE Systems had caused a much stronger stock market reaction (in about two-thirds of cases) than the three other companies.

Again, various factors made it difficult to determine any clear conclusions; the sample size is small, with only 72 announcement events from only four different acquirer firms. Only 21 events (29%) show a statistically relevant reaction. This value is so low that hardly any conclusion can be drawn from it. The selected announcement events are not further structured or re-grouped. The triggering events range from the divestment of smaller plants to the increase of shareholdings of an affiliated company. Only a few events fall under the general classification of M&A transactions. The link between transactions and the consolidation strategy is missing entirely. The values at stake of the underlying transactions are not taken into account at all.

All in all, it can be assessed that the existing event study publications on M&A value creation in the defence industry do not satisfactorily answer the research questions posed by this dissertation. The samples utilised are small, with a much too limited selection of acquirer companies. In all five studies, a maximum of five acquirer firms were considered, which contributes to the sampling problem. The period of observation is often too limited with regards to the long industrial cycles of the defence industry. With one exception, the studies neglect European defence companies entirely, and are solely focused on the top US defence consolidators. In sum, the limited results are statistically weak, and it seems almost impossible to draw a general conclusion or even practical management advice from them.

3.4. Expected academic and practical research advancements

A broad set of academic literature on the defence industry exists, mainly in the domain of macro-economic and defence-political studies. There has also been a focus on security implications resulting from a stronger integration and consolidation within the defence industry. Despite this broad academic focus and discussion, a gap in the academic literature exists; namely, the impact of M&A on the shareholder value within the defence industry is not covered sufficiently. The very limited number of event studies that link the industry specific M&A motives with the associated value effects produce many shortcomings. None of them satisfyingly helps to answer the research question about the value creation of defence industry M&A for target shareholders.

Due to their crucial role in governance, it is surprising that the perspectives of the investors in the defence industry have been widely neglected by researchers. This dissertation will add the missing perspective value creation through M&A in the defence industry from an equity investor's point of view. The research will identify strategic M&A motives, analyse and interpret the statistical findings, and link them to strategic management decisions with the help of empirical data. The research aims to answer the questions which M&A strategy increases the shareholder's value and which strategies destroy value.

Apart from advancing academic literature in this specific field, this dissertation also seeks to add further knowledge about stock market reactions to M&A announcements in general. The knowledge gained from this dissertation intends to have practical benefits for strategic management decisions; specifically, in supporting managers to set up M&A strategies that maximize shareholder value. Neglecting a "value-increasing" strategy bears a high risk of deal failure. Shareholders increasingly use their influence and oppose value destructive deals through the Board of Directors or public power.[206]

4. Motives for M&A transactions

The following sections will take a closer look at the motives for undertaking an M&A transaction, with a particular focus on the motives of the buy-side. The sell-side or "target company" often does not select a strategic partner; but rather chooses a buyer who makes the most attractive financial offer.

4.1. Identification of M&A motives

Different stakeholders and interest groups within a company have their own individual motives to either advocate or oppose external growth through M&A. These motives may differ for each stakeholder. Managers or Board of Director members might follow different motives when pursuing a merger compared to shareholders or even employees.

An analysis of M&A motives sometimes does not succeed to identify the real motives that finally lead to a merger. For one, managers often do not explain their true motives to the public, be it for personal reasons or for strategic business reasons. Second, public statements

[206] Lajoux, A. (2015): *"Role of the Board in M&A", Harvard Law School Online Forum on Corporate Governance and Financial Regulation*

are often biased, PR-streamlined, and incomplete. “Non-objective” motives that may seem “irrational” are often hidden, especially because they might contradict corporate governance rules or seem inappropriate in a business environment.

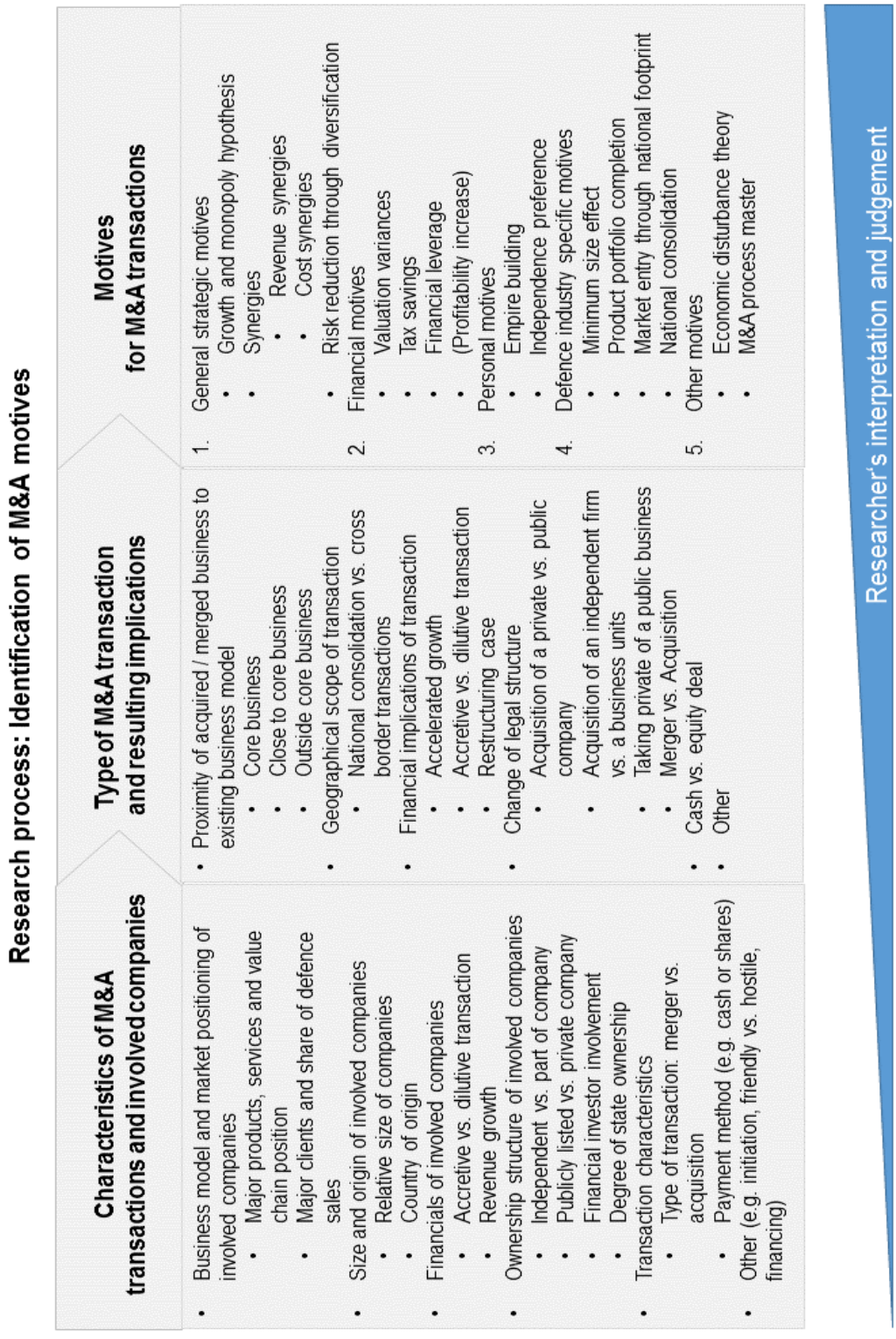
Due to these reasons the author believes that it is not scientifically sound to categorize M&A deals according to only one specific M&A motive. This dissertation takes a three step approach of identifying the motives.

The most relevant characteristics of the M&A transactions are selected. All of these information are objective data with as little interpretation by the author as possible. In a second step, the base information is condensed and clustered into types of transactions. This helps to anticipate the resulting implications of the M&A deal as regards the involved companies. There is already some interpretation involved in the clustering and condensation of information. The final step is the reasonable “approximation” of the most relevant strategic motives for each M&A transaction (there can of course be more than one single motive).

The author is aware of the fact that the strategic motivation can only be an interpretation based on the given company and characteristics of the deal. To rule out mistakes to the greatest extent, the author has diligently analysed each single transaction. The basis for analysis is publicly available information from various sources. This includes both information published by the companies involved (i.e. ad- hoc share info releases[207], press releases, investor presentations, and annual reports), as well as information published by external bodies, such as financial analyst reports and business press articles. In case of vague or sometimes even contradicting information, the author has used his own judgment and in some cases the perspective of industry experts.

[207] Definition by the Daimler Corporation: “Ad hoc announcements are regulatory announcements which must be published pursuant to an obligation based on Securities Trading Law”, see: http://www.daimler.com/investor-relations/news/adhoc-releases
The release of ad-hoc news is intended to prevent that news with relevance for the share price are only known to "insiders", who might use this knowledge to their advantage”.

Figures 16: Identification of M&A motives



Source: Own representation

In the next sub-chapters, the theoretical foundations and the knowledge about the defence industry are used to identify the most relevant M&A motives within the defence industry.

4.2. Strategic M&A motives

The motives categorized as "strategic M&A motives" are classical motives for companies to perform an M&A transaction. The three major motives are the search for competitive advantages through acquisitive growth, the reduction of company specific risks with the help of external growth and financial advantages through synergies. "Strategic M&A motives" are generally valid for all companies and not exclusive to the defence industry.

4.2.1. Acquisitive growth and the monopoly hypothesis

The monopoly hypothesis is based on the rationale that firms try to create monopolies and thus gain market power by the acquisition of rival firms.[208] This motive has been in depth examined by researchers in both industrial organisations and the strategic management domain. It argues that when firms achieve a leading or even dominant position within their specific market, they are able to dominate sales channels, achieve costs benefits from economies of scale, and set market prices. In an extreme case, the merger of two former competitors could even bring competition to a complete halt. This would lead to enduring competitive advantage and a shift in power from the demand side (clients) to the supply side (company). Through reduced competition it is also possible to capture additional profits, or the so-called "monopoly rent".[209]

However market power is not just a result of sheer company size. Indeed, the relatedness of the two merged entities is often a crucial prerequisite for achieving competitive advantages. Presumably, only closely related firms can combine their strengths effectively and gain relevant traction to dominate a market.

The monopoly hypothesis sounds convincing from a theoretical point of view, but there are various reasons that contradict the theory in practice. For one, anti-monopoly legislation has been established by nearly every developed economy; the primary goal of such legislation is

[208] Trautwein, F. (1990): "Merger Motives and Merger Prescriptions", *Strategic Management Journal, Vol. 11, No. 4 (May - Jun., 1990), pp. 283-295*
[209] Porter, M. E., (1987): "From Competitive Advantage to Corporate Strategy.", *Harvard Business Review*. 65(3)

to avoid the creation of market-dominating companies through extensive antitrust laws.[210] The geographical focus areas of this dissertation, the EU and US, are on the forefront of anti-trust regulations, but the defence industry is largely exempted from the general antitrust regulations due to its importance for national security. Each M&A transaction is evaluated on a case by case basis in regards to their compliance with such legislation.[211]

For the overall evaluation of external growth, the economists Espen Eckbo and Robert Stillman (1983) have tested the validity of the monopoly hypothesis for M&A transactions by measuring the valuation changes of all market players in an industry where consolidation happens through acquisitions. Eckbo argues that if the monopoly theory holds true, all industry players should benefit from consolidation and not only the companies that are directly involved in the merger. The empirical study revealed no positive effects from the relative increase in market share.[212] According to Eckbo and Stillman, these results deny the validity of the monopoly theory as a rational motive for value creation of M&A transactions.

Growth can come in various forms and the rarionale may not only be the monopoly hypothesis. The most often observed growth levers are portfolio completion and the value chain extension. A wisely chosen product and business portfolio allows a company to offer a suitable product for each individual customer need; products and services can also be complementary, so that a customer buys them together. In the defence industry, the "products" are mostly "projects" or "systems". If the contract is for example related to border control and surveillance, the customer is likely to buy a drone for air surveillance together with tracking software that can interpret videos and inform security forces. This example shows the competitive benefits of firms that can offer the entire integrated system instead of just one product. The acquisition of firms is a fruitful way to complement missing capabilities and to satisfy customer needs.

In the defence industry, the relationship between manufacturers and their customer is at least as important as the capabilities and related product portfolio itself. In order to satisfy the customer's demand, defence companies have often extended their product range to cope with

[210] Stillman, R. (1983): "Examining Antitrust Policy Towards Horizontal Mergers", *Journal of Financial Economics, Volume 11, Issues 1–4, pp. 225-240*

[211] For further reading, see also the legislation of the Hart-Scott-Rodino Act, the US antitrust control and the regulations around "§15 USC 18a: Premerger notification and waiting period"

[212] Eckbo, B.E. (1985): "Mergers and the market concentration doctrine", *Journal of Business, Vol. 58, pp. 325-349,1985*

the army's demand. Though it might be more cost efficient to acquire a product elsewhere, there is a clear preference for national sourcing from an integrated supplier.

The value chain extension strategy relates to the question how further products or services, are integrated inside the firm. Downstream integration describes a move towards the end customer and upward integration is a step towards the basic production process. In the defence industry, the value chain extension is a popular strategic move. For one, the downward integration into service business usually lifts the profit margin of hardware focused platform companies. Secondly, the service business is more stable than the project business and flattens sales volumes over time. Consequently, there has been a wave of integrating test and service offerings, such as electronic warfare simulator training in the OEM's value chain.[213] Defence contractors have also integrated upwards into the primary production process. The main motive for this move is to secure the supply of crucial parts; for example, Airbus recently took over a crucial composite material producer who was on the edge of going bankrupt.[214]

It can be summarised that the pure arguments of the monopoly-hypothesis are not regarded as feasible motives in this context. However, the minimum-size effect is confirmed and regarded as very relevant for the defence industry. As the two motives are measured identically through general external growth, it is not easy to fully credit the results of the measurement to only one of the motives.

4.2.2. Risk reduction through diversification

Reducing a company's specific business risk also reduces the investor's cost of capital. Risk reduction through diversification can thus have an economic value for investors.

Research about the diversification strategy is grounded on Harry Markowitz's portfolio theory which dates back to 1952[215]. Since then, it has become an integral part of modern financial portfolio theory. There are two sort of risk associated to an equity share: market risk and firm specific risk. As the name suggests, market risk is related to the overall development of the market. In contrast, the firm specific risk is based upon the specific performance of the individual firm. While risk and return are related to each other, an efficient portfolio only

[213] See Northrop Grumman as an example www.northropgrumman.com/Capabilities
[214] SEPI (2014): **"**The European Commission authorizes the rescue plan for ALESTIS Aerospace submitted by SEPI and AIRBUS", *Press Release, 11th July 2014*
[215] Markowitz, H. (1952): "Portfolio Selection", *The Journal of Finance, Vol. 7, No. 1. (Mar., 1952), pp. 77-91.*

bears the market risk. By adding more stock to a financial portfolio, the firm specific risk[216] of an individual stock can be almost eliminated.

The effects of diversification are highest when the individual stocks of a portfolio bear a low correlation coefficient. This means that their individual risk is unrelated or even opposed to each other. As a rule of thumb, the correlation between two firms is lowest when the firms are active in two different industries; in this case, they are not affected by the same market deviations. The residual risk is the general market risk, which cannot be further diversified. As the stockholder is only compensated for the market risk, it is vital to diversify the firm specific risk.[217]

Based on the findings of the financial portfolio theory, the majority of M&A transactions in the 1970s-1980s were typical portfolio diversification cases, as corporations were growing outside their traditional businesses into conglomerates. Conglomerate companies often consisted of a vast array of products and businesses with no obvious relation to each other. Many conglomerates have ceased to exist in a strategic wave of re-concentration on the core business.[218]

The evaluation of business diversification strategies is thoroughly discussed and evaluated ambivalently by economic researchers: According to neo-classical theory, diversification makes sense for a financial investor but not on a company level. Investors can easily diversify their funds in the stock market by acquiring several shares or investing into a portfolio; this is more efficient for an individual than it is for a firm diversifying its business portfolio. Many researches show that industrial diversification on a company level destroys shareholder wealth[219], it will also be tested in the course of this dissertation whether diversification increases or destroys shareholder value in the defence industry.

The defence industry offers many examples for diversifying M&A deals; Fiat Industries, Litton, GE, and also Daimler Benz AG[220] have all acquired unrelated aerospace and defence firms. State-owned companies seemed to be predestined for conglomerate business portfolios. By means of pressure imposed by the shareholder (i.e. the state), these companies were often

[216] Also called unsystematic risk
[217] Brealey, R. and Myers, S. and Allen, F. (2007) "Principles of Corporate Finance", pp. 174-180, *9th Edition, Mcgraw-Hill Publishing Company*
[218] Cyriac, J. et al. (2012): "Testing the limits of diversification", *McKinsey & Company Article*
[219] Jensen, M. (1987): "The Free Cash Flow Theory of Takeovers: A Financial Perspective on Mergers and Acquisitions and the Economy",", "The Merger Boom", Proceedings of a Conference by the Federal Reserve Bank of Boston, pp. 102-143
[220] Daimler Benz diversified into aerospace and defence (later Daimler Aerospace) in the late 1980s under the vision of a "unified technology company"

"pushed" to buy assets which should be restructured under the patronage of the state. The acquisition of the automobile manufacturer Rover by the state-controlled aerospace and defence company British Aerospace (BAE) in 1988 is from today's view an extreme example of state-driven "diversification". The real intention of the British government was not to let Rover be acquired by Honda, a foreign automotive firm, and British Aerospace only served as the company vehicle to fulfil this goal. [221]

In contrast to many negative examples, there are also very successful companies which have a tendency of becoming conglomerates. Take Google or Apple, two of the highest valued firms in the world: According to a broad definition, they also encompass typical aspects of a conglomerate, in that their products range from online search to self-steering cars.[222] Similarly, Apple's products range from digital music to smartphones. But there are obvious differences between Google and Apple and the previous examples of industrial conglomerates. Despite the wide product range, there are general similarities between their customer base and the incorporated technology which is used. This difference between historic examples of inefficient conglomerates and obviously successful conglomerates encourages me again to test the relatedness of two businesses in an M&A transaction (see chapter 3.1.2). A recent study supports the hypothesis that related M&A deals show a positive performance compared to unrelated deals which are value destructive.[223]

4.2.3. Synergies through M&A transactions

The expression of synergies comes from the Greek word *synergia*, which can be translated as "to work together".[224] In chemistry it describes the effect when two substances are mixed together and the resulting product is larger than the sum of its ingredients (like flavour and water). The economist Ansoff bridged the concept of synergies to the corporate world in his book "Corporate Strategy" in 1965. He described the effect of synergies as "[…] the combined return on investment of the firm is higher than the return which would result if each division (or strategic business unit) operated without taking advantage of sharing and complementarities".[225] Synergies are the most often used explanation by CEOs as a motive

[221] Brady, C. (2005): "English patient unsuitable case for treatment", *The Guardian Business section Online Edition*
[222] Wakabayshi, D. (2016): "Google Parent Spins Off Self-Driving Car Project", *The New York Times, December 14th, 2016, p. B3*
[223] Bierregaard, P. and Nielsen, B. (2010): "An Analysis of Mergers and Acquisitions during the Recent Merger Wave in Scandinavia", *Department of International Economics and Management, p. 61*
[224] See the definition in the Oxford dictionary: https://en.oxforddictionaries.com/definition/synergia
[225] Ansoff, I. (1965): "Corporate Strategy", *p. 75, McGraw-Hill Inc.*

for an M&A transactions and related value-creation. Sometimes synergies are referred to as the primary and most convincing goal of M&A[226]: synergies increase the value of the combined entity, and can thus justify an acquisition price premium on top of the fair market value. The occurrence of synergies is a field for debate among many management and researchers, as it is argued that a lot of emphasis is placed on positive synergies while the occurrence of dis-synergies is mostly neglected. Negative synergies can occur in the form of transaction and integration costs[227], and are generally more visible; in other words, "it's very hard to capture the positive synergies, while the negative synergies will come automatically."[228]

There are two main types of synergies: operational and financial synergies. This dissertation is focused on strategic management questions. For this reason financial synergies are not covered in depth, as they are either firm-specific financial windfall profits like tax benefits or derive from pure financial engineering. This dissertation will focus on operational synergies, which include cost and revenue synergies. Revenue synergies have a surplus effect on the sales volume, while cost synergies over-proportionally reduce the combined cost base.

4.2.3.1. Revenue synergies

Revenue synergies, also called sales synergies, describe additional sales that originate from the M&A transaction. The primary sources of revenue synergies is the increase of sales with new or existing customers and the realization of price increases.[229]

In the context of M&A, cross-selling describes the additional sale of newly integrated products to the existing customer base. While the product or service offering expands, these new products can be marketed by the existing sales force. Product bundling is also an effective part of cross selling. Instead of just selling one single product or service, companies can offer a complementary set or a combination of products. In the context of the defence industry, this could include the sale of a technology, the relevant training software, and

[226] Damodaran, A (2005): "The value of synergy", *p. 3, Stern School of Business*
[227] Legal fees, advisor costs, financing costs, advisor costs, redundancy costs, and opportunity costs for management
[228] Vogel, D. (2002): "M & A Ideal und Wirklichkeit", *p. 35, Gabler Verlag*
[229] Capasso and Meglio (2007): "The evolving role of mergers and acquisitions in competitive strategy research" pp. 6-15, *University of Sannio - Department of Economic and Social Systems Analysis; European Corporate Governance Institute (ECGI)* and Zollo, M. and Meier, D. (2008): "What Is M&A Performance?", *Academy of Management Perspectives*

consumables such as ammunition. Bundling has a similar effect as cross selling, and results in higher revenues with the same client.[230]

New customer acquisition can be achieved through the acquisition of a company with an efficient sales force and distribution channels. Through these new channels, the existing product can be distributed to previously untapped customer groups, mainly new national governments. The acquisition of a company which brings in new sales channels is an often chosen way to realize revenue synergies. It must also be stated that this strategy is much easier to implement by consumer product companies than by industrial companies. Defence companies traditionally have to enter a new market with the help of a local company, where there is the option is to either cooperate in a joint venture or to acquire the local defence company. The "national market access" through M&A is a valid motive for M&A in the defence industry.

The rationale of pricing power is similar to the monopoly theory. Once a company has gained a dominant market position, it has the opportunity to increase prices due to lower competitive pressure. The defence industry in a sense is almost predestined for oligopolistic or even monopolistic market structures; therefore, pricing power is a very likely motive for many M&A transactions. The relatedness of products and geographical proximity are also important factors to realize pricing power.

4.2.3.2. Cost synergies

Cost synergies are the core argument of M&A related cost savings. The most relevant forms of cost synergies are economies of scale, economies of scope and economies of experience.[231]

Economies of scale describe the relationship of costs in accordance with production volume - the higher the combined production, the lower the resulting total costs per unit. This effect is predominantly achieved by the regression of fixed costs. Fixed costs remain constant compared to the general business volume increases.

Governance functions or shared service costs do not increase at the same rate as sales increase when two firms merge. An example is the headcount of a two similar sourcing departments

[230] Starr, R. et. Al. (2009): "Creating value through integrated products and services in aerospace and defense", *Report published by Booz & Company*
[231] Zollo, M. and Meier, D. (2008): "What Is M&A Performance?", *p. 71, Academy of Management Perspectives*

which are integrated after a merger; when the sourcing volume of similar products doubles, the headcount of the sourcing department does not need to increase substantially. Additionally, the prices of sourced items will likely drop per unit if the sourcing volume increases.

A similar effect can be observed in relation to IT systems and general R&D cost. If the results of the research can be used for a larger production volume, the costs per unit decrease accordingly.[232] According to my experience as a Project Leader for several Post Merger Integration (PMI) projects, economies of scale are the most fruitful and realistically achievable source of cost synergies. But these synergies also have to be captured actively, and often involve additional costs when they are captured. These include redundancy and integration costs at the beginning of an integration.

Economies of scale are closely interlinked with the concept of the experience curve, which was developed by The Boston Consulting Group (BCG) in the 1960s and further refined thereafter. According to studies made by Bruce Henderson (1968), the unit costs of production decrease with each doubling of cumulative production output. The elasticity of the experience curve is related to the specific production process; it differs by industry and ranges roughly from 10-25%. The effects of the experience curve have a rather long-term effect. M&A transactions in the same industry can spur these experience effects due to higher production volumes. Despite the practical relevance of this well-researched phenomenon, the effects of the experience curve are not as easily quantifiable as economies of scale.[233]

4.2.3.3. Synergies of scope

Synergies from economies of scope occur when different business lines share some common assets or services. The effects mostly result as a consequence of production bundling for different lines of business or products. Synergies from economies of scope are different to pure fixed-cost digression synergies, and often involve a re-thinking of product combinations and production techniques and a network effect.

The automotive industry has been at the forefront of realizing synergies of scope, especially in instances when different types of cars can share a common platform. This leads to a lower

[232] Henderson, B.D. (1984): "The Logic of Business Strategy", *Ballinger Publishing*
[233] The Boston Consulting Group (1973): "The Experience Curve Reviewed", *BCG Publication N° 173*

production and R&D cost base. The defence industry can also benefit from economies of scope within the same line of business such as aeronautics or military vehicles. Technical knowledge about electronics, sensors and software can be shared across very different defence platforms and the integration of a former supplier can also reduce coordination cost by eliminating interfaces.[234]

Taking into account the cost structure of the defence industry, it is apparent that synergies can have a major economic impact. The practical relevance is also underlined by several defence industry studies in this field: "The high fixed R&D costs and the steep learning curves, with costs falling sharply with each further unit produced, mean that major weapons producers can gain economies of scale […]."[235] The defence industry is in fact predestined for economies of scale. Further efficiencies can be realized through the utilization of idle capacities and gains related to the experience curve.[236]

4.3. Financial M&A motives

All M&A transactions should be pursued with the unilaterally valid motive to create sustainable value for the owners of the firm. The opportunity for value creation differs for financially driven investors versus strategic investors. The most striking differences are the type of firm and the relation they have to the target company.

Financial investors like Private Equity (PE) firms, mutual funds, or so-called active investors act like banks. The target company's business and the market it operates in are not of primary importance for the investor. The main focus lies in the short to mid-term value increase of the invested capital. The gains of financially motivated deals are often realized in a shorter time frame than in the case of strategic transactions. Especially Private Equity firms follow a buy and sell strategy. In order to repay funds, the average holding period lies between 2-5 years.

Strategic investors are in most cases familiar with the industry or even a direct competitor of the acquisition target. Financial investors have often no operational business in the industry that they invest in. Unlike strategic investors, financial investors do not seek to integrate the

[234] Teece, D. (1980): "Economies of Scope and The Scope of the Enterprise", *Journal of Economic Behavior and Organization 1 (1980) , pp. 223-247*
[235] *Dunne, P. (2015): "*European defence industry - what future?", *Eurofund, European Monitoring Centre on Change*
[236] Grueber, M. (2012): "Industrial R&D—Aerospace/Defense/Security", *R&D Magazine Online Edition*

purchased business into the existing operations, but instead keep it as a stand-alone unit[237]; the value creation can thus not come from operational synergies.

The most common financial M&A motives are undervalued firms, under-managed firms, financial leverage, and tax savings. These motives will be briefly[238] presented and discussed in the following section.

4.3.1. Undervalued firms

The motive of acquiring an undervalued firms is based on the assumption of a mispricing by the (financial) market, the ability of a buyer to realize higher synergies than competing bidders, or the existence of illiquid markets.

According to the classical economic theory (the academic grounding of this dissertation) a superior price evaluation can only be justified by advantages through private information. Superior information can either be private information or a better understanding and interpretation of the market environment. During my time as a Project Leader at BCG, we advised a client who had legally obtained information about a likely change in legislation within the transportation sector. Based on this information, the target company's value became much higher when the legislation was put into practice, and as a consequence revenues of the company soared.

The acquisition of an undervalued firm is more likely to happen in illiquid and in-transparent markets. This especially holds true for non-listed firms. Even if the owner is publicly trying to sell his company, there might not always be the suitable buyer available, or the market for corporate control can be illiquid. During the financial crisis and triggered credit crunch, illiquidity was a regular phenomenon. Although attractive acquisition targets were available, the market was not liquid and only very few M&A transactions were realized. In such an environment, it is more likely that undervalued firm is acquired.[239]

A good proxy for the M&A motive of "valuation differences" is the activity of Private Equity investors. They are driven by purely financial motives and do not have strategic implications for an acquisition. PE investors have also a set of measures in their value-creation toolbox that

[237] Serial acquisition or add-on acquisitions are an exception from this rule.
[238] The discussion is rather short as this dissertation focuses on the evaluation of strategic M&A motives.
[239] Warren Buffet's rescue acquisition of the Bank of America serves as practical example. See: Melloy, J. and Moyer, L. (2017): "Warren Buffett just made a quick $12 billion on a clever Bank of America investment", *CNBC Online Edition*

"corporate buyers" (i.e. industrial firms) often do not like to pull; these include heavy restructurings, instant change of management and achieving high leverage through hefty debt financing.

4.3.2. Under-managed firms

Poorly managed firms are said to perform much worse than they actually could. The change of corporate control might allow buyers to achieve synergies by starting a corporate restructuring program. A new management team, an adjusted strategy, and lower resistance during a period of transition are typical factors that free (hidden) values.[240] Active investors try to improve the value of portfolio companies by bringing in experts and consultants. They are also likely to implement a harsh cost and cash flow regime; this is why the financial industry often compares these actions to "squeezing the lemon".[241]

Companies or divisions that are not the focus of the owner are predestined for being poorly managed as well. They are therefore called "corporate orphans"[242]. In this case the change in management means to realize the value of effective control and increased focus.[243]

4.3.3. Financial leverage

A company's financial structure is a further source of value creation potential during an M&A transaction by exchanging "expensive" equity through "cheaper" debt financing. If a company is primarily financed through equity, the increase of the debt portion automatically leads to an increase in the return on equity (ROE). The so-called leverage effect almost "automatically" lifts the return on the invested equity. The portion of debt can be increased up to the point where the marginal cost of debt is equal to the cost of equity.[244]

There are doubts that pure financial engineering brings the expected value creation. Investors react to the new structure and adjust their return expectations accordingly. In a highly recognized study, Modgliani & Miller (1958) have found that the capital structure actually has

[240] Jensen, M. (1987): "The Free Cash Flow Theory of Takeovers: A Financial Perspective on Mergers and Acquisitions and the Economy", Harvard Business School, *in "The Merger Boom", Proceedings of a Conference sponsored by Federal Reserve Bank of Boston, pp. 102-143, October 1987*
[241] Gadiesh, O. (2002): "The leadership testing ground", Bain Insights, Journal of Business Strategy, pp. 3-4
[242] Rossa, J. (2009): "A Classic Corporate Orphan", *The Wall Street Journal Online Edition*
[243] Aiken, C. and Keller, S. (2007): "The CEO's role in leading transformation", *McKinsey Article Online Edition*
[244] Harris, M. and Raviv, A. (1988): "Corporate control contests and capital structure", Journal of Financial Economics, Volume 20, January–March 1988, Pages 55-86

no impact on the company's valuation,[245] and the investors' target rate of return increases as the leverage becomes higher. This effect is a reaction of investors to an increased risk of bankruptcy resulting from hefty debt.

The capital structure is obviously of minor importance if it does not have an impact on the operational performance, nor does the change in capital structure imply a suitable motive for a merger. The capital structure and financing has to be considered first and foremost when planning a merger. This does not qualify as a suitable motive on its own and as such will not be further researched in this dissertation.

4.3.4. Tax savings

In academic M&A literature, taxation is said to be a further valid motive for M&A transactions. There are various ways through which taxes can be used as a benefit. While taxation still varies strongly by jurisdiction, generally unused tax reserves are exploited by lifting tax benefits from previous losses. Another tax saving opportunity derives from goodwill amortisation which was allocated as a part of the acquisition premium. Lately popular with US firms are benefits from the change of company location in a new jurisdiction with a more favourable tax legislation.

A wisely chosen transaction structure can help a company benefit from lower taxes, and thus to reduce the acquisition price. The tax motive is often regarded as a positive "side-effect" of an M&A transaction, and not a guiding motive. The theory of tax benefits as the predominant motive for an M&A transaction is clearly overrated on a longer perspective.

During recent years, US firms have increasingly engaged in cross-border M&A in order to reduce their tax bill. In 2014, more than half of the cross-border US deals were purported to occur or be triggered by the motivation of tax savings.[246] It is very likely that this tax benefit will not remain for very long in the future. The current discussion of US authorities shows that the taxation laws are likely to be changed soon, making inversion tax deals less attractive.[247] Furthermore, as described in the case of the US authorities, tax motives are

[245]Modigliani, F. and Miller, M. (1958): "The Cost of Capital, Corporation Finance and the Theory of Investment", *The American Economic Review, Vol. 48, No. 3 (Jun., 1958), pp. 261-297*
[246] Raice, S. (2014): "How Tax Inversions Became the Hottest Trend in M&A", *The Wall Street Journal Online Edition*
[247] McKinnon, J. and Paletta, D. (2014): "Obama Administration Issues New Rules to Combat Tax Inversions", *The Wall Street Journal Online Edition*

usually limited in time due to new regulations. Because tax savings and their relation to M&A are outside the scope of this thesis, this particular motivation will not be described in further detail.

4.4. Personal motives for M&A transactions

As described in section 3.2.3, the agency theory is relevant in theory and practice for the identification of M&A motives. From a theoretical point of view, it stands in stark contrast to the neo-classical school of thought. Some of the most debated and well-researched patterns of the agency problems have a direct influence on the manager's decision to engage in M&A. The next section takes a closer look at the motives of CEO compensation, empire building, the independence theory, and the hubris hypothesis.

4.4.1. Compensation and benefits

Managers strive to increase their personal utility which mainly comprises their monetary remuneration. The agency theory identifies conflicts of interest with regards to the managerial compensation and the value creation for investors.

A manager's compensation is not always aligned to the profits of the investors, and this issue is central to the principal-agent theory. Applied to the case of M&A, it is important to understand whether the manager benefits in undertaking an M&A transaction, even in cases where the shareholders do not profit from the transaction. This misalignment of interest stands in contrast to the tenets of neo-classical economic theory. It is assumed that a manager who benefits from a merger is likely to undertake a transaction even if the utility of the shareholders is not maximized. When managers are not controlled effectively, so-called "management entrenchment" is likely to happen. As Weisbach (1988) suggests, "managerial entrenchment" occurs when managers gain so much power that they are able to use the firm to further their own interests rather than the interests of shareholders."[248] The involvement of a firm into M&A transactions to increase a manager's personal utility falls under the category of entrenchment.

[248] Weisbach, M. (1988): "Outside directors and CEO turnover", *Journal of Financial Economics, Volume 20, January–March 1988, pp. 431-460*

The study of Grinstein and Hribar (2004) on CEO compensation[249] analysed 327 large[250] M&A deals between 1993 and 1999 in the United States. In 39% of the examined cases, the CEO of the acquiring firm received compensation in order to complete the deal. The reward was in most cases a significant cash bonus of $2.2 million on average. Two-thirds of CEOs received the cash bonus without any direct relation to the value increase of the firm[251]; in fact, it appears that the opposite seems to be the case. In other words, the firms which paid out the highest bonuses to their CEOs experienced the strongest loss in company value (-3.8% vs. -1.3% on average) in the two-days subsequent to the announcement of the deal. These observations are confirmed by Bliss and Rosen (2001). According to Rosen, a series of acquisitions has a much stronger impact on the pay-rise of managers than a single transaction[252]. Their study reveals that CEOs' compensation in the banking industry increases even if the listed market value of the firm declines.[253] This clearly contradicts the principles of effective corporate governance and alignment of interests.

4.4.2. Empire building

In the corporate world, the "size of the empire" is defined by the number of employees, the sales level, or the stock market position of the firm. The term "empire building" describes the phenomenon when a manager is eager to increase the size of the firm rather than its value.[254]

The value of a firm should be attributed to the shareholders, either through dividends or the increase of the share price. The manager may, however, increase his personal utility by investing free cash flows in new businesses and increasing the size of the firm rather than paying out funds to shareholders in the form of dividends. The manager's utility

[249] Grinstein, J. and Hribar, P. (2004): "CEO compensation and incentives: Evidence from M&A bonuses" *Journal of Financial Economics, Volume 73, Issue 1, July 2004, pp. 119-143*
[250] The transaction value had to be larger than $1 billion
[251] Of the 50% of firms who give an explanation for the M&A bonus, 66% mention reasons for the bonus other than "value increase of the firm" (i.e. "increasing firm size and revenues" and "effort and skills by the CEO") are the mostly mentioned explanations. See: Grinstein, J and Hribar, P. (2004): "CEO compensation and incentives: Evidence from M&A bonuses" *Journal of Financial Economics, Volume 73, Issue 1, July 2004, p. 123*
[252] Even if the *"acquired revenue"* of the single transaction is higher or equal to a string of acquisitions.
[253] Bliss, R. and Rosen, R. (2001): "CEO compensation and bank mergers", *Journal of Financial Economics, 2001, vol. 61, issue 1, pp. 107-138*
[254] Gaughan, P. (2004): "M&A lesson: Beware of empire builders", *Journal of Corporate Accounting & Finance, Volume 15, Issue 2, January/February 2004, pp. 21–23*

maximization from building an "empire" derives from higher compensation, more prestige, and a higher degree of job security along with the growth in firm size. [255]

Besides the remuneration of the manager in the event of an M&A transaction (see also the previous paragraph, chapter 4.4.1), there is also a psychological aspect to the empire-building theory. Managers feel that they are acting bravely in the role of a consolidator. Buying rival companies underlines their general success; especially in markets with consolidation pressure. The existing market players need to decide at a certain point of time whether they will act as a consolidator or as a potential acquisition target. If the company is taken over by a rival, it might be perceived as "losing" and not being important anymore.[256]

Proxies help to identify the trend of "empire building" by M&A transactions. It is argued that a firm with high cash flows prior to an acquisition is more likely to invest these excess funds according to the personal interests of the CEO. The firm is more likely to overpay and thus to destroy value of M&A transactions. The analysis of nearly 600 M&A deals in Scandinavia showed in the existence of empire building in an impressive manner: the pre-deal cash flow of companies that created under-performing deals were significantly higher than of those with value creating deals.[257] These results are supported by the findings of a negative correlation between overpaying and financial leverage. A highly leveraged firm is dependent on the financial debt markets. This dependence has a disciplinary effect on CEOs, encouraging them not to engage in empire building M&A deals but rather to concentrate on sustainable value creation.[258]

4.4.3. Independence preference

The independence hypothesis describes the preference of managers to keep their firm independent instead of being acquired by another company out of a personal motivation. Striving for independence is based on the fear of job level gradation and the risk of job loss.

[255] There is a direct link between the remuneration of managers and company size., see Murphy, K. (1985): "Corporate performance and managerial remuneration: an empirical analysis", *Journal of Accounting and Economics, Volume 7, Issues 1–3, April 1985, Pages 11-42*

[256] Teerikangas, S. and Faulkner, D. (2012): "The Handbook of Mergers and Acquisitions", *Oxford University Press*

[257] Bierregaard, P. and Nielsen, B. (2010): "An Analysis of Mergers and Acquisitions during the Recent Merger Wave in Scandinavia", *Department of International Economics and Management, p. 60*

[258] de Bodt, E. and Roll, R. and Cousin, J. (2014): "The Hubris Hypothesis: Empirical Evidence", *p. 24, SSRN Electronic Journal*

The likelihood that a top manager loses his job in the aftermath of a takeover is four times more likely than under normal circumstances.[259]

Furthermore, an ex-CEO's professional standing and reputation is likely to decrease after a takeover. It is very difficult to measure such a subjective emotions, though there is at least a high likelihood that the manager feels degraded and thus fears the loss of reputation and interest in their person. To avoid this loss, managers tend to oppose an M&A deal when their firm is the acquisition target. From the point of view of the company's owners, this behaviour might appear irrational as it harms the potential for creating value for shareholders, who would otherwise benefit from a potential acquisition premium.

The managers' actions are rational from a personal point of view but may impose an agency conflict with the shareholders.

4.4.4. The hubris theory

The concept of the hubris theory has been developed by Richard Roll (1986) and describes the exaggerated self-appreciation by managers of their own capabilities. Managerial hubris can be the result of a CEO's previously strong performance in business or praise by the media which often leads to an exaggerated feeling of self-importance. Managerial hubris misleads the self-perception of CEOs and makes them believe that they are personally responsible for the fundamental achievements. According to Roll, managers may then believe that under their guidance the acquired business will flourish and is therefore worth more than the current evaluation at the stock market or the evaluation of a competing bidder suggests. This false perception is often combined with inexperience in the acquired field of business.[260] Hubris causes managers to overestimate a firm's value and thus leads to overbidding.

Similarly, the acquisition premium is described as the "winner's curse".[261] According to Oren and Williams (1975), the "winner" of a competitive M&A bidding process overpays by default; that is, in order to win the competitive bidding process, the winner of an auction holds

[259] Martin, K. J. and McConnel, J. J. (1991): "Performance, Corporate Takeovers, and Management Turnover", *Journal of Finance, vol. 46, pp. 671-687*: It is four times more like for a CEO to be replaced in the year subsequent to a takeover

[260] Hayward, M. and Hambrick, D. (1997): "Explaining the Premiums Paid for Large Acquisitions: Evidence of CEO Hubris", *Administrative Science Quarterly Vol. 42, No. 1 (Mar., 1997), pp. 103-127*

[261] Varaiya, N. (1988): "The 'winner's curse' hypothesis and corporate takeovers." *Managerial and Decision Economics.*

value assumptions that are necessarily optimistic, and is therefore willing to bid more than others.[262]

But can the hubris theory be tested and proven in an empirical scenario? There are few studies about this phenomenon, and the results are at best described as "mixed".[263]Bodt, Cousin and Roll (2014) tested the hypothesis of overbidding empirically in 2014; on the basis of detailed statistical research. They drew the conclusion that there is clear support for the existence of overbidding in competitive bidding contests.[264] Out of nearly 1,000 acquisition attempts from 1994 to 2008, the average 4-week bid premium was 39%. In contrast to the positive performance for target shareholders, the acquirers' CAR was significantly negative at -2.8% for the three day period around the bid. This is a strong indication of the existence of the "winner's curse", at least on a short term basis. If the results of overbidding can be identified, they may well be grounded in management hubris. However it must be stated that it is difficult to draw a clear conclusion on the cause-effect relationship in this regard.

4.5. Defence industry specific M&A motives

Several M&A motives are specifically and potentially only relevant to the defence industry. These include the minimum-size effect, international market entry, and national consolidation pressure. These three motives are elaborated in the following sections in more detail.

4.5.1. The minimum-size effect

The relationship between company size and economic success has been debated greatly among academics with no clear result. Sheer company size is only a weak indicator of profitability,[265] while in specific market or industry environments, large and small firms may have advantages.

Cummins and Weiss (2015) found out that the success of a firm positively correlates with company size in the financial services and insurance industry. With increased firm size after a

[262] Oren, M and Williams A. C. (1975): "On Competitive Bidding", *Operations Research, Vol. 23, No. 6 (Nov. - Dec., 1975), pp. 1072-1079*
[263] No clear conclusion can be drawn from the studies published by Moeller et al., or Ecko and Thorburn. Moeller cannot find clear evidence for overbidding but in contrast Eckbo does so.
[264] Roll, R. (1986): "The Hubris Hypothesis of Corporate Takeovers", *Journal of Business, pp. 19-24*
[265] Hall, M. and Weiss, L. (1967): "Firm Size and Profitability", *The Review of Economics and Statistics, Vol. 49, No. 3 (Aug., 1967), pp. 319-331*

merger, the ratings of the firms improved; this in turn led to lower re-financing costs. These risk-reduction effects have been positively acknowledged by investors.[266]

A large company size can be an advantage in situations where economies of scale is a major success factor; this is predominately the case for standardized manufacturing companies. Small companies are said to be more flexible as they can react quicker to market changes. In most industries, company size is neither an asset nor a disadvantage by itself. This is different for the defence industry, where company size does matter.

Defence procurement programmes have constantly grown in size and complexity over the last few decades. Large defence project contracts are often worth billions and have a project duration for 20 years or more.[267] Each programme plays a significant role in a nation's long-term defence strategy. It is therefore understandable that the customer diligently chooses the industrial partner firm that it fully trusts and that can rely on.

Avoiding operational and financial risks is essential to end-customers and main contractors alike. This gives a competitive advantage to large defence firms over smaller rivals. Large defence firms are more prepared to handle and deliver large projects, and also appear to be more financially viable as they can better avoid the risk of default. The defence firms also seek to reduce operational risks by increasing control over their value chain.[268] Most large defence companies have started to follow this strategy with suitable M&A transactions.

It can be summarized that external growth through related M&A transactions is a positive measure to achieve a critical size in order to qualify for large contracts in the defence industry.

4.5.2. International market entry

Sales growth is one of the major strategic goals of corporate managers.[269] The positive implication of company growth on the value of a company has brought external growth to the

[266] Cummins, D. et al. (2004): "Consolidation in the European Insurance Industry: Do Mergers and Acquisitions Create Value for Shareholders?", *The Wharton Financial Institutions Center, p. 9*
[267] The Eurofighter contract has a combined contract value of more than €10 billion
[268] Thisdall, D. (2014): "Forget orders - M&A is the measure of a robust industry", *Flight International*
[269] Profitable sales growth is the major source of a company's value creation, see: The Boston Consulting Group: "The Importance of Value-Creating Growth", *BCG Online Publication*
In mature markets, large firms even grow faster than the "average" firm, see: Samuels, J.M. (1965): "Size and the Growth of Firms", *The Review of Economic Studies, Vol. 32, No. 2 (Apr., 1965), pp. 105-112*

agendas of top managers.[270] The defence industry is no exception to this rule. The search for growth opportunities is very high,[271] and 30-50% of Aerospace and Defence industry managers cite "international expansion" as a primary strategic goal.[272] For European and (to a lesser extent) American companies, international sales are necessary to balance the under-utilization of production capabilities due to shrinking demand from the home market.[273]

Many rapidly developing countries in addition to "traditional" export countries procure defence technology and services from US and European defence firms. The most important export markets are Saudia Arabia and India. Further countries in the Gulf region, Asia and South America are also importing defence industry's products and services.[274]

Pushed by slow growth or shrinking local markets, all European and American defence companies are very active in global sales efforts. The result is harsh competition for the few "big tickets"[275] that arise. For the multi-billion dollar contract to renew the Indian jet fighter fleet, six companies from Europe, the US and Russia competed against each other for almost a decade. Finally, the French Rafale won the competition and was awarded the €8 billion contract, which ensures the programme's survival for the next 20 years.[276]

The defence industry's export procedures are significantly different from civil industries. The export options are limited by political restrictions of the home country and a national sourcing preference of the customer country, too.

Most large defence markets have a national sourcing preference; strict policies that prevent imports from other countries is largely based upon the national security. The acquisition of a local defence firm is therefore regarded as the only viable option to enter a new national market. As stated earlier in this dissertation, market entry through M&A is critically assessed

[270] Gulati, R. (2004): "How CEOs Manage Growth Agendas", *Harvard Business Review, July–August 2004 Issue*
[271] Steger, U. and Kummer, C. (2007): "Why Merger and Acquisition (M&A): Waves Reoccur - The Vicious Circle from Pressure to Failure", *pp. 4-5, Global Corporate Governance Research Initiative IMD International*
[272] KPMG (2015): "Global Aerospace and Defense Outlook"
[273] Lifshitz, Y. (2003): "The Economics of Producing Defense: Illustrated by the Israeli Case", *p. 277, Springer Science and Business Media*
[274] Blanchfield, K. and Wezeman, P. and Wezeman, S. (2017): "The state of major arms transfers in 8 graphics", *The 20 largest importers of major arms 2012–16. Data and graphic: SIPRI, SIPRI Online Edition*
[275] There are only few large and long-term programmes. In contrast to markets with many small customers, these defence customers are "must-wins" to secure the survival of an entire programme.
[276] The RfPs were issued in 2006, 9 years before the (presumably) final contract award to Dassault's Rafale, for details see: Sabah, K. (2017): "Timeline: The turbulent history of the Rafale deal", *ThePrint Online Edition*

by local governments and is regularly opposed.[277] The US has often signalled to European firms that they would oppose potential transactions, and the same holds true for cross-border acquisitions within European borders.[278] This limitation makes the "multiplication of home market" strategy difficult but even more attractive. Establishing a new national footprint also creates competition for contracts that are limited to local defence firms.

The prospect of a European defence firm acquiring a US company is more attractive than that of a US company acquiring a European contractor. The reason lies in the large amount of defence spending administered by the US federal government. The rationale of US firms to acquire a European rival is often based upon their technological ability. In spite of the difficulties, the empirical results support the practical importance of cross border M&A transactions as a "door-opener" into new local markets. Interestingly, there are only a few firms from Europe such as British BAE Systems that have successfully entered the US market with a string of acquisitions.

4.5.3. National consolidation pressure

The close ties between defence contractors and their national customer are based on a strong dependency on the national contracts. Lockheed Martin, the largest defence company in the world, realizes 75% of its sales from US authorities; other large US contractors reach a ratio of nearly 90%.[279] European companies are more export-driven and often more diversified into civil programmes; however, a strong dependency on the home market remains. National governments have a very high preference for national procurement because of security concerns, economic and political considerations. Taxpayer money should be paid out to local companies if possible, and pressure from industry groups and labour unions support this doctrine. The result is a monopsonist-monopoly market structure, in which one large buyer and one or a few major suppliers depend upon each other. Such an industry configuration makes cooperation difficult, though necessary, for both parties.[280]

[277] Goldstein, K. (2011): "Reviewing Cross-Border Mergers and Acquisitions for Competition and National Security: A Comparative Look at How the United States, Europe, and China Separate Security Concerns from Competition Concerns in Reviewing Acquisitions by Foreign Entities", *Tsinghua China Law Review, Vol. 3, p. 215, 2011*

[278] Leidel, S. (2003): "Deutsche Rüstungsindustrie soll deutsch bleiben", *Bundesverband der Deutschen Industrie*

[279] Northrop Grumman had 87% of its direct sales with the US army and further 10% to foreign countries where the US authorities acted as an intermediary. See: Northrop Grumman Annual Report 2013

[280] Levine, P. and Smith, R. (2014): "The Arms Trade, Security and Conflict", *Routledge*

With the fall of the Soviet Union and political appeasement, a reduction of the military threat scenario followed. Some of the results were strong budget cuts and a wave of privatizations with the purpose to increase the efficiencies of the defence industry.[281] National governments, which often formerly owned their major defence contractors, started to actively foster consolidation efforts of the industry. The US followed a stringent and well-orchestrated industry consolidation plan by reducing the number of major contractors from 15 to only 5.[282] Consolidation efforts have also been undertaken in Europe, though not as stringently. The consolidation is not only a strategic move made by independent companies, but is also a way that national governments have used their influence to support or oppose national M&A deals.

The reduction of competition and benefits from monopolistic structures are associated with national consolidation: a monopoly is the logical response to the monopsonistic structure on the demand side. With a preference for large suppliers, national governments are actively looking for one or a few national consolidators, and most government even accept inefficiencies as the "premium" they have to pay for an independent defence industry.[283] Many defence companies have also realized that they have much better negotiation power towards local governments when they bundle their forces and consolidate.

The industry consolidation is per-se beneficial for governments as well. It is, however, difficult for governments to determine the efficient company size and the best level of industry consolidation. Large companies promise more efficient cost structures, but have the down-side of limited competition.[284] Furthermore, the national consolidators can only realize M&A deals in consent with local governments. Even more directly, the local government actively "chooses" a consolidator or a consolidation concept.[285]

The critics of regard national consolidation deals as a major risk for companies and their shareholders. Particularly, they argue that these deals foster even stronger dependency on the

[281] Farrand, R. (1994): "Defence Industry Privatization and national security requirements: The United States Experience", NATO Economics Colloquium
[282] The Economist (1997): "Global Defence Industry - Land of giants - Why America is out in front", The Economist Online Edition
[283] The Economist (2013): "Europe's defence industry - A hard pounding, this", *Business section, 2nd March 2013*
[284] A report of the US Congress stated in 1998 that the consolidation was too intense and further consolidation should be prevented. See: GAO (1998): "Consolidation and Options for Preserving Competition*", GAO, report to Congressional Committees*
[285] Howe, J. and Jack, S. (2015): "Defense and Government Contractor M&A—Special Concerns for Private Equity Buyers", *The Journal of Private Equity Fall 2015, 18 (4), pp. 40-45*

local market, and that the only common denominator of the combined firms is the nationality of the firm. This strategic misfit often leads to a "combination of weak firms".

It is my hypothesis that positive value effects occur given that there is a strong home market with a stable defence spending and a high strategic fit between acquirer and target. From a financial perspective, the take-over of a financially healthy company (rather than a restructuring case) is recommended.

4.6. Formulation of M&A hypotheses

The previous chapter presented and discussed the underlying rationale for undertaking M&A transactions. The various lines of reasoning have been evaluated for their fit in the context of the defence industry. Based upon these findings, concrete hypotheses are formulated in this chapter for empirical testing.

4.6.1. Acquisitive growth

The growth hypothesis shares the same reasoning as the monopoly theory. The theories are based on the assumption that firms can significantly improve their business conditions through a growth in market share. It is believed that with a growth in market share, the negotiation power shifts from the customer to the firm; in other words, the former price taker becomes a price maker. The result of such a mechanism is higher profits through higher prices. This surplus profit is also called the "monopoly rent".[286] According to the monopoly theory and growth theory, acquisitions in the same market generally create value.

The theory is very much driven by a mechanistic view of the firm and its environment. The major critique of the growth theory is the assumption that all firms are "price takers" that only receive pricing power through market domination. Especially in industries with heterogeneous and differentiated products, such as in the defence industry, this assumption does not hold true. The assumption of gaining negotiation power through acquisitions seems overly optimistic, too. At which point can a firm really benefit from its size as a result of increased negotiation leverage? That would only work in a highly concentrated market environment.

[286] Trautwein, F. (1990): "Merger Motives and Merger Prescriptions", *Strategic Management Journal, Vol. 11, No. 4 (May - Jun., 1990), pp. 283-295*

This criticism is substantiated by the empirical results of M&A analysis. A stronger market concentration through mergers does not increase the value of a firm per se. This conclusion is strongly supported by Jensen (1987).[287] Eckbo[288] (2010) also confirms that M&A transactions which are intended to improve a firm's market position do not lead to superior results. The studies have revealed that the combination of firms from the same industry neither positively influences the firm's share price nor does it negatively influence the share price of potentially harmed rival firms.

Do the findings of Eckbo also hold true for the defence industry? On the one hand, the defence industry has in most of its niches an oligopolistic or even monopolistic structure. This lack of competition increases the likelihood of creating a dominating market position through M&A. The national acquisition strategy of the local customer further decreases competition. Following this argumentation, M&A deals could in fact create increased market power and thus shareholder gains.
On the other hand, the national state is the major customer and simultaneously the market regulator. If an M&A transaction bears the risk of creating a market-dominating monopoly, the state has various means to prevent this prior to an acquisition. Consequently, the market position and the negotiation power of the state is higher than one might anticipate.
When weighing the pros and cons, I tend to follow the findings of Eckbo and Jensen; specifically, that the monopoly hypothesis should generally be rejected. On the contrary, size does matter in the defence industry, and monopolistic or oligopolistic structures are common to several local defence niche markets. The minimum-size-effect (see details in Chapter 4.6.1.7) is also very relevant in the defence industry. For these reasons, acquisitive growth is expected to yield superior return.

Hypothesis 1: External growth through M&A transactions yield abnormal returns for acquirers.

[287] Jensen, M. (1987): "The Free Cash Flow Theory of Takeovers: A Financial Perspective on Mergers and Acquisitions and the Economy", *Conference Series*
[288] Eckbo, E. (2010): "Takeover Activity, Valuation Estimates and Merger Gains: Modern Empirical Developments", *Academic Press, p. 109*

4.6.2. Active portfolio management

One of the key efforts of strategic management initiatives is to create an effective corporate portfolio. The business portfolio should take advantage of the firm's capabilities and existing customer relationships. It should balance the need for growth and stable returns. Overall, it is fundamental that each line of business fits into the overall business concept and also earns its required cost of capital.[289]

The corporate business portfolio is not static, but rather needs regular adjustment. All businesses should fit to the core strategic direction of the firm with an optimal level of relatedness to the existing firm. It is the strategic goal to achieve competitive advantages[290] in selected business segments. Acquisitions and divestitures are effective means to shape and refine the business portfolio. Divestitures liberate resources and help a company to re-focus. While some economists regard divestitures as an indication of a failed strategy, Weston describes it as a useful instrument for building an effective and focused business portfolio.[291] Gregory (1997)[292] asserts that the launch of an M&A programme in combination with an open communication strategy serves as a signal of value creation. These arguments support the theory that serial acquisitions do create value when they follow a clearly defined acquisitive strategy.

Besides the right acquisition strategy, it is vital to integrate the acquired firm effectively. Researchers examined the question as to whether there is a correlation between integration success and a firm's experience. Based on organizational learning theories, it was predicted that there would be a positive correlation between the number of transactions and integration success[293]; In fact, the opposite is true. An extensive study of nearly 21,000 global M&A transactions has shown that serial acquirers do not perform better, but even worse, than single acquirers.[294] This finding is called the indigestion hypothesis. It claims that an organization cannot indefinitely digest consecutive acquisitions in a limited period of time, and further that integration efforts overburden the firms and lead to sub-optimal integration results. The efforts block the entire firm and avoid successfully raising synergies, and it is questionable as

[289] Carlesi, L. and Verster, B. and Wenger, F. (2007): "The new dynamics of managing the corporate portfolio", *Spring 2007 issue of* McKinsey on Finance
[290] For example specific capabilities or cost leadership
[291] Weston, J.F. (1989): "Divestures: Mistakes or Learning?", *Journal of Applied Corporate Finance, pp. 68-74*
[292] Gregory, A. (1997): "An Examination of the Long Run Performance of UK Acquiring Firms", *Journal of Business Finance & Accounting, Volume 24, Issue 7-8, September 1997, pp. 971–1002*
[293] Aktas, N. and de Bodt, E. and Roll, R. (2011): "Learning from Repetitive Acquisitions: Evidence from the Time Between Deals", *Journal of Financial Economics (JFE), Forthcoming*
[294] Kengelbach, J. et al. (2012): "An anatomy of serial acquirers, M&A learning, and the role of post-merger integration"

to whether it also holds true for the defence industry. Mergers and take-overs happen at a much lower frequency than in other industries, such as the global food or consumer goods industry.[295]

I suppose that the strategic and organizational learning benefits of serial acquirers slightly overcompensate for indigestion drawbacks.

Hypothesis 2: Expected superior value creation per deal for serial acquirers.

4.6.3. Cost synergy preference

Synergies are the most cited and communicated motive for an M&A transaction. For investors, governance and control bodies,[296] as well as the general public, synergies are understandable and quantifiable. Synergies are regarded as a rational motive for undertaking an M&A transaction. In fact, the existence of synergies is a major motive for acquiring a company and to pay a premium on top of the stand-alone market valuation.
The high relevance of synergies can be seen by the way managers communicate them. It looks as if the responsible management attempts to "justify" a transaction by announcing the realization of synergies. Synergies are mentioned by the majority of firms in their annual reports after a transaction has been realized. The publication of pre-deal synergy estimates have surged, as an analysis of US deals shows.[297] Prior studies about M&A in the banking industry by Houston, James and Ryngaert (2001) reveal a significant and positive relationship between the announcement of synergies and related value effects around the announcement.[298] Capital markets take synergy announcements into account positively, and the announcement of cost synergies is valued more positively than revenue synergies; this might be the reason why synergy announcements are almost entirely focused on cost synergies.[299] Revenue synergies are only precisely quantified in 5% of cases. The reason for announcing cost synergies more prominently is that they are easier to quantify and that the

[295]Rhodes– Kropf, M. et al. (2005): "Valuation waves and merger activity:The empirical evidence", *p. 571, Journal of Financial Economics 77 (2005) 561–603*
[296]Like the Board of Directors
[297] In 2008 30% of US bidders announced their pre-deal synergy assessment. This figure is up from 7% in 1995; see: Dutordoir, M. et al. (2010): "Synergy Disclosures in Mergers and Acquisitions", *Manchester Business School, United Kingdom*
[298] Houston, J. and James, C. and Ryngaert, M. (2001): "Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders", *Journal of Financial Economics, 2001, vol. 60, issue 2-3, pp. 285-331*
[299] Or "total synergies" without specifying the exact split between cost and revenue synergies

respective management is responsible for their realization, not an external party.[300] These are two aspects that are greatly appreciated by capital markets.

In contrast, the measures for realization of revenue synergies are less concrete, and are often not under the sole discretion of the managers. This leads to an over-estimation of revenue synergies in 70% of the cases, according to McKinsey.[301] In academic literature and publications of M&A professionals, revenue synergies are described as somewhat "vaguer" than cost synergies, in that they are more difficult to quantify and less likely to be realised. The fact that revenue synergies are not under the full discretion of the management, but instead largely depend on customer behaviour, makes a serious estimation more difficult. Revenue synergies are also closer depending on the concrete market conditions and are harder to predict. As described earlier, the entry into new markets can best be achieved by the acquisition of a local firm; this builds a further "national footprint". For the evaluation of revenue synergies, the growth in new national markets serves as a helpful proxy. The results from studies in other industries for cross-border M&A transactions are mixed. A study of acquisitions on M&A showed that cross-border deals perform better than "any other deal".[302] This result is supported by various further studies.[303]

In the defence industry, cross-border company acquisitions are a vital precondition for growth in mature and closed markets such as the United States. As the sample shows, there has been a clear tendency of EU defence firms to participate in US market growth through acquisitions. National interests make it very difficult to acquire attractive foreign defence companies, especially in the United States.[304]

Even US firms are strongly increasing their international revenue streams: the international sales volume of Boeing's defence unit has more than tripled from 7% in 2004 to 25% in 2014. In times of defence budget decreases and more difficult competition in the home market, "you go to where the money is" as Remy Nathan, Vice President for International Affairs at the Aerospace Industries Association describes.[305]

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[300] Kengelbach, J. et al. (2013) "Divide and Conquer - How Successful M&A Deals Split the Synergies", *The Boston Consulting Group and Technische Universitaet Muenchen*

[301] Christofferson, S. et al. (2004):"Where mergers go wrong", *Article McKinsey Quarterly May 2004*

[302] Danbolt, J. (2004): "Target company cross-border effects in acquisitions into the UK.", *University of Glasgow, European Financial Management 10(1), pp. 83-108*

[303] "Does Cross-border M&A Perform Better?"; "Shareholder Wealth Effects of European Domestic and Cross-border Takeover Bids"; and "Cross-border mergers and the cross-border effect: the case of the automotive supply industry"

[304] In the underlying sample, UK companies make 17 out of 21 European acquisitions in the USA.

[305] Lerman, D. (2013): "U.S. Defense Contractors Focus on Foreign Buyers", *Bloomberg Online Edition, published on 15th November 2013*

Neither cost nor revenue synergies are easy to lift. This is particularly true for the defence industry as well as with almost all manual manufacturing processes. Another limitation on value creation is the fact that synergies are almost never exclusive; instead, they are achievable for competing bidders, too.[306] This creates a situation in which synergies are shared between the buyer and the seller.

I regard revenue synergies in general (and for the defence industry specifically) as very difficult to achieve. Due to market entry limitations and harsh conditions in the case of an acquisition, the value impact is potentially low. For this reason, cost synergies are more likely to have a positive value impact.

Hypothesis 3: Superior value creation for acquirers through cost synergies than revenue synergies.

4.6.4. Relatedness of acquired business

There has been a lively discourse in management science for many years about the evaluation of diversification growth strategies versus growth in related businesses.[307] In the end, the question boils down to the evaluation of risk reduction (i.e. diversification) versus focus, efficiency and cost synergy realization (i.e. relatedness).

The diversification theory argues that the acquisition of an unrelated business to the existing business portfolio reduces the *firm specific risk*; that is, the lower the correlation between businesses, the higher is the degree of risk reduction. In an extreme case, the additional business has a negative correlation with the existing business and thus serves as a natural hedge.[308] In support of this idea, the Nobel Prize laureate Markowitz demonstrates that financial investors should diversify through the investment into a portfolio of shares, as diversification reduces the investors' risk without lowering the expected return.[309] Economic researchers have a broad consensus that diversification does reduce risk overall. However, the

[306] At least for bidders that are active in the same industry
[307] Salter, M. and Weinhold, W. (1978): "Diversification via Acquisition: Creating Value", *The Harvard Business Review, from the July 1978 Issue*
[308] An illustrative example is an imaginative firm that produces ice-cream and umbrellas. With these two lines of business the firm hedges against business risk resulting from rainy weather (with umbrellas) and sunny weather (with ice-cream).
[309] Markowitz, H. (1991): "Foundations of Portfolio Theory", *Journal of Finance, Volume 46, Issue 2, pp.469-477*

important question remains at which level the diversification should take place: at the level of financial investors or on firm level?

The short answer to this question is that the investor should be well-diversified, while the corporate portfolio of businesses should be rather focused. It has been discovered that conglomerates perform worse than competitors which are more focused.[310] The so-called "diversification discount" provides empirical proof of the fact that conglomerates trade at a discounted valuation on the stock market compared to concentrated companies.[311] Moreover, Berger and Ofek (1995) revealed the existence of the diversification discount for US companies. Diversified firms suffered from a valuation discount of 13-15% towards their peer group.[312]

This general conglomerate or diversification discount is also valid for M&A transactions. M&A studies affirm the negative value impact of unrelated M&A deals for the acquiring firm. Maquiera et al. (2015) assert positive abnormal market returns for related mergers, but fail to identify those for conglomerate mergers.[313] Additionally, a more recent study of European mergers confirms overall positive abnormal returns of M&A transactions, but warns about the negative value effect of unrelated mergers. Based on this study, Goergen and Renneboog[314] advise that "bidding firms should not further diversify by acquiring target firms that do not match the bidder's core business", as this leads to a significant deterioration of the short term value creation for investors.

Despite the fact that the economic researchers Grahan, Lemmon and Wolf (2002) accept these results, they argue that most of the valuation discount derives from the pre-deal performance discount, and because of this does not constitute a post-acquisition phenomenon.[315] The impact of diversification is different for each industry and cannot be generalised.[316] Industries with a specialist-centric industry structure (such as the micro-chip industry) bear a higher

[310] Studies include Rumelt (1974), Meeks (1977), and Palepu and Ruback (1997)
[311] Burch, T. and Nanda, V. (2003) :"Divisional diversity and the conglomerate discount: evidence from spinoffs", *Journal of Financial Economics 70 (2003), pp. 69–98*
[312] Berger, P. and Ofek, E. (1994): "Diversification's effect on firm value", *Journal of Financial Economics 37 (1995), pp. 39–65*
[313] Maquiera et al. (1998): "Wealth creation versus wealth redistributions in pure stock-for-stock mergers", *Journal of Financial Economics, Volume 48, Issue 1, pp. 3-33*
[314] Goergen, M. and Renneboog, L. (2003): "European mergers and acquisitions", *Mergers and Acquisitions, Volume 2, pp. 97–146*
[315] Graham, J. et al. (2002): "Does Corporate Diversification Destroy Value?", *The Journal of Finance, Vol. LVII, No. 2, April 2002*
[316] Santaló, J. and Becerra, M. (2004): "The effect of diversification on performance revisited: Diversification discount, premium, or both?", *IE Working Paper, Submitted for presentation at the 2005 Academy of Management Meetings in Hawaii*

diversification discount. In industries with very few specialists, there is no discount or even a diversification premium. The reason behind this may be found in the reduction of "excess risk" which might be found in small niche markets.

Taking all these arguments and findings into account, there is a high likelihood of an M&A diversification discount in the defence industry. Although the defence industry has many specialist niches, most players in the defence industry are already diversified. Transactions which lead to a further increase of unrelated business segments will lead to a loss of focus, higher coordination costs, and therefore to a value deterioration.

The general M&A literature is not clear concerning the value effects of related versus unrelated M&A deals. There is a tendency among researchers that suggest that related deals perform better.[317]

The rational is that related deals do not only use existing resources more efficiently, but they also reduce relative R&D costs the use of related technologies. This is an important factor in the defence industry where R&D is a major cost driver. Additionally, the close relationship to existing customers make the integration of related companies swifter. Defence companies are in general not well prepared to deal with new customers, and this seems to be a major benefit for them to rely on existing customer relationships. For the above-mentioned reasons, it is very likely that related M&A deals in general (and defence industry M&A deals in specific) have a superior value creation impact.

Hypothesis 4: Superior value creation of closely-related business acquisitions compared to unrelated acquisitions.

4.6.5. Acquisition of undervalued firms

Acquiring an undervalued company through an M&A transaction seems like a rational strategy in theory. In practice, it is extremely difficult to assess whether a company is actually undervalued or not. The ability to identify a stock listed as an undervalued firm fundamentally opposes the Efficient Market Hypothesis (EMH),[318] which suggests that the market digests and interprets all publicly available information, and the right price for the firm is set according to the price that bidders are willing to pay. Even if an undervalued firm is

[317] Singh, H. and Montgomery, C. (1987): "Corporate acquisition strategies and economic performance", *Volume 8, Issue 4, July/August 1987, pp. 377–386*
[318] Ross, S. (*date unknown*): "What does the efficient market hypothesis assume about fair value?", *Investopia Online Edition*

identified, it is more than unclear if the perceived undervaluation will persist or if the transaction will change this. Only if the market recognizes and agrees with the acquirer that the target firm had been undervalued is there a likelihood that the deal creates value for the acquirer.

It is neither feasible nor efficient to test the "validity" of the market valuation of every firm in the empirical sample; moreover, it is doubtful whether the results would really help to identify undervalued assets. Instead, a proxy will be used to test a market mispricing and under evaluation of acquired firms.

Firms that are privately held or are sub-divisions of large companies usually do not obtain a market evaluation. They are not listed on the stock market, and often only very limited information about their financial performance is published. It is more likely that privately held companies or divisions of larger firms are sold below the general market value due to informational asymmetries during the bidding process. For sub-divisions, the synergy potential is expected to be higher too. Sub-divisions are usually outside the management's focus and therefore are not able to unleash their full potential[319]; for this reason, these entities are often referred to as "corporate orphans". Due to a higher potential for value creation, it is expected that the acquisition of a sub-division creates more value than a stand-alone firm.

Hypothesis 5: The acquisition of a sub-division of a large company results in superior value creation than the acquisition of a stand-alone firm.

4.6.6. The minimum-size effect

This dissertation proposes a new term for measuring the positive effect of growth for a defence firm, the so-called "minimum-size effect". The reasoning is based upon the observation that a large firm qualifies more easily for large defence contracts. The defence contracts have become larger in size and scope over the last decades, and the programme development time frames are very long, too. As a risk reduction strategy, both military procurement agencies and prime contractors prefer to work with larger, financially viable firms. [320] For this reason, large firm have a clear benefit over smaller competitors.

[319]Mantecon, T. (2008): "An analysis of the implications of uncertainty and agency problems on the wealth effects to acquirers of private firms", *Journal of Banking & Finance, Volume 32, Issue 5, May 2008, pp. 892-905*
[320] Thomson, L. (2016): "What Defense Downturn? Why Military Contractors Are Thriving Despite Lower Pentagon Spending", *Forbes Online Edition*

In this respect, market consolidators are more likely to survive and to benefit from large contract awards.

Hypothesis 6: Acquisitive growth of defence companies in their core business leads to superior value creation.

4.6.7. US market benefit

Several characteristics make the US defence market appear more attractive than European defence markets. The US administration spends about 50% of the global defence budget, and this budget is almost entirely spent with US-owned or based firms. The market entry barriers for foreign defence firms are expected to remain high.[321] Furthermore, the national US defence industry benefits from strong support by the US administration, the political and global world power, in exporting defence technologies.

These favourable conditions have made the US defence industry the strongest in the world, with seven US companies in the ranking of the top ten defence firms. The favourable market conditions make it attractive for both US and European defence companies to increase their business in the US market. It is argued that the acquisition of a European defence company is regarded more critically by investors, as the general market is small and the overall outlook has been gloomy. This is supposed to lead to less valuable business acquisitions.

Hypothesis 7: The value gain of US company acquisitions outperforms the gains of an acquisition in Europe.

4.6.8. National consolidation benefit

The motive to enter a market and to deepen a new market footprint is at first sight equivalent to any cross-border deal in another industry. Cross-border deals have been examined in various geographical scopes (country specific, regional) and time frames. The overall results suggest that there is almost no cross-border effect on the value creation from the perspective of the target company[322]. For the acquirer (or bidder), cross-border deals yield a significantly

[321] Gregg, A. (2017): "Pentagon moves to shut foreign firms out of its supply chain", *The Washington Post Online Edition*

[322] Evidence from the UK suggest almost no cross border effect into the UK. Danbolt, J. (2004): "Target company cross-border effects in acquisitions into the UK.", *University of Glasgow, European Financial Management 10(1):pp. 83-108*

positive effect. These results have proven to be valid for European deals[323] but also US American M&A transactions, where cross-border transactions outperform national M&A deals by 2%.[324] These results are based on general industry empirical data, but they seem to also be consistent with the market access theory for defence industry deals.

Governments in Europe and the United States have set up barriers to actively prevent non-national firms from intruding in their defence market.[325] The result is an array of laws and contractual rules that make it impossible for European firms to enter the US market and vice versa. If they are able to enter the market, strict legal and economic provisions have to be fulfilled. Attractive and relevant target companies are often entirely excluded from the acquisition of a foreign firm. Government support for national consolidation deals is omnipresent in Europe and in the United States, and both the direct and indirect support that national firms enjoy should0 lead to better conditions for national bidders and higher potential for synergy. Outside bidders have to adhere to more regulations and restrictions. For these reasons it is likely that national consolidation deals perform better than cross-border transactions.

Hypothesis 8: The value gain of national consolidation deals outperforms cross-border deals.

4.6.9. Large acquisition benefit

The size[326] of an M&A transaction has two potential implications for the value creation potential: the relevance of the acquisition and the associated integration effort.

Although size is not the sole determination factor of relevance, large deals have a stronger impact on the strategic direction of a company. The larger the acquisition, the more likely the deal is evaluated as a real "game changer" and large deals have a higher impact, be it positive or negative.

Even if the abnormal return is positive for the target company, the relative size of both the target firm and the acquirer will lead to a strong dilution. The absolute abnormal return of a

[323] Significant positive effect for bidders performing cross-border deals; Danbolt, J. and Maciver, G. (2012) "Cross-Border versus Domestic Acquisitions and the Impact on Shareholder Wealth", *University of Glasgow, Department of Accounting and Finance, Faculty of Law, Business and Social Sciences*

[324] Also for US deals, the acquirer achieved more positive results for cross border deals than for national deals (0 vs. -2%); Cummins, J. et al. (2004):"Consolidation in the European Insurance Industry: Do Mergers and Acquisitions Create Value for Shareholders?", *The Wharton Financial Institutions Center*

[325] Latham, A. and Hooper, N. (2013): "The Future of the Defence Firm: New Challenges, New Directions", *pp. 43-44, Springer Science & Business Media*

[326] The relative size of an acquisition target in terms of sales

small target firm being acquired by a large firm will almost certainly be diluted due to the imbalance of market capitalization. Asquith, Bruner and Mullins (1983) discovered a positive correlation between the size of a target company and the value creation potential.[327] Therefore, a large transaction is expected to bring a larger abnormal return than a small M&A acquisition.

On the other side, the ease of integration has to be considered for the evaluation of the deal size. The integration process is often not the focus of literature related to management principles, but it can severely create or destroy value. Experts consider the integration process and the associated efforts to be the most critical part of an M&A transaction.[328] Several smaller firm acquisitions are said to be "better digestible" from a financial, organizational and business integration point of view rather than one large acquisition.[329] The integration of smaller entities also does not overwhelmingly claim management attention which disables the organization. Consequently, small acquisitions have a clear advantage over large acquisitions in terms of integration efforts.

The findings with regards to the ease of integration and the size effect are to a certain extent contradictory. I support the argument that large deals have a higher potential to create abnormal returns due to their relevance to the acquirer; they also strongly support the "minimum-size-effect" strategy. These effects more than compensate for the indigestion disadvantages.

Hypothesis 9: The value gain of large M&A transactions is higher than for small transactions.

4.6.10. Cash payment benefit

According to financial theory, if investors have the option, they will opt for higher, earlier and risk-free payments. These factors underline the target company's preference for cash payments rather than to receive equity titles when they are acquired. The payment of an acquisition with shares bear the risk of value deterioration for the seller, once the exchange quota has been set. Often, a pre-determined minimum holding period makes this form of

[327] Asquith, P. and Bruner, R. and Mullins, D. (1983): "Merger Returns and the Form of Financing", *Harvard University and University of Virginia*
[328] Larsson, R. and Finkelstein, S. (1999): "Integrating Strategic, Organizational, and Human Resource Perspectives on Mergers and Acquisitions: A Case Survey of Synergy Realization", *p. 9, Organization Science Online Edition*
[329] Porzio, M. (2015): "In M&A, Bigger Is Rarely Better", *Forbes Online Edition*

payment inflexible and thus even more unattractive. Previous studies found out that the payment with cash yields a much higher value than stock or other forms of equity payments.[330]

Contrary to what one might expect, the effects of the form of payment do not constitute a zero sum game. Asquith, Bruner and Mullins (1983) revealed that payment with stock does not only lower the value creation of the target, but also has a negative value impact on the bidder. Stock payments are associated with a negative signalling effect, indicating that the current share price is overvalued. Furthermore, the payment with stock changes the capital structure of a company and might lower the financial gearing.

Hypothesis: The value gain of M&A deals with cash payments is higher than deals that are paid with stock.

Note: The "cash payment preference" hypothesis will not be tested further. The sub-sample for empirical testing is too small to achieve statistically relevant results.

4.6.11. Target company value creation

A significantly positive value creation potential for target company's shareholders is undisputed. Acquirers are aware that a successful bid for a publicly traded share must comprise a premium to the current trading price.[331] Only then a majority of shareholders can be convinced to sell their shares.[332]

The actual takeover premium differs by industry (higher for growth industries), by expected gain of market power[333] and by the mode of payment (cash preferred over equity compensation).[334]

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[330] Travlos, N. (1987): "Corporate Takeover Bids, Methods of Payment, and Bidding Firms' Stock Returns", *The Journal of Finance, Volume 42, Issue 4 September 1987, pp. 943–963*

[331] In theory negative premiums do exist as well. These cases are rarely found in practice and rather a theoretical phenomenon. See also: Weitzel, U. and Kling. B. (2016): "Sold below value? Why takeover offers can have negative premiums", *Utrecht University & Radboud University, IMR, The Netherlands, SOAS, University of London, United Kingdom, Preprint submitted to Review of Finance*

[332] William Schwert, W. (1996): "Markup Pricing in Mergers and Acquisitions", *William E. Simon Graduate School of Business Administration, University of Rochester, National Bureau of Economic Research, Cambridge, MA 02138, USA, p. 30-38*

[333] Bowman, R. and Richards, A. (2013): "Market Power, Toeholds and the Takeover Premium", *University of Auckland and University of Queensland*

[334] de la Bruslerie, H. (2010): "Crossing takeover premiums and mix of payment: An empirical test of contractual setting in M&A transactions", *Université Paris Dauphine, International Conference of the French Finance Association (AFFI), May 11-13, 2011*

Most researches report acquisition premiums of 15-35% over the stock market price. Jensen and Ruback (1983) observed abnormal returns of target shareholders of 20-30%.[335] The more recent study of Eckbo (2009)[336] analysed US M&A transactions with resulting takeover premiums in the range of 25-30%. Eckbo draws the conclusion that these value are skewed due to old reference points and that the real premiums even have a value of 45-50%.

Due to these study results it is expected that target shareholders in the defence industry also earn significant abnormal returns in the range of 20-30%.

Hypothesis 10: Shareholders of target companies experience significant value creation in M&A transactions.

[335] Ruback, R. and Jensen, M. (2010): "The Market for Corporate Control: The Scientific Evidence", *Harvard University, Journal of Financial Economics, Vol. 11, pp. 5-50, 1983*
[336] Eckbo, B. (2009): "Bidding Strategies and Takeover Premiums: A Review", *Journal of Corporate Finance, 15 (1), pp. 149-178*

4.6.12. Overview of M&A hypotheses

The overview shows the 10 M&A hypotheses which translate into 13 test scenarios.[337] Most hypotheses are categorized as either “strategic” (6) or “defence specific” (3) hypotheses. The expected value impact is indicated by (+) and (-) and represents the value impact for shareholders of the acquiring company, except for hypothesis 10.

Table 2: M&A hypothesis and expected value impact

#	Type	Hypothesis	Description	Expected value impact
1	Strategic	Acquisitive growth	(Slightly) positive gains from external growth	(+)
2		Active business portfolio management	Superior gains for active portfolio managing firms	(+)
3		Cost synergy preference	Superior gains from cost synergies than revenue synergies	(+)
4a)		Relatedness of acquired business	Highly positive gains of "core" business acquisitions	(++)
4b)			Positive gains of "close-to-core" acquisitions	(+)
4c)			Negative gains of "out-of-core" acquisitions	(-)
5	Financial	Undervalued assets	Superior gains from acquisitions of sub-divisions compared to stand-alone firms	(+)
6	Defence specific	Minimum size effect	Superior gains by acquisitions that increase the size of the defence business	(++)
7		US market benefit	Superior gains from US than European targets	(+)
8		National consolidation benefit	Superior expected gains of national consolidation deals	(+)
9	Structure	Deal size	Superior expected gains of (relatively) large transactions	(+)
10	Target company	Target company value creation	Highly positive gains for all target companies	(++)

Source: Own representation

[337] The hypothesis around the subject of business relatedness results in 3 dedicated test cases (hypotheses 4a, 4b and 4c)

5. Measuring M&A value creation through an event study

After having outlaid the motives for M&A transactions it is time to define the concept which is most useful to finally measure value creation of M&A transactions. The creation of value is probably the most fundamental goal of each firm[338]. Some definitions even speak about value creation as the "raison d'être" of a company.[339]

A unilateral definition of value creation is difficult to find. Different stakeholders have different, somewhat opposing views as to what value creation means for them. The value of a firm might be judged very differently by an employee, a manager or shareholder. The following methodological reviews concentrate on value creation for shareholders as the focus of this dissertation.

5.1. Methodology review

While the options for the assessment of M&A value creation are not exhaustive, three major methods have proven to be the most suitable in the context of measuring the value for shareholders[340]: case studies, accounting studies and event studies. In order to better understand the advantages and disadvantages, all three methods are presented and discussed.

5.1.1. Case studies

A case study is a research method that explores a phenomenon, situation or event with the help of detailed observation. This observation is enriched with background information and is usually captured over a longer period of time. Case studies are generally used in order to examine a very limited number of occurrences or a very specific problem more deeply. Case studies are mostly used to describe and analyse complex situations that cannot be well captured by methods that condense information of a larger sample.[341]

A case study analyses a very specific question; therefore, this inductive research is comparable to a description of a research question, rather than a test with a clear result. It

[338] Non-profit firms might be an exclusion
[339] Hindle, T. (2008): "The Economist Guide to Management Ideas and Gurus", *The Economist Ltd., Profile Books*
[340] Zollo and Meier also discuss surveys as a further important method. These are in the context of this dissertation not the method of choice, as they are optimised to measure short term value creation for investors.
[341] Siggelkow, N. (2007): "Persuasion with Case Studies", *University of Pennsylvania, Academy of Management Journal, Vol. 50, No. 1, pp. 20–24*

usually falls short in demonstrating a generalizable pattern, due to the inherently small sample size. Less than 10% of research on M&A transactions has been analysed with the help of case studies. Case studies are however often used to describe complex situations with regards to the post-merger integration (PMI) process.[342]

5.1.2. Accounting studies

Accounting studies measure business phenomena with the help of quantitative accounting data. Accounting studies are the second most popular method for researching M&A performance.[343] Accounting studies analyse a company's official financial data in order to evaluate the success of a merger. In most cases benchmark figures from the Profit & Loss (P&L) accounts, Cash Flow accounts or Balance Sheet data are used. The goal is to compare the financial performance of the new company with historic accounting data prior to the M&A transaction.

The advantage of the accounting perspective is the anchoring of information on officially audited data. Furthermore, accounting studies can take a long-term perspective and accounting data has a lower variation compared to stock market data. Stock market data is more volatile than accounting data.

In contrast, critics argue that accounting data often do not reflect the actual situation of a company. Accounting standards in different legislations differ significantly from each other. Even if the same standards are applied, the data is not free from adjustments based on individual judgements. The case of "window-dressing" is a regularly observed problem, especially around M&A transactions.[344]

The time-lag between the old and the new entity's data constitutes a further disadvantage, as markets and industry benchmarks can change drastically over the years. This makes it even more difficult to claim causality between the merger event and the potential change of accounting data.

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[342] Bengtsson, L. and Larsson, R. (2012): "Researching Mergers & Acquisitions with the Case Study Method: Idiographic Understanding of Longitudinal Integration Processes", *CSIR – Center for Strategic Innovation Research, Paper No. 2012/4*

[343] 28% of the examined M&A performance studies rely on accounting data, see: Zollo, M. and Meier, D. (2008): "What is M&A performance?", *Academy of Management Perspectives*, pp. 57-58

[344] Wangerin, D. (2010): "M&A Due Diligence and its Consequences for Post-Acquisition Financial Statements", *Doctoral Candidate in Accounting University of Wisconsin-Madison*

5.1.3. Event studies

Event studies evaluate the impact of a corporate event on the value of the firm by measuring the stock price changes. It is a widely used method for the evaluation of corporate events and management decision making. Most studies are focussed on short time frames. This type of research has become a major part of finance literature during recent decades. The evaluation of stock price reactions to M&A announcements is a central application of event studies; almost 30 years ago Fama noted that "[…] this research documents interesting regularities in the response of stock prices […] and changes in corporate control."[345]

According to the neo-classical theory, investors correctly and timely interpret news and promptly react to it. Investors will buy a firm's share if they evaluate the impact of an event positively. If the majority of investors evaluate the event negatively, they sell their shares and the share price will fall. Consequently, investors can quickly and correctly evaluate the event and act upon it by either selling or buying shares. Value-increasing events ultimately lead to a market price increase and value-destructive events lead to a market price decrease. It is assumed that markets are efficient, and the market price reflects the actual value of a firm at any time. The market reaction can be precisely measured and relevant data can be statistically captured.

The popularity of event studies has quickly grown in the 1970s and 1980s. Event studies paved their way into mainstream research through technological innovations and the availability sufficient data bases. The Harvard Professor Richard Caves (1989) praises the positive academic impact of event studies as "[…] a genuine innovation – theoretically well grounded, cheap to execute and able to evade the problem of holding constant other factors that plague ex post studies of mergers' effects." He also asserts that event studies are not only effective but also very efficient, characterising event studies as "a better product, available at a lower price."[346]

The popularity of event studies is also confirmed by Zollo and Meier's (2008) study "What is M&A performance?", which examined 88 articles from highly regarded Finance and Management magazines between 1970-2006. Around 60% of the identified studies that

[345] Fama, E. (1991): "Efficient Capital Markets: II", *p. 1600, The Journal of Finance*
[346] Caves, R., (1989): "Mergers, takeovers, and economic efficiency: Foresight vs. hindsight", *International Journal of Industrial Organization, 7, issue 1, p. 151*

measured M&A performance relied upon event studies. Not surprisingly, two thirds of these studies focused on the measurement of short term effects.[347]

5.1.4. Conclusion on M&A value creation measurement

All three presented research methodologies have their advantages and disadvantages. Zollo and Meier state that the relevance and applicability of these options depends on the duration of the study and the perspective of the analysis. It is therefore a pre-requisite to identify the focus group and the time frame for this research study.

It is worthwhile to take the most relevant criteria into account before finally selecting the method of research. I regard the following five criteria as the most relevant:

- **Measurability:** Precisely measurable, objective and clean raw data.
- **Distinguishability:** The impact of M&A events should be distinguishable from other firm internal and external market events.
- **Doability:** The research must remain manageable. It must be operationally possible to analyse hundreds of M&A events.
- **Shareholder orientation:** The research shall focus on the view of the shareholder. The results must be meaningful and relevant for shareholders and shareholder oriented managers.
- **Comparability:** The results of this research shall be comparable to results from other industries.

Both quantitative measures, accounting studies and event studies could be applied to answer the research questions.[348] According to Zollo and Meier (2008), there is also a high likelihood that event studies and accounting studies draw the same conclusion. Event studies are the most commonly used methods for the purpose of this dissertation. They focus on the shareholder gains of investors. It also brings many practical advantages to use the event study method, like the easy interpretation of available stock market data and the comparability of results with other event studies.

[347] Out of the 11 methods, 40% of the research was executed with the help of event studies. See: Zollo, M. and Meier, D. (2008): "What is M&A performance?", *Academy of Management Perspectives, pp. 57-58*

[348] Case studies are not useful for large samples and therefore not practicably applicable for the underlying dissertation.

Table 3: Comparison of event, accounting and case studies

	Event studies	Accounting studies	Case studies
Measurability	**High** The quantitative raw data derives from the stock market and does not have to be adjusted or interpreted before the analysis.	**Medium** Analysis is based upon objective and audited financial data **but** the data has to be altered and compared with external benchmarks. This makes the measurability and interpretation difficult.	**Low** The data is often based on few examples and mostly of quanlitative nature. The objective measurability is limited.
Distinguishability	**High** distinguishability of share price reaction in the short run. The distinguishability decreases as time passes and further internal and external events dilute the immediate announcement effect.	**Medium** The interpretation of pure financial data is not sufficient. Raw data has to interpreted to benchmarks. As the nature of accounting studies is mid- to long-term, the effects may well be influenced by other events.	**High** Due to the limited number of cases and the high level of detial, a case study can be designed in a way that M&A events and their effects are seperated from other events.
Doability	**High** Event studies are very well suited to process a high number of deals as the data is (potentially) available and only has to be converted and edited.	**Low** The effort of data extraction, adjustments and benchmarking is high. It takes a lot of time to draw meaningful conclusions.	**High:** The number of events is limited and qualitative data are relatively easy to process.
Shareholder orientation	**High** There is a direct link between abnormal returns and quantitative shareholder value measurement.	**Medium:** There is presumably a correlation between the results of financial (accounting) data and shareholder value but it is only an indirect link. The abnormal stock returns represent anticipated future developments. Financial data represent however current or even past information about the company.	**Low** Case studies are mostly inward related. Managers are asked for evaluation or specific attributes are evaluated in depth. But it is hardly feasible to extract valuable shareholder insights from case study data.
Comparability	**High** The high number of M&A announcement event studies makes comparisons easy.	**Medium:** Financial data is per se comparable but in cases of M&A transactions, the raw data is usually adjusted and benchmarked against industry standards. The a general comparibility is thus limited.	**Low** The data and findinds are by definition case related and difficult to compare with other cases.

Source: Own representation

Similar to other statistical research methods, event studies are neither infallible nor undisputed among researchers. The most fundamental criticism questions the meaningfulness of event studies as a means to measure value creation. It is argued that stock markets do not always act rationally but according to market sentiments. This is not a criticism on the event study method, but rather on the assumptions of neo-classical theory.

The general criticism may be true in some cases but the theoretical concept of efficient markets is a core pillar of the classical economic theory for a good reason. The explanation of market participants' trading behaviour may underlie anomalies, but the Behavioural concepts have not been able to successfully explain financial market reactions over a longer time period.

A whole discipline of finance researchers have challenged the EMH. Despite constant criticism about its shortcomings, the semi-strong form of Market Efficiency is broadly accepted by financial economists.[349] The semi-strong form of the Efficient Market Hypothesis (EMH) implies that all publicly known information is instantly absorbed by the investors and fully reflected by the stock price. Merger announcements have been explicitly mentioned by Firth as evidence for the EMH.[350] This dissertation also relies on mature stock markets and reliable data.

The predictive power of event studies has also been demonstrated. For example, MacKinley (1997) analysed the predictive power of event studies by measuring the impact of 600 profit announcements over 30 companies.[351] The results showed that events studies do correctly measure the effect of positive and negative news: positive announcements showed an abnormal positive return, and negative news the opposite. In both cases, the null hypotheses was clearly rejected. These results substantiate the reasoning that event studies are the most suited method to determine and measure value impacts in the short run.

[349] Dimson, E. and Mussavian, M. (1998): "A brief history of market efficiency", *European Financial Management, Volume 4, Number 1, March 1998, pp. 91-103*
[350]Firth, M. (1980): "Takeovers, Shareholder Returns, and the Theory of the Firm," *The Quarterly Journal of Economics , 94(2), pp. 235-260*
[351] MacKinlay, C. (1997): "Event studies in Economics and Finance", *Journal of Economic Literature, Vol. XXXV (March 1997), p. 25*

Figure 17: Stock market reaction to "news"

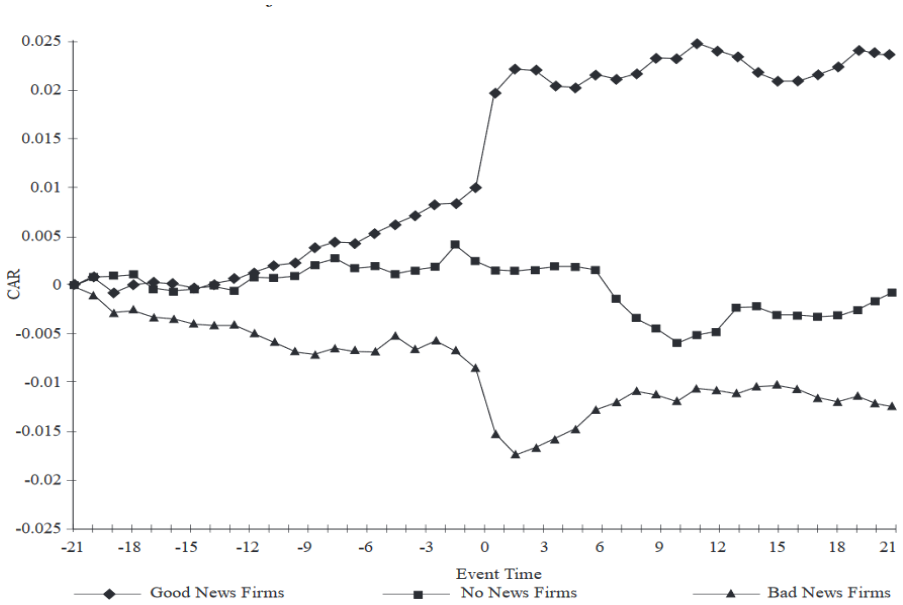


Figure 2a. Plot of cumulative abnormal return for earning announcements from event day -20 to event day 20. The abnormal return is calculated using the market model as the normal return measure.

Source: MacKinley in "Event Studies in Economics and Finance"

These findings raise the question if the short term announcement effects endure for a longer period as well. According to the neo-classical theory, and the assumption of complete information processing in frictionless markets, a positive correlation between short term announcement effects and long-term stock market performance is postulated.[352] The results of researchers raise scepticism, as a large part of the research shows a negative outlook on the long-term effects of M&A.[353] On the contrary, opposing research results exist as well.[354] Due to the difficulty of measuring long-term effects, there is not a clear answer to this question.

The second stream of criticism is concerned with the conceptual and technical weaknesses of event studies. The isolation of specific events and the calculation methodology of abnormal returns are particular areas of concern. However, these concerns can be overcome with a careful set-up. The effect of the pre-defined event must be captured with as little as possible interfering or overlapping outside events. The real world is not a laboratory-like testing

[352] Assumptions according to semi-strong efficient market efficiency, see: Fama, E. (1991): "Efficient Capital Markets: I1", *The Journal of Finance, VOL. XLVI, NO. 5 DECEMBER 1991*

[353] André, P. et al. (2004):"The long-run performance of Mergers and Acquisitions: Evidence from the Canadian Stock Market", *Financial Management, Winter 2004, pp. 27-43*

[354] The consulting firm BCG concludes that "short-term returns are usually a very good indicator of the long-term value created by acquisitions". See: The Boston Consulting Group (2010): "Value Creation in M&A*", BCG Perspectives, chapter 4*

environment, and many side events of minor or major importance can happen simultaneously. The longer the time frame of an event study, the more likely it is that interferences happen. It is nevertheless important to identify potential interferences and to rule these out as far as is possible. With regards to the underlying research, several deal announcements faced interference from a simultaneous announcement of relevant stock market relevant; these potentially misleading deals have been removed from the final deal data sample.[355]

Taking all arguments into account it is most suitable to apply the event study method for this dissertation.

5.2. Event study methodology

The aim of each event study is to calculate the abnormal return caused by the pre-defined event. The work of Fama, Fisher, Jensen and Roll (1969) on the reaction of stock markets to new information has been ground-breaking. Although it was not the first event study, it has set the standard of event studies for decades to come; the underlying logic and structure of event studies has changed only slightly since this fundamental publication in 1969.[356]

The investors' reaction towards the transactions is reflected in the increase or decrease of the shares of the two involved companies. The return of the share price reaction is compared to the general stock market development. The difference between the two is considered to be the excess or the abnormal return. An abnormal return can be measured by taking samples at various stages, but it is most useful closely around the event date. Then the cause-effect relationship between the event and the stock price movement can be drawn with a high likelihood.

This sub-chapter serves as a practical guideline to the setup of an event study and how to evaluate its results.

The procedure has four main steps:

(1) The definition of the event study framework
(2) The event study preparation
(3) The calculation and aggregation of abnormal returns
(4) The statistical testing and interpretation of results

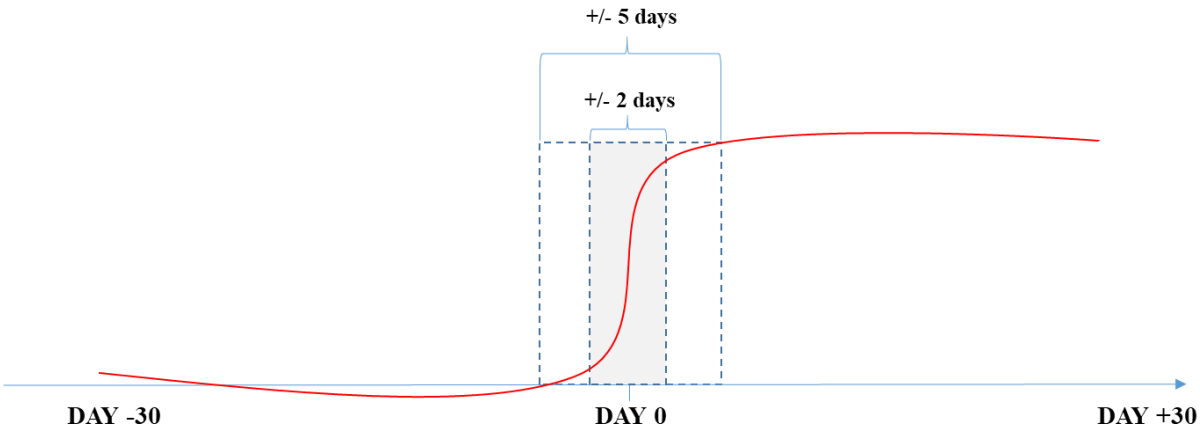
[355] In nine cases major financial data had been announced simultaneously to the M&A deal announcement
[356] What has changed is the ability to retrieve and process large amounts of data at almost no costs.

5.2.1. Methodology review and variation options

This sub-chapter will present how event studies are set up, as well as how stock market data have to be selected in order to calculate abnormal returns. The intention of this chapter is to establish a practical guide for the empirical study in Chapter Six.

The durations of event studies vary strongly and range from a few days up to several years. Due to statistical shortcomings for long event studies, most of the current event studies take a research timeframe for the calculation of abnormal returns. The "standard" is a set of time periods, starting with +/- 30 days; this is further refined at +/- 5 days, +/-2 days and of course the analysis of events at DAY 0.

Figure 18: Typical research time frame (illustrative)



Source: Own representation based on Brown "Using daily stock returns, the case of event studies"

In order to extract the abnormal return, we need to understand the components of stock market returns. The return of a single stock is composed of the normal (or expected) return and the abnormal return. The normal return is the return that would have been expected irrespective of the event. On the other hand, the abnormal stock return is unexpected, and a direct stock market reaction carried out by investors. The abnormal return is therefore also called an event-induced market reaction. The formula for determining the abnormal return is:

$$R(St) = MR(St) + AR(St),$$

where R (St) = observed return; MR (St) = market return; AR (St) = abnormal return

Solving the equation for the abnormal return shows that the abnormal return is the result of the total return minus the normal market return:

AR (St) = R (St) - MR (St)

The total return on any day (t=0) equals the closing stock price minus the closing stock at the last day prior to the event (t-1). The return is divided by the closing stock price of the prior day (t-1). The daily closing stock market prices are taken as reference points. Stock market prices of de-listed shares are often difficult to obtain, even with the help of professional databases like Thomson One Banker.[357]

The calculation of the expected market return is a central requirement to separate the "event effect" from the normal market price development. There are several methods that can be applied. All methods follow the goal to simulate the expected market price development of the shares under the assumption that the event had not taken place.

The methods can be separated into one-factor, multi-factor models and models with no factor exposure.[358]

5.2.1.1. One-factor models

One factor models use, as the name suggests, one factor to assess the return of a share. The most commonly used methods are the Capital-Assed-Pricing-Model (CAPM) and the market model. Both are one factor models that have similar underlying assumptions.

The revolutionary work "Portfolio Theory" of Nobel Prize Laureate Markowitz in 1952 set the basis for the market model and the CAPM.[359] Grounded in Markowitz's portfolio theory, it is of essential importance to the neo-classical theory. In the search for an efficient portfolio design, Markowitz states that "the investor does (or should) consider expected return a desirable thing and variance of return an undesirable thing".

A decade later, Sharpe refined the general assumptions of the CAPM. He discovered a direct link between the return of the overall market portfolio and a single share. The CAPM

[357] The longer the period since the de-listing, the less likely a share price history can be obtained
[358] The CFA Institute (1994): "A Practitioner's Guide to Factor Models", *The Research Foundation of the Institute of Chartered Financial Analysts*
[359] Rubinstein, M. (2002): "Markowitz's "Portfolio Selection": A Fifty-Year Retrospective", *The Journal of Finance, VOL. LVII, No. 3*

describes a share's expected return as a result of the share's individual risk and the overall market return. Each share's return is constituted by its individual return (called alpha), or the overall market return and an unexplainable error variable. The error variable ε tends to be zero over a longer observation period with a constant variance:

$R(j,t) = \alpha + \beta(j) * R(market) + \varepsilon(j,t)$

Consequently, the market model is $E(Ri) = \alpha + \beta(i) * E(Rm)$ and the CAPM: $E(Ri) = Rf + \beta(i) * (E(Rm) - Rf)$

According to Sharpe, shareholders earn the risk-free rate of return and an additional risk-related market return. The unsystematic, firm specific return alpha is not related to the overall market development. The systematic risk of a share (measured by the coefficient beta) measures the degree of its participation in the overall movement of the market portfolio. A high beta means that the overall market development has an above average impact on the share price. A share with a low beta has a lower risk, and is less responsive to general market portfolio movements. The two parameters alpha and beta can be estimated with the help of the ordinary least square method. This method is an efficient way of estimating normal and abnormal returns in the context of an event study.

The essential part is to determine the systematic risk component, beta for the CAPM and the excess return alpha for the market model. Cable and Holland tested the usefulness of the market model and the CAPM for event studies,[360] and confirmed the conclusion of Brown and Warner that both models are useful for event study testing.[361] In a direct comparison, the results of the market model are superior to the CAPM. The models will not be used for testing purposes; therefore the detailed calculation methods not are covered here.

5.2.1.2. Multi-factor models

Multi-factor models focus on more than just one factor (the systematic market risk) for the calculation of the expected market return. The Arbitrage Pricing Theory is the basis for a number of multi-factor market models that have evolved over time. The Fama and French

[360] Cable, J. and Holland, K. (1999): "Modelling Normal Returns in Event Studies: A Model-Selection Approach and Pilot Study", *The European Journal of Finance, Volume 5, 1999 - Issue 4*
[361] Brown, S. and Warner, J. (1980): "Measuring Security Price Performance", *Journal of Financial Economics 8(1980)*

three factor model uses the variables "size" and "book-to-market value" of similar firms in order to predict abnormal returns. Other models estimate market returns with the help of several broader economic factors. Multi-factor models are complicated, and they only bring very few additional insights (if any).

Multi-factor models are rarely used due to the low additional explanatory power and the complicated application in practice.[362] The inclusion of additional factors make the results almost incomparable to existing event study literature, which are based on one-factor models or models with no factor exposure.

5.2.1.3. Models with no factor exposure

Models with no factor exposure differentiate fundamentally from one- or multi-factor models as they do not rely on a share-specific adjustment factor. The Constant Mean Adjusted Return (MAR) model and the Market Adjusted Returns model (MARM) are the two models with no factor exposure that could be used for event studies. Both models are very easy to apply in practice.

The assumption behind the MAR model is the absence of mid-term variance in the systematic (market) and unsystematic (firm specific) return of a share. The MAR model relies on past returns; in the practical application, the average past returns are perpetuated in the future. This might work well in stable market environments with the absence of volatility. This is because in a volatile strongly (increasing or decreasing market) environment the MAR does not adapt accordingly, and is therefore not suitable to predict normal returns. Despite these model-specific problems, there are also practical hurdles in the application of this model. Previous event studies have shown that rumours have led to an increase in share prices before the event date, the so-called run-up phase.[363] This phase has no clear beginning. Therefore it is almost impossible to select a fair mean return that reflects the normal market movements. The mean stock returns in the days or weeks before the event date may already have a run-up bias, and therefore are not the best choice. On the other hand, an older return period may not serve as a

[362] Campbell, J. et al. (1997): "Event Study Analysis", p. 156, The Econometrics of Financial Markets, *Princeton University Press, Chapter 4, pp. 149-180*

[363] Jarrell, G. et al. (1980): *"*The Market for Corporate Control: The Empirical Evidence Since 1980*", The Journal of Economic Perspectives, p. 51, Vol. 2, No. 1 (Winter, 1988), pp. 49-68*

valid frame of reference either; that is, the past returns might not be representative of current market trends anymore.

This criticism leads us to another simple but effective return model. The market adjusted return model assumes that the general stock market return[364] is equal to the normal stock return in absence of the assessed event. The general development of market return is the sole reference point of this model. It is assumed that it fully reflects the applicable market movement. The underlying theoretical beta that describes the relationship of the stock market movement and the individual stock is 1 for all sample shares:

$AR_{j,t} = R_{j,t} - R_{m,t}$

The abnormal returns are calculated by subtracting the market or index returns from the actual returns of the stock. The remainder is, by definition, the abnormal return.

Warner and Brown (1980 and 1985) have assessed this methodology rather positively. The simulations show the abnormal return at the 1%-level is detected in 79.6% of all cases. This value is significantly better than for the mean adjusted return model, and is almost identical to the market model (80.4%). The model is particularly well-suited and robust for short return periods of less than 30 days and large samples with over 50 events.[365]

5.2.1.4. Conclusion on event study models

All models in assessing normal returns in the context of event studies, no matter how elaborate they may seem, are approximations. They are based upon predictions and proxies. Cable and Holland (1999) even label the various models as "blunt instruments", and advice accepting a certain level of uncertainty about future expected normal returns.[366] However, it is important that the model is robust to deliver correct results. A further important aspect is the relative ease of applying the model in practice. Both criteria have to be evaluated under the parameters and in the context of the respective event study.

[364] Alternatively, a more suitable industry index can be chosen
[365] Warner, J. and Brown, S. (1980): "Measuring security price performance", *Journal of Financial Economics, Volume 8, Issue 3, September 1980, pp. 205–258*
[366] Cable, J. and Holland, K. (1999): "Modelling Normal Returns in Event Studies: A Model-Selection Approach and Pilot Study", *p. 16, The European Journal of Finance, Volume 5, 1999 - Issue 4*

To summarize, it is not recommended to use multi-factor models. The set-up is complex and they do not deliver superior results. Furthermore, the results can hardly be compared to other event studies as they strongly depend on the assumptions of the specific model.

In contrast, both one-factor models,[367] and the models with no factor exposure are much better suited to estimate the abnormal returns of event studies. Their results are also more generalizable and comparable with other event studies.

Concerning one-factor models, the market model is preferred due to model-specific limitations of the CAPM.[368] They are especially useful for the estimation of longer time frames. On the downside, both one-factor models use past performance factors to determinate future price developments. Doubts about the stability and preciseness for shorter time horizons have been raised and are subject to constant discussion.[369] The Market Adjusted Returns Model leads to identically stable and precise results. The ease of use and its robustness make it a good choice for short-term event studies based on daily stock returns with large data samples. For these reasons, the Market Adjusted Returns Model is best suited to the underlying purposes of this dissertation.

5.2.2. Event study preparation

Various preparations need to be conducted before the empirical data can be processed to calculate the results of the event study. At first, the triggering events must be clearly defined. Then, a sample needs to be selected based on pre-defined criteria. The final preparatory step is the formulation of hypotheses for empirical testing.

5.2.2.1. Definition of events and formulation of hypotheses

Determining what constitutes a "triggering event" is an important step in preparing an event study. It might sound trivial for an M&A event study, but there are many iterations of an M&A deal to consider. Are partial acquisitions included or only full acquisitions? Do only legally executed M&A transactions qualify, or are M&A attempts which were unsuccessfully announced also taken into account? Which industries are taken into account? What is the

[367] The CAPM and the market model
[368] For further reading, please see MacKinlay, C. (1997): "Event studies in Economics and Finance", *Journal of Economic Literature, Vol. XXXV (March 1997)*
[369] An imprecise beta would distort the model and lead to wrong return calculations.

threshold deal size? Do geographical restrictions apply? The precise description of the timing is also important. This dissertation has defined the announcement day as the triggering date. While we use the standard definition, alternatives like the legal closing date could also be chosen.

Once the events are defined, hypotheses are formulated for empirical testing purposes. The hypotheses mainly derive from the assumptions of the neo-classical theory, strategic management literature, existing research, and the findings about the defence industry.

5.2.2.2. Sample selection and data sources

The research sample can be selected based on the precise definition of the triggering event(s), and can be refined even further by operationalizing this definition to determine the sample selection. These criteria can be numerous and very individual which in return makes each study unique.

In order to obtain the necessary sample data, it is highly recommended to use reliable and renowned data sources. The deal data is obtained from the M&A deal data base of Thomson Reuters, called OneBanker.[370] The stock market daily price data is received from the specific data pool of the appropriate stock market; such data pools include the DOW Jones for the United States or their regional equivalent like the CAC 40 or the FTSE 100.

It is important that the raw data is cleaned before the detailed processing starts. The main cleansing is related to misleading industry codes during the M&A deal selection.[371] Even if the data is "correct", a misleading cause-effect relationship due to parallel events must be avoided to the most possible extent. For example, data from an M&A deal sampled at the same time that a profit warning was issued: In this instance the data as such is "correct", but it reflects the effect of the profit warning rather than the impact of the M&A deal. These anomalies can be either identified on a case-by-case check or a screening for anomalies. Manual adjustments help to reduce mistakes but cannot be completely ruled out.

[370] For further info: http://banker.thomsonib.com/

[371] The Thomson Reuters ONE Banker database relies on SIC industry codes for the assignment of M&A deals to an industry. In fact, the industry codes do very often not reflect the actual industry designation. For this reason, each deal had to be manually checked.

5.2.3. Calculation and aggregation of abnormal returns

When the triggering events have been defined and the data selection has taken place, the calculation of abnormal returns can begin. The correct calculation and aggregation of returns is fundamental to obtain robust event study results. Depending on the type of stock market raw data, case specific adjustments must be made.[372]

5.2.3.1. Market portfolio selection

The right selection of the market portfolio is crucial for an event study. The market return serves as the normalising factor in order to separate the abnormal return from the total stock market return of a respective share. This is especially true in the underlying case where the "Market Adjusted Returns Model" is applied. Here, the market portfolio's return is by definition equivalent to the assumed market return without any further adjustments.

In the best case the market portfolio or index fairly reflects the value of the share as if the M&A transaction had not happened. The selected market index should fulfil the condition of similarity and independence at the same time, and should be similar enough to mirror the general market impact on the share. At the same time, it should also be detached enough from the underlying share so that the M&A event does not have a direct impact on the index, as this would potentially lead to a circular reference and interdependency. As these two criteria often stand in opposition to each other, it is not easy to identify the right reference index.

Either a general, well-balanced market index like the "Dow Jones Index" or an industry specific index like the "STOXX Europe TMI Aerospace & Defense"[373] index could be selected; both options have specific advantages and disadvantages.

At first glance, the sector-specific index is the more suitable choice. These specific indices intend to precisely reflect the share price movement of the respective market segment. For large and diversified industries like the financial services industry, the sector indices are in fact the better choice,[374] though for smaller industry sectors they are often not. The defence sector index in Europe only contains a limited number of shares. The reference share can have

[372] Brown, S. (1984): "Using daily stock returns – The case of event studies", *Journal of Financial Economics 14 (1985) pp. 3-31*

[373] For more details, see: https://www.stoxx.com/index-details?symbol=SXPARO

[374] For comparison: The Eurostoxx Banking index has a free float market capitalization of €1.1 billion and the Eurostoxx Aerospace and Defense of only €157 million. All values refer to the stock market valuation on 26th July 2017.

a huge impact on the index, and the M&A event can then lead to a self-induced market movement. This effect alters the meaningfulness of the market index. In the defence industry this is precisely the problem that occurs, worsened by the fact that the respective industry index contains many civil aerospace companies. For these reasons, the general local market index is the more suitable point of reference.

5.2.3.2. Calculation of abnormal returns

The essential basis for each event study is a systematically correct return calculation. There are two options for the basic return calculation: a discrete (one-time) return compound or a continuous return compounding. The difference of the frequency of compounding results in different rates of return, they are less significant for shorter time frames of only several days but can be substantial for longer time horizons of several months.

The discrete return calculation basically takes into account the price movement divided by the historical price. While this calculation does not need to be adapted, the crucial question is the handling of dividends.[375] In arbitrage-free and efficient stock markets, the pay-put of dividends lead to a simultaneous reduction of the share price by the same amount all other things being equal:

$$\mathbf{R(D)}_{j,t} = (\mathbf{P}_{j,t} + \mathbf{D}_{j,t} - \mathbf{P}_{j,t-1}) / \mathbf{P}_{j,t-1}$$

The underlying share price data for the sample deals has been adjusted for dividends where necessary. Less than 10 out of 174 deal data points needed to be adjusted. The underlying indices are predominantly price indexes; for example, the S&P 500 serves a reference market index in 134 of 174 cases. The price index is a genuine mirror of the weighted market price of the shares.[376] This could theoretically lead to the problem that the dividends are accounted for in the share prices but not for a majority of market prices. This problem is marginal and can be ignored here due to the low average annual dividends that have been paid out in the observation period. The dividends are on average below 0.05% for a 10 day (+/-5 days) timeframe.

[375] Dividends are mostly annual or bi-annual pay-outs to shareholders. Each regular share entitles the shareholder to receive the dividend.

[376] A price index reflects the weighted average market prices of shares as they can be observed on the market. It does not reflect other return components, like dividend payments. A value index reflects the weighted average stock market prices and also takes into account dividends. It simulates a re-investment of dividends into the index. For this reason, value indices are also called total return indices.

5.2.3.3. Aggregation of abnormal returns

The calculated abnormal returns can be aggregated over different timeframes and over various sample companies. Both perspectives are essential for a deeper analysis, especially for a further generalisation of the research results.

The aggregation over different timeframes creates an important insight. Particularly, it allows for a closer view of the exact timing of market reactions. Often, abnormal returns start to occur slightly before the event, see their climax shortly after the event date (t=0), and decrease thereafter.[377] A longer observation period helps to identify a potential overshooting of stock market returns.

The abnormal returns of different time frames can be captured by aggregating the abnormal returns of the single days within the observation time frame:

$$CAR_{j,t} = \sum_{K=1}^{t} AR_{j,k}$$

This method is slightly imprecise, as the reference prices for the calculation of the abnormal returns are not consistent. Each day a new stock reference price is taken as a basis. For this reason, it is preferable not to aggregate the daily returns but to set a new basis for each time frame:

Example calculation for DAY +/-5

$$CAR_{j,5} = \frac{(SP_5 - SP_{-5})}{SP_{-5}} - \frac{(MP_5 - MP_{-5})}{MP_{-5}}$$

SP = Stock Price; MP = Market Price

This calculation method ensures that the return data are not distorted by fluctuating daily baseline prices.

The abnormal return **accumulation of several deals** is a vital function for the identification of specific return patterns. Only patterns that appear in several sample companies in the same or

[377] Thaler, R. and de Bondt, W. (1984): "Does the Stock Market Overreact?", *The Journal of Finance, Vol. 40, No. 3, Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas, December 28-30, Jul. 1985, pp. 793-805*

equal mode can serve as a basis for a generalizable model. The simplest aggregation is the accumulation of abnormal returns and the calculation of its arithmetic average.

$$CAR\ (sample) = \frac{CAR_1 + CAR_2 + \dots CAR_N}{N}$$

The calculation of the arithmetic average has the downside that relative abnormal returns of small companies are taken into account to the same extent as the abnormal return of larger companies.

The weighted average return helps to solve this problem. The abnormal return values are weighted by the stock market value of the underlying company. Larger companies thus have a stronger impact on the average value than smaller companies.

$$\Delta CAR = \sum_{j=1}^{N} MV_j * CAR_j$$

MV = Market Value

The same weighting principle is used for the evaluation of the value effect of the entire deal. The weighted market value impact on the acquiring and the target company are also added. The result is a fair view of the entire market impact of the deal, and evaluates whether or not mergers create value from a more holistic perspective.

$$\Delta CAR_{combined} = \frac{CAR_{Buyer} * MV_{Buyer} + CAR_{Target} * MV_{Target}}{MV_{Buyer} + MV_{Target}}$$

The weighted average return better reflects the overall stock market perspective, as well as the value creation or destruction impact on the whole market. In contrast, the management's perspective is better reflected by the arithmetic average. It is not of primary importance for a manager whether the combined value creation is positive or negative for the entire stock market; for a manager, it is important to understand if the intended deal is likely to create value for his specific firm and the firm's shareholders. This dissertation is oriented more to a managerial perspective, and therefore relies more heavily on the arithmetic average.

5.3. Statistical testing of event study results

The results of event studies are statistically analysed in two ways. The descriptive patterns are calculated in order to evaluate the event study results. The descriptive values of interest are

the mean (or median) value and the variance (or the standard deviation) of the sample. This small selection is usually sufficient for the description of a sample.

In the second step, the descriptive results need to be analysed with the help of inferential statistical testing methods for their distribution pattern. Gaining knowledge about the distribution helps to determine which methods are most suitable for the test of significance, which determines the overall meaningfulness of the analysis. After the calculation of the abnormal returns it has to be tested if the sample data is significantly different from normal returns or if the results are just a random result. Only in the case that the results are statistically significant they qualify for generalisation purposes. In this case, it could be stated that positive or negative abnormal returns exist.

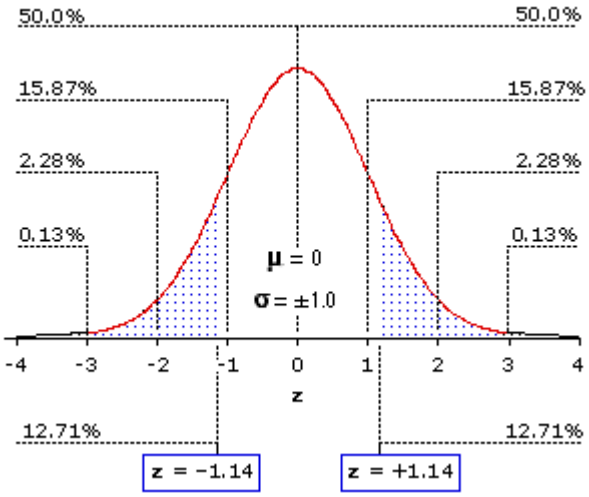
The basis of significance testing is the formulation and testing of the null hypothesis. The so-called null hypothesis formulates the anti-thesis of the analysis and shall be rejected.[378] In the underlying case, the null hypothesis can be formulated as follows: "The abnormal stock market return of acquiring companies in M&A transactions is not significantly different from zero." The aim is to reject the null hypothesis and to prove that the sample results are in fact significantly different from zero. The null hypothesis (H0) and the alternative hypothesis (H1) can be formulated in the following way:

H0: CAAR [e1; e2] = 0
H1: CAAR [e1; e2] $\neq 0$

The cumulative abnormal return is one way of looking at the sample results. In the case of equally distributed negative and positive sample outcomes, the CAAR would be zero, and this result would confirm the null hypothesis. As previously outlined, my hypothesis is that the sample results are significantly different from zero, either positive or negative. Therefore the test hypothesis has to be formulated as a two sided test.

[378] Kothari, S.P. and Warner, J. (2004): "Econometrics of Event Studies"

Figure 19: Normal distribution



Source: Lowry, R. (2017): "Introduction to Probability Sampling Distributions"

In the case that the test result surpasses the significance level (at the 1% or 5% level), the null hypothesis is rejected and the alternative hypothesis is accepted. However, statistics can only provide results that either accept or reject a hypothesis with a high degree of certainty; a certain level of insecurity always remains.[379]

The results of the statistical analysis can have two possible outcomes. In the better case, the statistics are accurate and allow one to either accept or reject the null hypothesis. But the test statistics can also produce wrong and misleading results. For example:

- A Type 1 error occurs when a correct null hypothesis is rejected
- A Type 2 error describes the acceptance of the null hypothesis although it is wrong

	Actual Outcome	
	H0 is true	**H0 is false**
Acceptance of H0	Correct	Type 2 error
Rejection of H0	Type 1 error	Correct (power)

[379] Corrado, C. (2010): "Event studies: A methodology review", *Accounting & Finance, Volume 51, Issue 1 March 2011, pp. 207–234*

Due to the nature of the statistical test, mistakes cannot be ruled out entirely. The aim of statistical testing is to reduce both potential mistakes to the greatest possible extent. The power of a test can only be measured in the case of a correct rejection of the null hypothesis. It indicates the probability of identifying a wrong hypothesis. The power thus gives a good indication about the quality of the test: the higher the power, the more likely a mistake can be ruled out.[380]

Univariate and multivariate testing methods are both used to identify the significance of one or several variables within a statistical sample.

5.3.1. Univariate statistical methods

Univariate statistical testing methods focus on the influence of one factor on the abnormal return. This makes the statistical analysis relatively simple. Various statistical standard testing methods can be applied. They have evolved over time and are constantly refined. Eventually they all have the same aim; namely, to test the significance of descriptive statistical patterns.

These test methods are characterised as either parametric or non-parametric testing methods. Parametric tests are easier to apply and are more commonly used, though they do have stricter requirements to the underlying population.[381] The tested sample must have an interval scale and a normal distribution. The quality of the parametric standard tests is high, and are particularly valid for large data samples with short event time frames from stock markets with normally distributed returns (like the New York Stock Exchange).[382]

If one or several of these conditions are not fulfilled, non-parametric test methods should be considered as a stable alternative. The pre-conditions of test procedures are less strict; for example, it is not required to know the sample's population parameters such as the mean or variance. Non-parametric tests can be applied for any given scale of quantitative and qualitative measures, whether it be an interval, ordinal, ratio or nominal scale.[383] On the

[380] Hair, J. et al. (2013):"Multivariate Data Analysis: Pearson New International Edition", *Pearson Education Limited, 7th Edition*
[381] Lozano, J. (2006): "Nonparametric statistics", *University of Goettingen, Graduate Seminar in Applied Statistic*
[382] Corrado, C. (2010): "Event studies: A methodology review", *Accounting & Finance, Volume 51, Issue 1 March 2011, p. 213*
[383] Hoskin, T. (unknow): "Parametric and Nonparametric: Demystifying the Terms", *Mayo Clinic CTSA BERD Resource*

down-side, non-parametric are less precise than parametric tests[384] and require larger data samples. Non-parametric tests are also not very well applicable for long time horizons.[385]

The applied test statistics generally distinguish between the number of samples (two or more) and whether the samples are independent from each other or not. As the various sub-samples within this dissertation are independent from each other, only testing methods for independent samples will be described.

5.3.1.1. Parametric testing methods

The most commonly used parametric tests are the t-test for up to two samples and the one-factor analysis of variance for more than two independent data samples.

Number of Samples	*Type of sample*	
	Independent	**Dependent**
2	t-test	t-test for dependent samples
>2	one-factor ANOVA*	one-factor ANOVA with repeated measures

*Analysis of variance (ANOVA)

The t-test dates back to 1908 when William Sealy Gosset, working for the Guinness Brewery, tested the quality of the brewing process. Gosset's method made it possible to determine the brewing quality with a specified likelihood on the basis of a statistical population sample.[386]

The t-test, also called the student t-test, evaluates the risk of a Type 1 error. The result of the test allows one to make a statement of the probability that a Type 1 error occurs; this risk assessment factor is called α.

[384] Given the assumption that both methods could be applied
[385] Longer time horizons span a period of several months or even years
[386] Lovric, M. (2011): "International Encyclopaedia of Statistical Science", *Department of Statistics and Informatics Faculty of Economics*

In order to standardize the results, pre-defined confidence levels have been introduced. Confidence intervals sort the test results into quintiles and make it possible to make judgements about the null hypotheses within a certain probability. The most commonly used confidence levels are the 1%- (99% true), 5%- (95% true), and the 10%-level (90% true). The standardized confidence interval of 95% has been established for most economic and management research studies. This means that there is at least a 95% chance to rule out a Type 1 error (the rejection of a true null-hypothesis).[387] The distribution of data points is different from the normal, bell curve distribution and has a particular t-shape. With an increasing number of data points, the t-distribution starts to resemble a normal distribution. It fully converts to the normal distribution at an infinitive number of observations (n). The larger the data sample, the higher the probability that the acceptance or rejection of a test statement is in fact correct. The t-table shows that the conversion from the t-shape towards the normally distributed bell curve happens exponentially up to the level of 30 observations. For larger samples, the increase of the level of confidence is only marginal, with almost no difference between samples of 100 or 500 observations.

The student t-test variable, the firm-specific abnormal return, has a normal distribution with a pre-defined variance. The distribution has N-1 degrees of freedom. The degree of freedom is the sample size (N) minus the number of to-be identified variables.

The general t-test:

$$t = \sqrt{N}\,\frac{\bar{X} - \mu_0}{S}$$

N	= sample size
$\bar{X}$	= mean sample value
μ_0	= hypothetical mean value of the population
S	= standard deviation

For the test of abnormal returns the t-test is adjusted to the following function:

[387] In other academic disciplines (e.g. medicine) the confidence level might be set higher, mostly due to the fact that mistakes lead to severe consequences and a 95% confidence is therefore regarded as too inaccurate.

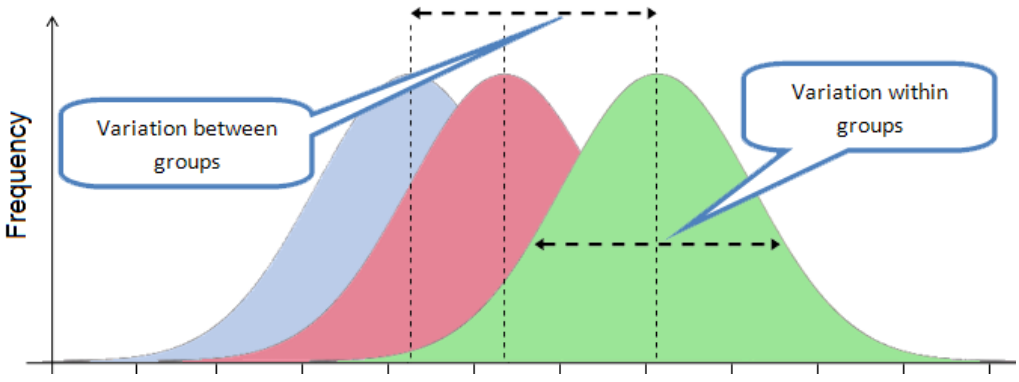
$$t = \sqrt{N}\ \frac{CAAR_{t1\text{-}t2}}{\hat{\sigma}\ (CAR_{t1\text{-}t2})}$$

N	= sample size
$CAAR_{t1\text{-}t2}$	= cumulated average abnormal return in the event window (t1-t2)
$\hat{\sigma}\ CAR_{t1\text{-}t2}$	= estimated standard deviation in the event window (t1-t2)

The simplifying assumptions of the t-test may lead to prediction errors. The cross sectional correlation and changes in the volatility of the observed sample are the major source of prediction errors. If there is a high risk of encountering these errors, it is advisable to use a Patell test.[388]

For the statistical evaluation of more than two independent samples, the so-called ANOVA (one factor analysis of variance) is used. The term ANOVA encompasses a group of statistical methods that evaluate if two (or more) samples significantly differ from each other. The central technique for this analysis is the comparison of the samples' variances. The variance of the sample values is explained by the impact of one specific factor. The basic form of the ANOVA is very similar to the t-test, with the exception that it compares two different samples with each other.

Figure 20: Data variation analysis



Source: Mater Research: "Confidence Interval of differences and Forest Plots"

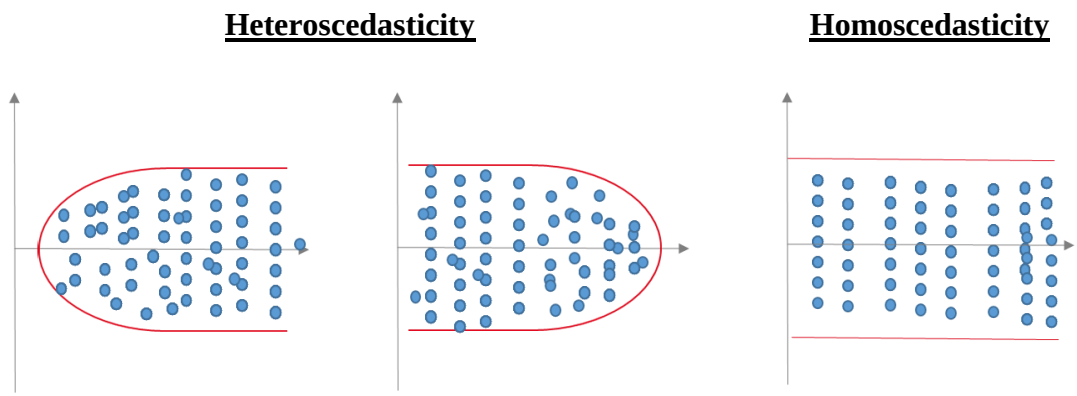
[388] Binder, J. (1998): "The Event Study Methodology Since 1969", *Review of Quantitative Finance and Accounting, 11 (1998): 111–137*

The examination procedure calculates whether the expected value of the variables differ within pre-defined groups. In a second step, it is tested if the variance within a group is larger or smaller compared to the variance between the different groups. The result of this testing method tells us whether the sample grouping makes "sense" from a statistical point of view. If the two or more groups are significantly different from each other, the grouping is statistically relevant. Let's suppose that both groups are statistically different from each other. Then we can assume that different regularities determine the results of both samples and that the division of the two samples makes sense.

In order to apply the ANOVA testing method, these pre-conditions need to apply:

- The initial sample must be normally distributed[389],
- The sample factors must be independent from each other, and
- The residual value or error term of the independent variable (the "noise" or scattering around the linear regression) must be stable across all values. The technical term is "homoscedasticity". It must not increase or decrease with increasing values but shall remain "random"[390]

Figure 21: Sample distribution patterns, homo- and heteroscedasticity



Source: Laerd statistics

[389] This is a basic assumption for all parametric testing methods
[390] Courtney, E. W. (2017): "Linear Regression: Uses and Interpretations", *Digital Edition*

5.3.1.2. Non-parametric testing methods

In summary, non-parametric testing procedures have to be applied when the conditions for parametric tests are not fulfilled. Non-parametric tests have been developed to overcome the criticisms of the assumptions that parametric tests make.[391] The main reason for an application of a non-parametric test would be in the case of a non-normal distribution of the underlying data sample.

Number of Samples	*Type of sample*	
	Independent	**Dependent**
2	U-test	Wilcoxon signed-rank test
>2	H-test by Kruskal and Wallis	Rank variance test by Friedman

The Mann-Whitney-U-test, also called "Wilcoxon rank-sum test", tests if the general tendency for two independent samples are different from each other.[392] The test is similar to the t-test, and are applied when the pre-conditions for the latter are not fulfilled.[393] The rank test does not take into account the exact nominal values of the samples, but instead translates these into ranks. The smallest value of both samples is assigned rank 1, the second smallest rank 2 and so on. The precise differences between the resulting values are not relevant for this method, and if two or more values are equal, they are grouped together and the average group rank is assigned to each value.[394] Finally, rank sums are calculated for both samples by simply adding the rank values.

The significance of this z-value can be interpreted with the help of the z-distribution table. If the z-value is below the reference value, then the samples are significantly different. A second testing method is the general sign test. It is an extremely simple yet effective binominal test to assess significance. The abnormal post event returns are sorted as positive and negative

[391] Only statistical methods for independent factors are covered here
[392] Martin, W. (2012): "Quantitative and Statistical Research Methods: From Hypothesis to Results (Research Methods for the Social Sciences)", *Jossey-Bass*
[393] The only important pre-condition for the U-test is that ordinal data is processed
[394] Imagine that 2 values are equal and would take the rank 7 and 8, then both values are assigned the rank 7.5 ((7+8)/2)

returns. Often, a threshold value (e.g. +/- 0.5%) is taken into account in order to avoid the impact of marginal deviations around the zero point. The expected result of a normal distribution would result in 50% of observations being above zero and 50% of observations being below zero.[395] If the results significantly differ from a 50/50 distribution, the likelihood is high that the values are in fact different from zero. In comparable event studies, 60-70% of abnormal returns had a positive sign. This was regarded as a clear sign of significant results. The general sign test can also be further redefined by comparing the post event results with the number of positive or negative pre-event abnormal returns.

The H-test by Kruskal-Wallis is very similar to the previously described U-test; the only difference is that it is applied for the measurement of variance for more than two samples. The H-test starts with the formulation of the null-hypothesis (H0), which claims that there is no difference between the samples.

In order to test the null hypothesis, the H-value is calculated. The basis of the calculation is, very similarly to the Mann-Whitney-U-test, the use of ranks for the observed values of the analysed groups (samples):

$$H = \frac{12}{n(n+1)} \sum_{h} \frac{S_h^2}{n_h} - 3(n+1)$$

df = k-1,

where

n = number of values within a group

N = total size of groups (sample size)

Sh = sum of ranks for each group (sample)

k = number of groups

The H-value is compared to a standardised value from the H-table[396]. The samples are significantly different from each other if the H-value is larger than the value of the H-table. This means at the same time that the null-hypothesis is rejected (and vice versa).

[395] Dutta, A. (2014): "Parametric and Nonparametric Event Study Tests: A Review", *Published by Canadian Center of Science and Education*

[396] The values are based upon a chi-square distribution

5.3.2. Multivariate testing methods

The learnings that we can draw from the univariate analysis are very insightful; however, they inherently do not account for any other influencing factors. How do the different variables influence each other? Are they correlated, and if so, do they increase or decrease the impact of the other variables? This particularly concerns the aims of this dissertation, and understanding which combination of influencing factors[397] leads to the highest (or lowest) abnormal return is essential.

Multivariate testing methods have been established to overcome this one-dimensional view. Instead of measuring the impact of one factor, multivariate tests incorporate multiple factors in the statistical testing set-up.[398] While the theory might sound compelling to academic researchers, the practical application is complicated and error-prone. While statistical programmes make it relatively easy to perform the calculations, the delivered results are often not as helpful as expected. The large number of independent variables increases the need for a larger sample size. If the sample is not large enough, the results will certainly not be statistically viable. A further problem to consider is the question of interdependency between the variables which might subsequently alter the power of the statistical tests.

5.3.3. Conclusion on statistical testing methods

The choice of statistical testing methods depends on the type of question that should be answered and the characteristics of the data sample.

The goal of the dissertation is to find out if M&A transactions in the defence industry have an overall impact on value creation, and to determine what the factors influencing value creation and destruction might be. It is neither realistic, nor the intention of the author to develop a mutually exclusive, collectively exhaustive formula for M&A transactions. Instead, this dissertation concentrates on single variables and their impact on the observed values. After a careful assessment, the author has concluded that the structural problems of multivariate analysis, such as too few observations for each sub-sample and limitations in the interpretation of results, outweigh the potential for additional insights gained. For this reason, the statistical analysis will solely focus on univariate methods.

[397] Variables like the country of origin, strategic direction or the payment method

[398] Rencher, A. and Christensen, W. (2012):"Methods of Multivariate Analysis 3rd Edition", *Wiley Series in Probability and Statistics*

The question of the application of parametric vs. non-parametric test statistics is based on the size of the underlying data sample, the quality of the observations and the distribution characteristics of the sample. Parametric and non-parametric tests both follow the same goal: the tests are designed to identify and prove the significance of statistical distribution results. Parametric tests are generally easier to apply and are said to deliver more precise results.[399]

As the underlying data is sufficiently large, with over 160 normally-distributed observations, parametric testing methods are very likely to deliver meaningful results.[400]

5.4. Conclusion on measuring M&A performance through event studies

Today the validity of event studies in measuring short term value effects can be regarded with confidence, as has been demonstrated by decades of research and practical applications. Even in insider trading lawsuits, event studies have been the method of choice for the estimation of the trading effect. This validates the robustness and the meaningfulness of event studies in theoretical and practical research for short time frames.[401] The predictive power of short term stock performance for long term stock market value creation is still vividly debated without a clear result.[402] Given the fact that this dissertation uses a short term horizon of 10 days (+/- 5 days), the use of event studies was determined to be the most appropriate and potentially insightful method.

The application of the market adjusted return model for the identification of abnormal returns is rather a methodological exception to the norm. Previous studies have proven the validity of results, especially with regards to short time frames; indeed, more complex models have not brought superior statistical results.

[399] Dodge, Y. (2009): "The Concise Encyclopaedia of Statistics", *pp. 376-377, Springer Reference*
[400] The short time horizon of the analysis is a further argument in favour of parametric tests.
[401] Jetley, G. (2010): "The Price Isn't Right: Event Studies In M&A Suits", *Analysis Group New York City*
[402] See: Capron, L. (1999): "The long-term performance of horizontal acquisitions", *Strategic Management Journal, 20 (11), pp. 987–1018* and also Loughran, T., and Vijh, A. (1997): "Do long-term shareholders benefit from corporate acquisitions?" *Journal of Finance, 52 (5), pp. 1765–1790*

6. Empirical analysis: Value effects of M&A in the Defence Industry

The aim of this chapter is to measure the financial value creation impact of M&A transactions in the defence industry. The perspective of this dissertation is focused on the impact of equity investors at the time of the announcement of the M&A transactions.

The following aspects will be covered in this chapter:

- The identification and selection of a suitable data sample: Particularly, large, legally finalized M&A deals in the defence industry, announced between 1992 and 2016. The acquirer must have been stock market listed during the M&A announcement.
- The empirical calculation of value creation effects: The abnormal stock market return of the acquiring company will be measured and evaluated. The analysis is focused on the identification of strategic factors which determine the value creation or value destruction impact.
- The statistical tests of empirical results: The statistical significance of the empirical results will be tested.

6.1. Description of the data sample

The 174 hand-selected M&A deals took place in the 25-year time frame between 1992 and 2016. These deals form the basis for the entire empirical analysis and the resulting study results. It is important to select the data sample in a stringent and conceptually meaningful way. Only if this is ensured can the empirical results can lead to valuable academic and practical insights.

6.1.1. Sample selection criteria

The initial sample selection has been extracted from the Thomson Reuters One Banker M&A Database, completed by M&A transactions that were published in defence industry publications.[403] In order to streamline the bulk of pre-selected M&A deals,[404] the following 10 selection criteria have been applied for the final deal selection:

[403] "Defense News", "Jane's", and consulting firm publications were helpful sources
[404] The database initially suggested over 2,000 defence M&A deals

1. Timeline: Deal announcements which took place between 1992-2016 (25 years)

2. Legal closing: Only deals that have been legally closed

3. Defence Industry: Focus on companies that are active in the defence industry.
   At least one involved transaction partner (acquirer or target) must have a defence industry share of 50% of revenues. Alternatively, the business unit which is involved in the M&A transaction must be active in the defence industry.[405]

4. Geography: Only North American (United States & Canada) and European deals and acquirer
   Rationale: Only very few stock market-listed defence companies exist outside Western Europe and North America and the quality of stock market data is often very poor.[406]

5. Critical deal size: Only deals with a minimum of value of $50 million.
   Rationale: The deal value has proved to be efficient in identifying enough deals but also to concentrate on relevant transactions of sufficient size.

6. Critical firm size: The target company's revenues must be at least 1% of the acquirer's revenues.
   Rationale: The firm size must be large enough in order to make a stock market reaction likely. M&A deals with firms below the 1% revenue threshold value are excluded.

7. Corporate control: Only majority, full acquisitions or merger of firms or sub-divisions
   Rationale: The deal shall qualify for the change of corporate control.

8. Legal structure: The acquirer must be a publicly traded company with at least 50% free float.[407] The target company can be either publicly listed or a private company.

[405] The identification of companies started by using the appropriate SIC Codes for Aerospace & Defence firms. The classification is however far too broad and encompasses a mainly companies from the civil aircraft industry. It was necessary to manually select companies, mostly by analysing their annual report or other public sources.
[406] This argument is especially valid for China and Russia, two countries with a large defence industry.
[407] This definition avoids the consideration of deals of closely held companies which often show unusual share price reactions due to low trading volumes.

9. Stock market data availability: The stock market data for the pre- and post-announcement period (+/- 30 days) must be available.

10. Relevance of M&A deal: No major news may interfere with the M&A announcement. *Rationale:* It is vital to filter out M&A deals that are highly impacted by abnormal stock market return effects other than the M&A transaction.[408]

The sample data selection is based upon quantitative data. There are, however, shortfalls in the data selection process that cannot be completely ruled out. The weakest point lies in the limited availability of stock market trading data. Even though a variety of free and pay-for sources have been used,[409] a lot of stock market trading data could not be retrieved. This has limited the number of M&A transactions in the underlying data sample. Due to the nature of data availability, a survivorship bias is the consequence.

A further bias is grounded in the minimum deal size of $50 million. The fact that the deal value has remained stable over the 25-year period gives preference to more recent M&A deals. Due to inflation effects, the threshold amount is, in relative terms, lower today than it was in 1992.[410] The third potential area for mistakes is the exclusion of M&A transactions due to simultaneous events with an anticipated effect on the share price. Here too, personal judgement in the evaluation of events may play some role. In order to rule out personal judgement to the most possible extent, for each single M&A transaction has been doubled-checked with the help of objective data.[411]

Despite the survivorship bias, the bias towards more recent deals and the potential impact of personal judgement, the data sample can be regarded as a fair and objective reflection of large

[408] The following analyst statement reveals a situation where this may happen: "Lockheed announced its plans [*to merge its IT business with Leidos*] on Tuesday during the company's fourth-quarter earnings call; following the results, the firm's share price lost almost 4 percent. However, many believe that the decline was largely the result of shareholders' worries about the company's failure to meet analysts' expectations for 2016 earnings per share", see: http://finance.yahoo.com/news/does-lockheeds-leidos-deal-mean-140049108.html

[409] The main data sources are the free of charge Yahoo Finance Historical Stock market data base and the pay-for data base Thomson Reuters OneBanker

[410] For the United States, the average inflation rate had been 2.338% from 1992 until 2016. According to the US CPI data $1 in 1992 has the same purchasing power as $1.74158 in 2016. A slightly lower inflation effect could be observed in Europe with around 2% annual inflation the Eurozone since 1992. See also http://ec.europa.eu/eurostat/statistics-explained/index.php/Inflation_in_the_euro_area

[411] According to this rule, all deals are exempt from the sample if quarterly or annual earnings announcements have been made which "surprise" investors (positively or negatively). The evaluation of the "surprise effect" is based on deviations of expected consensus forecasts and actual announcement results.

M&A deals in the global defence industry. The selected sample serves as a meaningful basis for the empirical analysis.

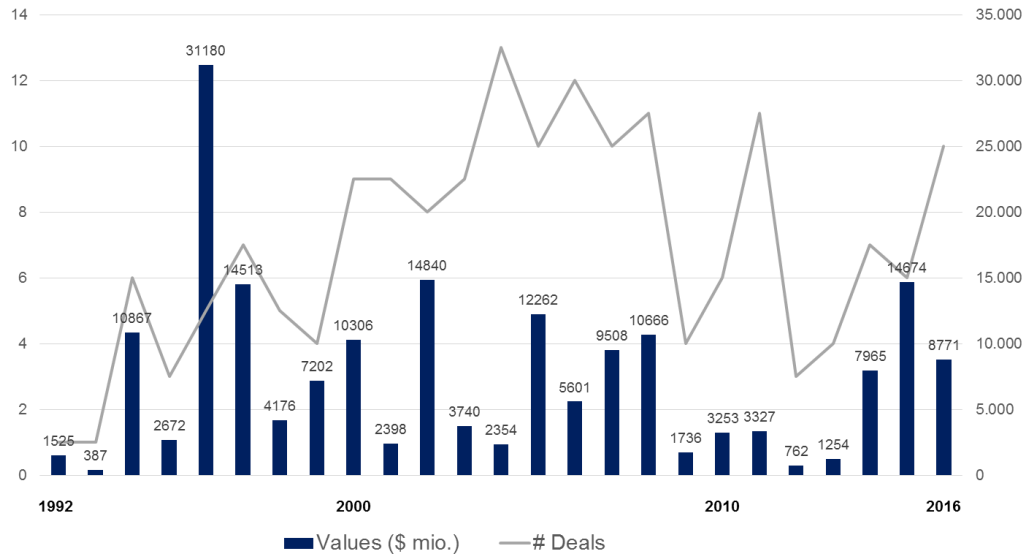
6.1.2. Description of the selected data sample

The data sample consists of 174 selected M&A deals over the 25-year-period from 1992-2016. An overview of the M&A deals can be found in the appendix.

The total deal value amounts to $186 billion. The variance of the deal values is high. The smallest deal in the sample has a transaction value of $50 million, while the largest deal was valued at $15 billion.[412] The average deal value of over $1 billion is strongly influenced by a small number of mega-deals.[413]

On average, each year 7 deals with a combined value of $7.4 billion were executed. Within this period, however, the annual figures fluctuate greatly, ranging from 1 deal and an annual value of $387 million (in 1993) to 13 deals and a combined transaction value of over $31 billion (in 2004 and 1996 respectively). The 10-year period from the mid-1990s to the mid-2000s brought accelerated M&A deal volume, mainly due to consolidation experienced by the US American defence industry consolidation. [414]

Figure 22: Overview of M&A sample deals 1992-2016



Source: M&A sample deals

[412] The acquisition of McDonnell Douglas by Boeing in 1996.
[413] The median deal value is much lower with $270 million.
[414] Seven of the ten largest deals took place between 1994 and 2002

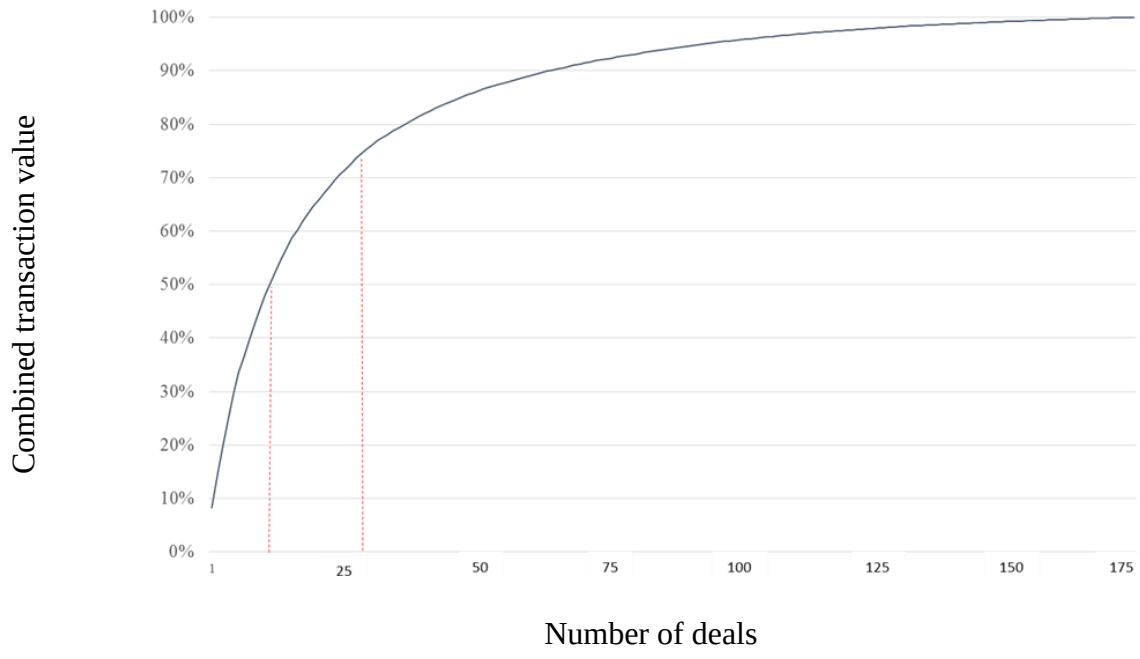
Most of the 174 selected M&A are small and medium-sized deals (77%). Despite the lower number of deals (23%), large deals and "mega-deals" account for over 80% of the aggregated transaction value.

Table 4: M&A sample deals by size

Deal size category	Value category ($ mio)	# deals	Transaction value ($ mio.)
Small	50-200	75 (43%)	8,016
Medium	>200-1,000	59 (34%)	26,327
Large	>1,000-5,000	30 (17%)	67,196
Mega-deals	>5,000	10 (6%)	84,4
Total		**174**	**185,944**

From the transaction value perspective, the size distribution is strongly biased towards large deals. This explains the strong difference between the average M&A deal size and the median value.[415]

Figure 23: Transaction value of M&A sample deals



Source: Own representation of M&A sample deals

[415] The average deal size is $1,085 million while the median is only $270 million.

The largest deal alone accounts for 8% of the total transaction value, roughly equal to the value of the 100 smallest deals (rank 75-174). The 12 largest deals combined have a transaction value of $94 billion, which corresponds to 50% of the sample value. The top 30 deals still account for 75% of total transaction value, while the 30 smallest deals only represent 1% with a combined value of less than $2 billion.

North American deals are not only more numerous, but the average deal is also three times larger than the average European deal.[416] These results are strongly influenced by mega-deals. All of the ten largest acquisition targets are based in the United States, and nine of these are also acquired by US firms.

The US is not only home to the largest deals but also to the majority of deals (79%).[417] One-fifth of the acquired firms are based in Europe (21%).[418]

Table 5: M&A sample deals by region

	Total	%	**North America**	%	**EU & RoW**	%
1992 - 2000	41	24%	34	*83%*	7	*17%*
2001-2009	86	49%	70	*81%*	16	*19%*
2010-2016	47	27%	34	*72%*	13	*28%*
Total	**174**	*100%*	**138**	*79%*	**36**	*21%*

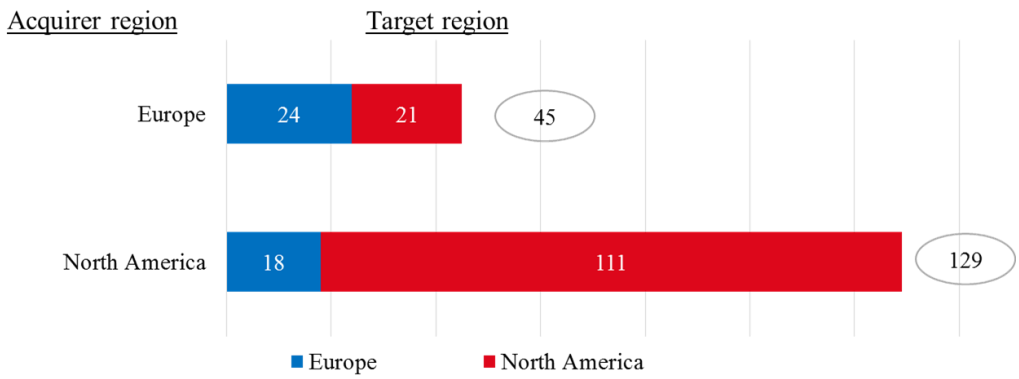
The geographical distribution of deals over time shows that US deals are dominant in all phases, with Europe making up some ground in recent years. Most of the acquisitions took place between 2000 and 2010, the peak of the US consolidation trend. The geographical distribution of deals reflects the general industry structure and the high degree of pressure to consolidate in the United States.

The majority of defence firms acquire targets within their country. Only 49 transactions (28%) are "cross border" deals.[419] Here, there is a clear difference between North American

[416] Average acquisition price of $368 million for European targets versus $1,251 million for North American targets
[417] 134 US American and 4 Canadian target companies
[418] 36 European and RoW target companies: 17 from Great Britain, 5 from France, three from Italy and from Sweden, two from Germany, and one acquisition for each of the following countries: Ireland, Israel, Switzerland, Norway, and South Africa.
[419] Cross border deals are M&A transactions that take place between companies of two different countries, but not necessarily two different continents.

and European firms. Most European deals are cross border deals, while in North America the exact opposite is the case. More than 85% of US acquirers buy American firms through so-called national consolidation deals.[420] Apparently, the special military and political partnership between the United States and the UK smoothen the US approval process for defence M&A transactions: out of 21 European acquisitions in the USA, 17 were executed by companies from the United Kingdom.

Figure 24: Overview of regional deal activity



Source: Own representation of M&A sample deals

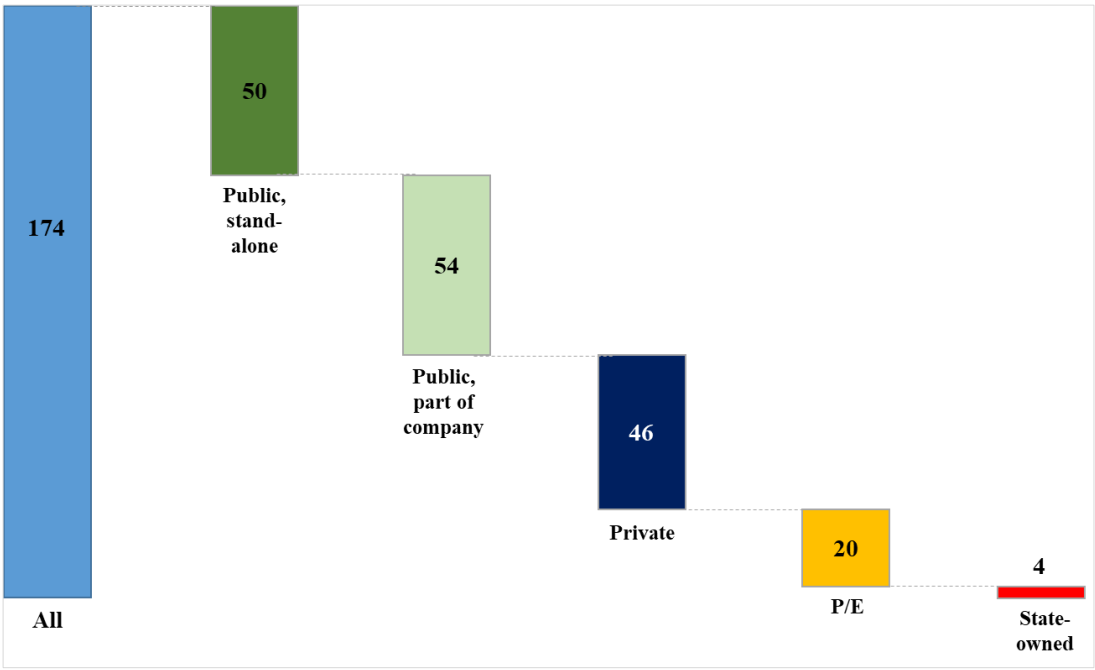
6.1.3. Description of the acquiring firms

Most acquirers are large defence companies that seek to consolidate the defence industry in their respective geographical market. The majority of firms are entirely focused on the defence industry. Many firms, especially in Europe and in the aeronautic industry, also have a strong or even predominant civil business.

According to the pre-defined selection criteria, all acquirers are stock market listed. Most of the target companies are either publicly listed (50 companies or 29%),[421] belong to a larger company as a separate entity, or are privately owned. About 12% of the target companies belonged to Private Equity funds, predominately a British and American phenomenon.[422] Only 4 companies were state-owned when they got acquired.

[420] In Europe (incl. RoW) 31 of 45 deals are cross-border deals which corresponds to 69%. In North America only 18 out of 129 deals (15%) are considered to be cross-border deals.
[421] 43 of the 50 stand-alone stock market listed companies were based in the USA.
[422] All of the 20 acquisitions from P/E firms were either executed in the USA (14) and in the United Kingdom (6).

Figure 25: Target Company by type



Source: Own representation of M&A sample deals

The 174 acquisitions were performed by 55 companies, so each acquirer bought three companies on average within the observation period. It is clear that the data is not equally distributed. The ten largest acquirers are responsible for 38% of M&A deals and for 70% of the accumulated acquisition value. That means that serial acquirers buy much larger companies, more often.

Table 6: The top 10 acquirers

#	Company	Coutry	# deals	Combined value ($m)
1	Lockheed Martin	USA	7	31.526
2	Northrop Grumman	USA	10	25.467
3	Boeing	USA	4	22.893
4	Raytheon	USA	5	15.917
5	BAE Systems	UK	4	10.231
6	Harris	USA	5	6.257
7	L4	USA	12	5.404
8	Finmeccanica	Italy	3	5.803
9	Thales	France	3	3.179
10	Cobham	UK	13	2.849
Sum			66	129.526

The acquirer was in most cases significantly larger than the target company.[423] Most acquirers bought targets which made less than 5% of their own revenues. But still 46% of target companies achieved over 10% of the revenues of their acquirer.

Table 7: Target companies by relative size

Relative size of target company	**1-5%**	**5-10%**	**10-20%**	**20-50%**	**50-75%**	**>75%**
Number of companies	56 (33%)	37 (21%)	43 (25%)	22 (13%)	11 (6%)	5 (3%)

The 16 M&A deals, mostly mergers, which lead to an increase of revenues by over 50% were unanimously US deals.

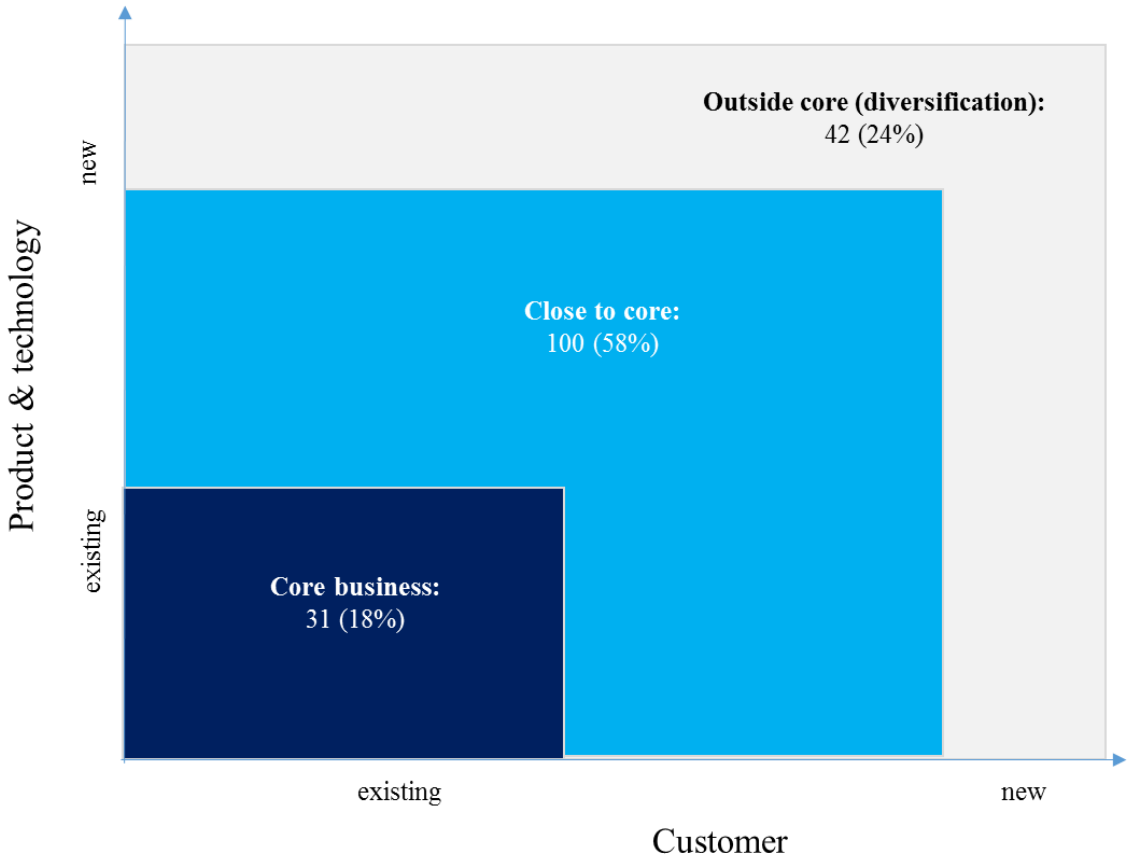
Most acquirers paid in cash (84%), followed by a mix of cash and shares (9%). Only 12 transactions (7%) were paid for completely with shares. Large transformational mergers were more likely to be paid by shares than smaller deals.

6.1.4. The strategic rationale behind M&A transactions

The analysis of an acquisition's strategic intent is the central pillar of this dissertation. Acquisitions of core businesses, which encompass the same customer and the same technology (mostly national consolidations), make up 31 deals or 18% of total transactions. The majority (100 deals, 58%) of acquisitions are executed in adjacent businesses, otherwise known as close-to-core deals. The remaining 42 deals are considered to be external growth options outside of the existing business. These diversification deals have neither the same customer nor the same technological basis. In the defence industry, diversifications are often growth acquisitions in civil industries.

[423] Measured as the relative revenue of target companies versus acquirers

Figure 26: The strategic direction of sample M&A deals



Note: The majority of sales volume (50%) indicates if an acquired customer or technology is considered as existing or new

Source: Own representation of M&A data sample deals

Overall, it can be summarised that the majority of M&A deals (about 80%) took place in the USA, and most of the acquirers are US companies. There are fewer and smaller M&A deals in Europe, but these are internationally more diverse, with over 50% being cross border deals. The total transaction value is highly influenced by large M&A deals and by the top 10 serial acquirers. The deal activity was highest from 2000-2010 during the wave of US consolidation. While most deals are considered as "close-to-core" to the existing business, acquisitions within the core business and diversification deals play an important role, too.

6.2. Applied test methodology

The following sub-chapter explains in more detail which analysis and tests are applied by this dissertation. The time frame of analysis, the applied market indices and the normalization logic are diligently selected.

The main priority is set upon the quality and correctness of the research. In the case of different choices the ease of the practical application is considered, too.

6.2.1. Analysis time frame and calculation of abnormal returns

The sample deal data and the abnormal return data have been collected for a period of 60 days, 30 days around the event date. In order to concentrate on short-term value creation effects, which provide the highest information, the focus of analysis is set on much shorter time frames, namely the 4- and the 10-day period around the event date. These short timeframes allow to filter out side events to the highest possible extent.

The short time frame of empirical analysis also has a direct impact on the calculation of abnormal returns. The accuracy of analysis is, for the given timeframe, provided through the no factor method. Here, the general market index replaces the market model which is far more complicated to apply in practice.

6.2.2. Applied market indices

As discussed in Chapter 5, the applied market index plays an important role in the calculation of abnormal returns. The question has been raised as to whether an industry specific index or a regional general market index should be used; the most suitable industry specific indices for this simple are the "S&P Aerospace & Defense Select Industry Index"[424] for the United States and its European equivalent, the "Eurostoxx TMI Aerospace & Defence".[425]

After careful analysis, the author has decided to select the respective local market portfolio[426] as a reference index instead of the industry index. These arguments show that the industry indices are not a suitable alternative:

[424] For further information, see: https://us.spindices.com/indices/equity/sp-aerospace-defense-select-industry-index

[425] For further information, see: https://www.stoxx.com/index-details?symbol=SXPARO

[426] S&P 500 for USA, TSX for Canada, FTSE 100 for UK, CAC 40 for France, MIB for Italy, OMX for Sweden, OBX for Norway, DAX 30 for Germany, and TA 100 for Israel.

1. Not the perfect fit: At least half of the companies in the index make most of their business with civil aerospace products. The defence industry is underrepresented.[427]
2. Low diversification: The US index contains just 37 shares, and the European index is even less diversified with only 16 shares. The largest shares have a value of over 4% and 11%, respectively; thus, the effect of the cross reference between the single merger or acquisition and the portfolio is strong. This could be reflected in an event-induced market reaction which would in return lead to an underestimation of the impact of the event.
3. Limited availability: The US "S&P Aerospace & Defense Select Industry Index" has only been active since November 2010.

6.2.3. Sample data normalization and statistical testing methods

The data sample will be statistically tested for its distribution patterns. Based on the results, the applicable significance testing methods are defined.

The original sample is strongly influenced by a few outlier values. In order to "normalize" the data sample, outlier values which lie outside the 25% and 75% quartile according to the Boxplot logic[428] will be excluded from the data sample. Ten out of the 174 sample deals have been identified as outliers (marked in red in the graphics). The adjusted data sample includes 164 deals with values ranging from -11.9% to 13.2% (for the +/- 5 day period). The range of values has thus been reduced from 35% to 25% for the normalised sample. The number of excluded deals is relatively low and the normalised sample size remains large enough for further analysis. The sample has been tested for its distribution characteristics. The results show that the abnormal returns for the acquiring firm for both sample time frames[429] are normally distributed. The normal distribution pattern allows to test the significance of results with parametric statistical methods.

[427] Only 6 out of the 16 stocks of the "Eurostoxx Aerospace & Defence" belong to the "Defense" sub-sector. 10 stocks are referred to the sub-sector "Aerospace".
[428] According to the SPSS Boxplot logic, see: Smith, G. (2015): "Essential Statistics, Regression, and Econometrics", *Academic Press; 2 edition*
[429] +/- 5 days and +/-2 days

Table 8: Statistical overview of M&A sample deals

			Statistics	Standard error
Performance +/- 5 days	Mean value		1,6381%	0,36326%
	95% confidence interval of the mean value	Lower limit	0,9208%	
		Upper limit	2,3554%	
	5% trimmed mean value		1,6358%	
	Median		1,4866%	
	Variance		21,641	
	Standard deviation		4,65199%	
	Minimum		-11,94%	
	Maximum		13,22%	
	Width		25,16%	
	Interquartile range		6,85%	
	Skewness		,022	,190
	Kurtosis		-,111	,377
Performance +/- 2 days	Mean value		0,8436%	0,28110%
	95% confidence interval of the mean value	Lower limit	0,2885%	
		Upper limit	1,3987%	
	5% trimmed mean value		0,8039%	
	Median		0,5982%	
	Variance		12,959	
	Standard deviation		3,59989%	
	Minimum		-8,26%	
	Maximum		10,86%	
	Width		19,12%	
	Interquartile range		4,51%	
	Skewness		,242	,190
	Kurtosis		,305	,377

Source: Results of SPSS data analysis, entire sample

The results of the statistical testing will be presented in the following way:

Table 9: Categorization of statistical results

		Value creation result	
		According to hypothesis	**Contrary to hypothesis**
Statistical Significance	**Significant**	Supported – statistically significant	Rejected – statistically significant
	Not significant	Supported - not significant	Rejected - not significant

6.3. Empirical test of value creation hypotheses

The following sub-chapter will present the empirical results of the event study. This quantitative section is the core of this dissertation.

In as first step, the abnormal return patterns of the complete normalized data sample are presented. Then the formulated hypotheses of M&A value creation for acquirers are tested. In the last step, the value creation for target company shareholders, though not the focus of this dissertation, will be approximated with the help of collected take-over premiums.

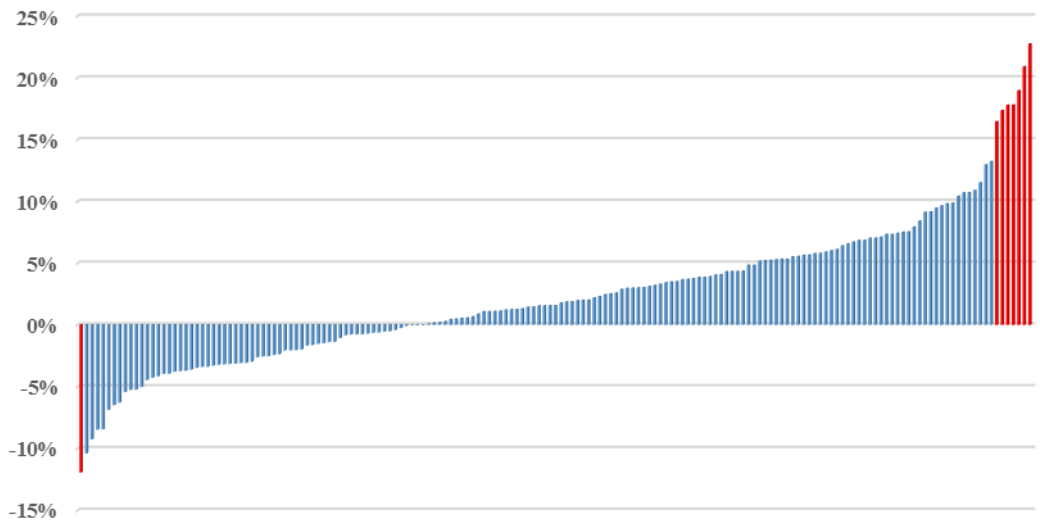
6.3.1. Overview of empirical results

The complete data sample of 174 deals shows a broad range of values with a span of almost 35% between the minimum (-11.94%) and the maximum (22.74%) value.[430] The average value is highly positive with 2.32%; and more than two third of the deals (68%)[431] show a positive abnormal return in the 5 day window before and after the event.

[430] All values based on the +/- 5 day time frame
[431] Only deals with an abnormal in excess of +1% or under -1% are taken into account

The median is significantly lower with 1.56% but still substantially positive. The large difference between the average and the median is caused by the extreme upper-tail values. Over one third (60 of the 173 deals) are either smaller than -5% or larger than +5%.

Figure 27: Abnormal returns sample deals (+/- 5 days)



Source: Own representation based on M&A sample deals

Note: Values in "red" have been excluded due to normalization

6.3.2. Hypothesis 1: Acquisitive growth

Hypothesis formulation:	Positive value creation through external acquisitive growth
Testing procedure:	Test of the value creation of all sample M&A deals
Sample size (n):	164 M&A deals
Results:	• The mean value creation of the 5-day period yields a positive return of 1.64%. • The mean value creation of the 2-day period yields a positive return of 0.84%.

Statistical testing:	Application of the t-test for two independent samples. The results are statistically relevant and different from zero: • For the +/- 5 day performance significant at the 1% level • For the +/- 2 day performance significant at the 5% level
Hypothesis evaluation:	*Supported and significant* The growth hypothesis is supported by positive mean abnormal returns and statistically significant results.

Test of significance:

Test value = 0	T	Df	Sig. (2-sided)	Mean difference	95% confidence interval	
					Lower	Upper
Performance +/- 5 days	4,509	163	,000	1,63812%	0,9208%	2,3554%
Performance +/- 2 days	3,001	163	,003	0,84360%	0,2885%	1,3987%

Descriptive statistics:

	N	Mean value	Standard deviation	Mean standard error
Performance +/- 5 days	164	1,6381%	4,65199%	0,36326%
Performance +/- 2 days	164	0,8436%	3,59989%	0,28110%

6.3.3. Hypothesis 2: Active business portfolio management

Hypothesis formulation:	Superior value creation through active portfolio management
Testing procedure:	Comparison of deal performance of top 15 acquirers against the remaining deals of the sample.
Sample size (n):	68 deals by top 15 acquirers and 96 deals by remaining companies.
Results:	Superior value creation of active portfolio acquirers. • Deal performance of active acquirers*: 2.0%; 1.1%

	• Deal performance of non-active acquirers*: 1.4%; 0.7%
Statistical testing:	The Levene test to compare the variances of two sub-samples. For both time frames, both sub-samples are not statistically different from each other.
Hypothesis evaluation	*Supported – not significant* The synergy hypothesis is supported by the mean values which are superior for firms that actively manage their business portfolio with multiple M&A transactions. The values are however not statistically significant different from each other.

Descriptive statistics:

		N	Mean Value	Standard deviation	Standard error
Performance +/- 5 days	no Active portfolio management	96	1,367%	4,532%	,463%
	Active portfolio management	68	2,020%	4,824%	,585%
Performance +/- 2 days	no Active portfolio management	96	0,652%	3,573%	,365%
	Active portfolio management	68	1,113%	3,647%	,442%

Test of statistical significance:

		Levene test of variance homogeneity		T-test for mean value equality				
		F	Significance	T	df	Sig. (2-sided)	mean difference	standard error of difference
Performance +/- 5 days	Varianzen sind gleich	,310	,578	-,885	162,0	,378	-,65277%	,738%
	Varianzen sind nicht gleich			-,875	138,7	,383	-,65277%	,746%
Performance +/- 2 days	Varianzen sind gleich	,028	,867	-,807	162,0	,421	-,46098%	,571%
	Varianzen sind nicht gleich			-,804	142,6	,423	-,46098%	,573%

6.3.4. Hypothesis 3: Cost synergy preference

Hypothesis formulation:	Superior value creation of cost synergies versus revenue synergies
Testing procedure:	Comparison of the value creation of national M&A deals (cost synergies) with cross border M&A deals (revenue synergies). M&A deals outside the core business are excluded from the data samples.
Sample size (n):	89 national M&A deals and 33 cross border M&A deals
Results:	• The mean value creation of cost synergies yields a value of 3.6% (+/-5 day period) and 1.8% (+/-2 day period) • The mean value creation of revenue synergies yields a value of 2.7% (+/-5 day period) and 1.8% (+/-2 day period)
Statistical testing:	The Levene test to compare the variances of two sub-samples. For both time frames, both sub-samples are not statistically different from each other.
Hypothesis evaluation:	*Supported – not significant* The synergy hypothesis is supported by the mean values which are superior for expected cost synergies than revenue synergies. The values are however not statistically significant different from each other.

6.3.5. Hypothesis 4: Relatedness of acquired business

Hypothesis formulation:	Superior value creation of "core" business acquisitions compared to "close-to-core" acquisitions and "out-of-core" (unrelated) acquisitions

Testing procedure:	Comparison of three M&A deal sub-samples according to the acquisition strategy ("core" vs. "close-to-core" vs. "out-of-core" acquisitions)
Sample size (n):	• "Core" M&A deals: 24 • "Close-to-core" M&A deals: 98 • "Out-of-core" M&A deals: 42
Results:	• "Core" M&A deals*: 6.7%; 3.5% • "Close-to-core" M&A deals*: 2.5%; 1.4% • "Out-of-core" M&A deals*: -3.4%; -2.0% *(+/- 5 days performance; +/- 2 days performance)
Statistical testing:	Application of the ANOVA to compare three independent samples. The results are statistically different from each other: • For the +/- 5 day performance significant at the 1% level • For the +/- 2 day performance significant at the 1% level
Hypothesis evaluation:	*Supported – significant* The relatedness of acquired businesses hypothesis is strongly supported by superior performance of related M&A deals versus non-related deals. The results are statistically significant at the 1% level.

Descriptive statistics

		N	Mean value	Standard deviation	Standard error	95%-confidence interval	
						Lower value	Upper value
Performance	close to core	98	2,53%	3,45%	0,35%	1,84%	3,22%
+/- 5 days	core	24	6,74%	3,58%	0,73%	5,23%	8,26%
	outside core	42	-3,36%	2,82%	0,44%	-4,24%	-2,48%
	Gesamt	164	1,64%	4,65%	0,36%	0,92%	2,36%
Performance	close to core	98	1,41%	3,38%	0,34%	0,73%	2,08%
+/- 2 days	core	24	3,49%	3,40%	0,69%	2,06%	4,93%
	outside core	42	-1,98%	2,24%	0,35%	-2,68%	-1,28%
	Gesamt	164	0,84%	3,60%	0,28%	0,29%	1,40%

Test of statistical significance (ANOVA)

		Square sum	df	Mean square	F	Significance
Performance +/- 5 days	Between groups	1752,283	2	876,141	79,461	0,000
	Within groups	1775,195	161	11,026		
	Combined	3527,478	163			
Performance +/- 2 days	Between groups	534,446	2	267,223	27,266	0,000
	Within groups	1577,91	161	9,801		
	Combined	2112,356	163			

6.3.6. Hypothesis 5: Undervalued firms

Hypothesis formulation:	Superior value creation through the acquisition of sub-divisions versus stand-alone firms.
Testing procedure:	Comparison of acquired divisions ("part-of-company") with stand-alone firms.
Sample size (n):	51 divisions ("part-of-company") and 113 stand-alone firms
Results:	• "Part-of-company" acquisitions*: 1.5%; 1.5% • Stand-alone acquisitions*: 1.7%; 0.6% *(+/- 5 days performance; +/- 2 days performance)
Statistical testing:	Two-sided t-test for two independent samples and the Levene test to compare the variances of both sub-samples. For both time frames and both sub-samples no statistically significant correlation has been identified.
Hypothesis evaluation:	Rejected and not significant The "acquisition of undervalued firms" hypothesis is rejected.

Descriptive statistics

		N	Mean	Standard deviation	Standard error
Performance +/- 5 days	part of company	51	1,46%	4,76%	0,67%
	stand alone	113	1,72%	4,62%	0,43%
Performance +/- 2 days	part of company	51	1,49%	3,84%	0,54%
	stand alone	113	0,55%	3,46%	0,33%

Test of statistical significance

		Levene test of variance homogeneity		T-test for mean value equality				
		F	Significance	T	df	Sig. (2-sided)	Mean difference	Standard error of difference
Performance +/- 5 days	Variances are equal	,123	,726	-,336	162	,737	-,26458%	,78690%
	Variances are not equal			-,333	94,070	,740	-,26458%	,79553%
Performance +/- 2 days	Variances are equal	1,613	,206	1,561	162	,121	,94369%	,60462%
	Variances are not equal			1,500	88,053	,137	,94369%	,62907%

6.3.7. Hypothesis 6: The minimum-size effect

Hypothesis formulation:	Positive value creation through growth of defence business
Testing procedure:	The value creation of all general growth and defence business specific growth is tested
Sample size (n):	164 M&A deals for overall acquisitive growth and 24 deals for core business growth.
Results:	Both testing hypothesis have shown a positive value creation. • The mean value creation of overall acquisitive growth (all deals) yields 1.6% (see chapter 6.3.2.2.1.) • The mean value creation of growth in "core" business yields 3.7% (see chapter 6.3.2.2.4.)
Statistical testing:	T -test for the entire sample to test the difference from the null hypothesis. ANOVA to test the difference of three independent samples ("core" vs. "close-to-core" vs. "out-of-core").

	• Both tests are statistically significant at the 1% level for the +/- 5 day timeframe.
Hypothesis evaluation:	*Supported and significant* The minimum size effect is (a proxy through the combination of two hypothesis) supported.

6.3.8. Hypothesis 7: US market benefit

Hypothesis formulation:	Superior performance through growth in US market
Testing procedure:	Comparison of the value creation by US target acquisitions versus European target acquisitions
Sample size (n):	128 acquisitions of US targets and 36 acquisitions of European targets
Results:	• US target company acquisitions*: 1.5%; 0.8% • European target company acquisitions*:2.0%; 1.1% *(+/- 5 days performance; +/- 2 days performance)
Statistical testing:	Two-sided t-test for two independent samples and the Levene test to compare the variances of both sub-samples. For both time frames and both sub-samples no statistically significant correlation has been identified.
Hypothesis evaluation:	*Rejected and not significant* The US market preference hypothesis is rejected.

Descriptive statistics:

Target continent		N	Mean	Standard deviation	Standard error
Performance +/- 5 days	North America	128	1,5481%	4,81339%	,42545%
	Europe + Other	36	1,9581%	4,07194%	,67866%
Performance +/- 2 days	North America	128	,7740%	3,78938%	,33494%
	Europe + Other	36	1,0911%	2,85799%	,47633%

Test of statistical significance:

		Levene test of variance homogeneity		T-test for mean value equality				
		F	Significance	T	df	Sig. (2-sided)	Mean difference	Standard error of difference
Performance +/- 5 days	Variances are equal	1,049	,307	-,466	162	,642	-,40995%	,87973%
	Variances are not equal			-,512	65,143	,611	-,40995%	,80099%
Performance +/- 2 days	Variances are equal	2,354	,127	-,466	162	,642	-,31712%	,68077%
	Variances are not equal			-,545	73,233	,588	-,31712%	,58230%

6.3.9. Hypothesis 8: National consolidation benefit

Hypothesis formulation:	Superior value creation of national consolidation deals
Testing procedure:	Comparison of national deals with cross-border deals
Sample size (n):	48 cross-border and 116 national M&A deals
Results:	National deals only show for the 5-day event window superior value creation. • "National" M&A deals*: 2.0%; 0.8% • "Cross-border" M&A deals*: 0.8%; 1.0% *(+/- 5 days performance; +/- 2 days performance)

Statistical testing:	Two-sided t-test for two independent samples and the Levene test to compare the variances of both sub-samples. For both time frames and both sub-samples no statistically significant correlation has been identified.
Hypothesis evaluation:	Weakly supported and not significant The national consolidation benefit hypothesis is weakly supported but not statistically significant.

Descriptive statistics:

Regional classification		N	Mean	Standard deviation	Standard error
Performance +/- 5 days	cross border	48	,8352%	4,35333%	,62835%
	National	116	1,9704%	4,74846%	,44088%
Performance +/- 2 days	cross border	48	,9543%	3,10632%	,44836%
	National	116	,7978%	3,79704%	,35255%

Test of statistical significance:

		Levene test of variance		T-test for mean value equality				
		F	Significance	T	df	Sig. (2-sided)	Mean difference	Standard error of difference
Performance +/- 5 days	Variances are equal	,526	,469	-1,426	162	,156	-1,13519%	,79586%
	Variances are not equal			-1,479	95,236	,142	-1,13519%	,76759%
Performance +/- 2 days	Variances are equal	2,830	,094	,253	162	,801	,15651%	,61960%
	Variances are not equal			,274	106,453	,784	,15651%	,57036%

6.3.10. Hypothesis 9: Large acquisition benefit

Hypothesis formulation:	Superior value creation through larger M&A deals
Testing procedure:	Comparison of deals with larger relative size with deals of smaller relative size
Sample size (n):	92 small M&A deals (<10%); 72 medium (10-50%) and large (>50%) deals
Results:	Larger deals (medium and large) show superior value creation than small deals. • Large and medium-sized M&A deals*: 2.1%; 1.1% • Small M&A deals*: 1.2%; 0.7% *(+/- 5 days performance; +/- 2 days performance)
Statistical testing:	Two-sided t-test for two independent samples and the Levene test to compare the variances of both sub-samples. For both time frames and both sub-samples no statistically significant correlation has been identified.
Hypothesis evaluation:	Supported – not significant The "deal size" hypothesis is supported but not statistically significant.

Descriptive statistics:

		N	Mean	Standard deviation	Standard error
Company size	Small	92	1,2436%	4,27462%	,44566%
	Medium and large	72	2,1422%	5,07975%	,59865%
Performance +/- 2 days	Small	92	,6737%	3,28420%	,34240%
	Medium and large	72	1,0606%	3,98021%	,46907%

Test of statistical significance:

		Levene test of variance homogeneity		T-test for mean value equality				
		F	Significance	T	df	Sig. (2-sided)	Mean difference	Standard error of difference
Performance +/- 5 days	Variances are equal	2,630	,107	-1,230	162	,221	-,89860%	,73084%
	Variances are not equal			-1,204	138,348	,231	-,89860%	,74632%
Performance +/- 2 days	Variances are equal	3,778	,054	-,682	162	,496	-,38690%	,56737%
	Variances are not equal			-,666	136,568	,506	-,38690%	,58075%

6.3.11. Hypothesis 10: Target company value creation

The hypothesis of this dissertation claims that investors of stock-market listed target companies always gain from an acquisition. The reason is a simple economic rationale: If the price offer for shares is too low, shareholders simply do not accept the deal and refuse to sell their shares. According to most stock market regulations, at least 50%[432] of shareholders have to agree to a merger proposal in order to approve a takeover attempt; the same applies to private investors and firms that sell a business unit. The owners only sell their company if they believe that the remuneration they receive is higher than the intrinsic value that they attribute to their business.

In efficient markets, take-over premiums should only exist under specific circumstances. In general, the market should value the shares of a company according to its fair value. The only rational reason for takeover premiums is that financial value can be created during an acquisition. This is generally the case for synergies which are realized during the integration process. The value of the synergies is predominantly attributed to the value of the target firm and thus distributed to the target shareholders in the form of a take-over premium.[433]

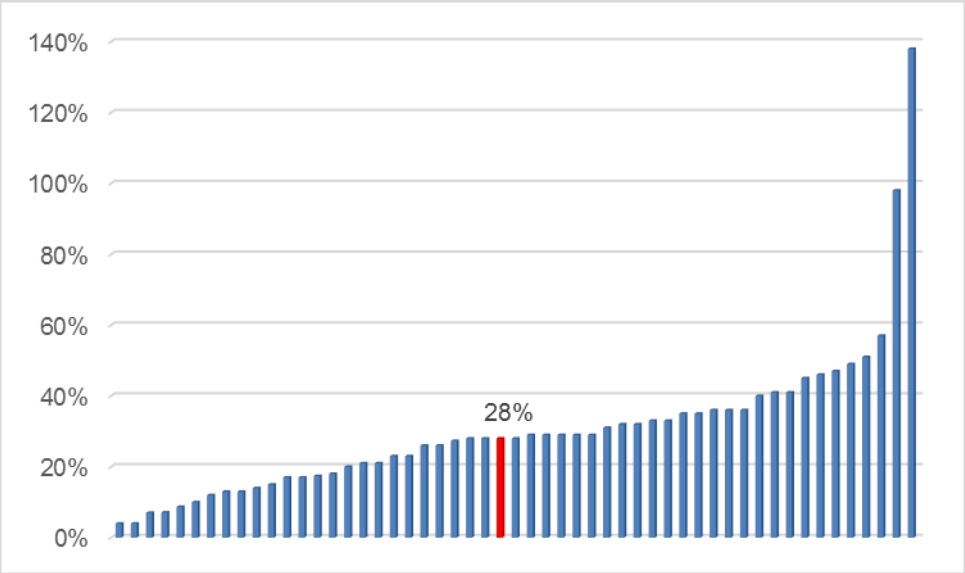
While take-over premiums depend on various factors, such as the geography, the time of the takeover, the industry, and the type of acquirer,[434] the bottom line of all studies is similar: Take-over premiums mostly lie between 20-40%, with a historical average of 30%.[435] Jensen and Ruback (1983) analysed 13 studies of takeover premiums; their study showed a 30%

[432] In some legislations super majorities of 75% or higher approval rates may even be needed.
[433] Thraya, M.F. and Hagendorff, J. (2010): "Controlling Shareholders and the Acquisition Premiums Paid in European Takeover Bids", *Cahier de recherche n° 2010-10 E2*.
[434] High tech companies bring much higher take-over premiums and large companies are more likely to pay higher premiums.
[435] Monga, V. (2013): "Why Are Takeover Prices Plummeting?", *CFO Journal, The Wall Street Journal Online Edition*

premium for shareholders in tender offers and 20% for mergers.[436] Jarrell, Brickley, and Netter (1988) also came to similar results, with premiums for target shareholders between 19% and 35% depending on the observation period.[437] A more recent study sets take-over premiums within the manufacturing industry between 30-35% in the 2000s.[438]

The 53 analysed take-over premiums of the underlying data sample are fully in line with prior research results. The premiums paid to target shareholders vary largely between 4% and 138%, but more than half of the values lie between 20-40%.[439] The average premium is 30% and the median is 28%.

Figure 28: Takeover-premiums from 1997 to 2016 in the defence industry



Source: Own representation, details in the appendix pp. 194-195

[436] Ruback, R. and Jensen, M. (1983): "The Market for Corporate Control: The Scientific Evidence*", Journal of Financial Economics, Vol. 11, pp. 5-50*
[437] Jarrell, G. (1988): "The Market for Corporate Control: The Empirical Evidence Since 1980", *Journal of Economic Perspectives, vol. 2, no. 1, Winter 1988, pp. 49-86*
[438] Madura, J. et al. (2012): "Why do merger premiums vary across industries and over time?", *The Quarterly Review of Economics and Finance, Volume 52, February 2012, pp.* 49-62
[439] The exact list of publicly listed target companies and the paid premiums can be found in the Appendix

6.4. Summary of results

The 10 main hypotheses resulted in 12 detailed hypotheses for statistical testing.[440] Altogether 10 hypotheses are supported, 5 of them statistically significant. The two rejected hypotheses are not statistically significant.

Table 10: Summary of empirical test results

#	Type	Hypothesis	Description	Results
1	Strategic	Acquisitive growth	(Slightly) positive gains from external growth	Supported and significant
2		Active business portfolio management	Superior gains for highly active acquirers	Supported - not significant
3		Cost synergy preference	Superior gains from cost vs. revenue synergies	Supported - not significant
4a)		Relatedness of acquired business	Highly superior gains of "core" business acquisitions	Supported and significant
4b)			Superior gains of "close-to-core" acquisitions	Supported and significant
4c)			Negative gains of "out-of-core" acquisitions	Supported and significant
5	Financial	Undervalued assets	Superior gains from acquisitions of sub-divisions vs. stand-alone firms	Rejected - not significant
6	Defence specific	Minimum size effect	Superior gains by defence business increaseing acquisitions	Supported
7		US market benefit	Superior gains from US vs. European targets	Rejected - not significant
8		National consolidation benefit	Superior gains of national consolidation deals	Weakly supported - not significant
9	Structure	Deal size	Superior gains from large transactions	Supported - not significant
10	Target company	Target company value creation	Highly positive gains for all target companies	Supported and significant

[440] The relatedness of acquired business“ hypothesis resulted in three detailed hypotheses to test the value creation of the detailed “relatedness” strategies

6.5. Major findings of the empirical analysis

The empirical analysis has revealed valuable insights about M&A transactions in the defence industry. Five findings of particular importance are outlined below.

(1) Positive and significant value creation of M&A transactions in the defence industry

The value creation for *target shareholders* is only an approximation based on the premiums paid for takeovers of publicly listed firms in the defence industry. The results are unambiguously positive for all of the 53 analysed deals.

The takeover premiums in the sample show that mergers have a significant positive value impact for target firms with an average premium of 30%. These premiums translate roughly to an abnormal return of 3-4% on a combined transaction level for the new entity.[441] The positive value impact is in accordance with previous studies on takeover premiums, but the high level is nevertheless noteworthy.

Even more remarkable are the results of the detected value creation for acquiring shareholders. The empirical tests have shown significantly positive results for both examination periods, the 4-day and the 10-day period.[442] The average abnormal returns of 0.84% and 1.64% may not seem extraordinarily high at first glance, but in fact, the results are impressive. Previous studies have mostly failed to detect high positive abnormal returns for acquirers. Bruner concludes in his broad compilation of 130 M&A takeover studies that even in the best of cases, shareholders of bidding firms strive to "break even"; thus, highly positive abnormal returns for acquirers are an exception. Even when event studies identified positive value creation for acquirers, the gains are generally marginal.

For this reason, the significantly positive value creation for acquiring firm shareholders of defence companies is a major finding.

The calculation of the combined value creation of M&A deals in the defence industry is not the focus of this dissertation. Based upon the approximated value creation for target shareholders and the calculated abnormal returns for acquiring firm shareholders, the combined value creation can be estimated with 4-6% abnormal return. The exact value on a

[441] This estimate is based on a triangulation: The average relative size and value of the target companies is estimated at 15% based upon an average 12-17% revenue level. The 30% take-over premium therefore translates into 3.9% value increase of the combined entity. Due to various assumptions and simplifications, the value spread of 3-4% for the estimated combined value increase seems realistic.

[442] Significant at the 1% level for the period of +/- 5 day and significant at the 5% level for the +/- 2 day period.

combined level depends on the time frame and the relative firm size of the acquirer and the target firm.[443] This value is also exceptionally high, and suggests the high potential for value creation of M&A in the defence industry.

(2) Cumulative abnormal returns sustain over a longer period

The normal pattern is a slow increase of the abnormal return prior to Day 0 in the so-called "run-up phase", followed by a strong jump in abnormal returns on the event date and a slight decrease in the days thereafter. The decrease is a quasi-correction for the over-shooting on the event day.[444]

The effects of the run-up phase and the correction for the overshooting are directly opposed to each other. The run-up of abnormal returns increases the cumulative abnormal return of longer time-horizons, while the response to the overshooting has a slightly stronger impact, thus reducing the cumulative abnormal return of longer time periods.

The cumulative abnormal returns of the underlying sample are significantly higher for the 10-day period (1.64%) than for the 4-day period (0.84%) around the event day. These results are rather uncommon, and can be interpreted as an indicator for sustainable abnormal returns over a longer period.

(3) Core business acquisitions create shareholder value, unrelated acquisitions destroy it

The acquisition of firms with a similar product offering and business model lead to very high and significantly abnormal returns. The average value creation of "core" business acquisitions is significantly superior to "close-to-core" acquisitions, and even more so for value destructive acquisitions outside the core business, the so-called "diversifications".[445]

It was expected that the value creation of related deals would be superior to unrelated deals, as this is a common pattern for M&A acquisitions in almost all industries. Moreover, positive

[443] Due to the fact that the values are triangulated and partly estimated, the suggested range of positive value creation is high.

[444] Thaler, R. and de Bondt, W. (1984): "Does the Stock Market Overreact?", *The Journal of Finance, Vol. 40, No. 3, Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas, December 28-30, Jul. 1985, pp. 793-805*

[445] The definitions of "core", "close-to-core" and "outside core" business acquisitions can be found in Chapter 3.1.2.

value creation of core business acquisitions was especially expected for the defence industry due to the minimum-size-effect, operational synergies and value chain integration benefits.

Through the so-called minimum-size effect, the acquiring firm becomes more relevant for its major customer and can benefit from further contract awards. It is expected that firm acquisitions that grow the core business of the acquirer increase the relevance of a firm substantially, while diversifications do not. The minimum-size effect therefore relies on core and close-to-core acquisitions.

But also value chain considerations make related acquisitions attractive: The acquisition of a supplier eliminates managerial and organizational interfaces. This frees resources and lifts efficiency gains in a project environment. The downward integration of partner firms also stabilizes revenues through higher revenues at later stages of the business cycle. The upward integration mainly reduces project related risks and financial risks like the bankruptcy of an important supplier.

Despite the aforementioned general expectation of positive results, the magnitude of the average abnormal return for acquiring company shareholders is exceptionally high. Core business acquisitions yield 6.7% abnormal return, and "close to core" acquisitions are still above average with a mean 2.5% abnormal return. On the contrary, acquisitions outside the core business destroy shareholder value with -3.5% abnormal returns. [446]

A closer look into the empirical data reveals an interesting pattern. Not only the average value of core business acquisitions is very positive, but except for one, each deal yields a positive return. Almost the exact opposite is the case with diversification deals. Only three out of 42 deals create marginal positive abnormal returns; all of the other 39 deals destroy shareholder value.

The key finding is that core business acquisitions in the defence industry are almost always a safe bet for value creation. On the contrary, acquisitions of businesses outside the core almost ultimately lead to shareholder value destruction.

[446] The abnormal returns of the 4-day period around the announcement date yield lower returns but show the same trend. All results are statistically significant at the 1% level.

(4) European target acquisition also lead to positive value gains

The detailed analysis of the defence markets of the United States and Europe lead to the assumption that the US market is more attractive for defence firms. The industry structure seems to support this assumption, as US firms are among the largest and most successful defence firms globally. Based on this finding it was assumed that the acquisition of US defence firms leads to superior value creation results than the acquisition of European firms.

Following empirical analysis, the assumption of superior value creation by the acquisition of US targets must be rejected. On average, the acquisitions of US targets lead to the same or even a slightly inferior cumulative abnormal returns. Moreover, the national consolidation strategy of US firms only yields slightly higher abnormal returns than international acquisitions.[447]

These results are an impressive argument for an acceleration of M&A activity by defence companies in Europe.

(5) Many M&A characteristics are deal-specific

In addition to the major assumptions about M&A, various other characteristics of defence industry M&A transactions were tested as well. These characteristics were either firm-specific (e.g. firm size), deal-related (e.g. type of payment) or depended on structural factors (e.g. year of transaction). Most of these characteristics and assumptions did not lead to tangible results. The abnormal returns were either not different from the average deal or the results were not statistically significant. The lack of statistical significance is caused by the small number of deals for specific sub-samples and the inconsistency of outcomes.

These results confirm that many characteristics of M&A transactions are very case specific and cannot be generalized. Bruner's (2004) assertion that "M&A deals are local", meaning that many characteristics of deals are unique with a high bandwidth of results, can hereby be confirmed by the results of this study.[448]

[447] The results are not statistically significant

[448] Bruner, R. (2004): "All M&A is local", *The Batten Briefings, Winter 2004*

7. Summary and implications

The last chapter of this dissertation aims to briefly evaluate the main findings of the analysis, to critically assess them, and to compare the results to the outcome of prior research. In a final step, further areas for academic research are suggested in order to supplement the research results.

7.1. Research results and contribution

The aim of this dissertation is to examine the value creation of M&A transactions in the defence industry with a particular focus on equity investors. This research, in both its theoretical and practical contributions, should provide insights for researchers and business managers alike. The three major research questions as formulated in Chapter 1.2 have served as a recurring theme throughout the research. The following paragraphs will discuss whether these three questions have been sufficiently addressed.

(1) Do M&A transactions in the defence industry create value for equity investors, or do they destroy shareholders' wealth?

The empirical results confirm a statistically significant, positive abnormal return for equity investors of acquiring defence firms, with an even greater effect for equity investors of target firms. Consequently, this research questions can be affirmed unambiguously.

These findings are very relevant for academic researchers. The high abnormal returns for target shareholders confirm the consensus view that wealth is distributed to target shareholders. The empirical findings also strengthen Bruner's view that M&A transactions, on a combined basis, increase value. These findings may also encourage managers and policy makers to re-think acquisitions in the defence industry. The general stigma that M&A transactions destroy value for acquiring shareholders must be dispelled, at least for the defence industry.

(2) Which specific M&A strategies should managers in the defence industry follow in order to increase shareholder value?

As "M&A is an instrument of corporate transformation",[449] executives are concerned with the question of which specific strategy they can follow in order to create value for their firm and their respective shareholders. The finding that the *average* M&A deal in the defence industry creates value does not help managers in the evaluation of a *specific* deal which could be executed by them.

This dissertation cannot provide an exhaustive answer to this question. Not all hypotheses about value creation strategies could be doubtlessly verified or falsified on the basis of this empirical analysis alone.

What has become clear, however, is the strong preference of investors for related M&A deals. The highly negative returns of diversification deals show that investors do not trust in the ability of defence companies to successfully integrate companies outside their current customer and technology focus. Investments in civil industries almost always lead to massive value destruction. The recommendation for managers is therefore to focus on acquisition targets that fit well to the existing capabilities and customer base of their firm. Core business acquisition lead to substantial value gains in almost all empirical sample cases. "Close-to-core" deals also create above-average value, but on a much lower scale.

(3) Are value-enhancing or value-destructive M&A strategies dependent on timing, geography or other external factors?

Previous event studies of M&A transactions have discovered various structural characteristics with either significant positive or negative impacts on value creation. Some of these assumptions about structural characteristics have been tested in the course of the empirical analysis. None of them have been identified as a significant influencer of either value creation or destruction.

The strategy to acquire undervalued assets through the acquisition of a corporate subdivision instead of a stand-alone firm has not been supported by the empirical analysis. The active portfolio management strategy and the positive impact of larger deals on abnormal returns is

[449] Bruner, R. (2004): "All M&A is local", *p. 2, The Batten Briefings, Winter 2004*

supported, but the results are not statistically significant. The same holds true for the mode of payment. The sub-sample is just too small to gather significant results and to draw viable conclusions.

Besides these three major research questions, the dissertation describes specific characteristics of the defence industry, such as the strong political influence of the home-country's administration and their impact on M&A transactions. Furthermore, defence industry-specific M&A motives have been introduced and later statistically tested. The qualitative and quantitative assessment offers valuable insights and sheds light on previously uncaptured topics.

Overall, it can be stated that the research has brought substantial results for academic research, for business managers and for industrial policy makers as well.

7.2. Comparison of results with prior research

The comparison of research results has to be regarded from two perspectives: First, from that of the general M&A literature and second to the M&A literature that specifically concerns the defence industry.

The empirical findings stand in opposition with the general notion that M&A destroys shareholder value for shareholders of the acquiring firm. This contemporary legend of business literature needs to be re-thought, not only because of the results of this dissertation but also because of previous studies.

The observed positive abnormal returns for acquiring shareholders are in line with about half of the prior event studies. The identified value effect for buyers are almost equally negatively and positively distributed, as the following figure shows.

Table 11: Value effects of selected M&A event studies

	Value effect[450]	
	Negative (-)	Positive (+)
Target firm	0	**21**
Acquirer	**13**	**17**
Combined firms	1	**11**

Source: Own representation, data based on Bruner (2003) "Does M&A pay?"

Based on these results, there is further support for the unpopular and still highly disputed view that M&A actually does create value. The current academic knowledge is enriched by a further example that shows that industry-specific characteristics may lead to significant value creation for *all* involved shareholders.

This dissertation can certainly bring further insight into M&A transactions in the defence industry. There is very little prior research that can be compared with this dissertation (see Chapter 3.3). The existing literature is either too focused on small sub-samples or includes very broadly defined events that are outside the general M&A focus. No single study is concerned with an event study that takes into account US and European defence M&A deals. In none of the 5 studies the results were statistically viable.

The findings of the previous publications assume, that M&A in the defence industry adds shareholder value, though this has not been measured or demonstrated in a statistically significant way. Through this research the previous *assumptions* of positive value creation of M&A in the defence industry has finally been empirically *demonstrated* in a statistically viable manner.

7.3. Critical evaluation of results

A critical assessment of the research shows that several factors have influenced the results of the research. These factors are primarily concerned with the design of the research methodology, the data availability and the interpretation of results.

[450] Only statistically significant values have been taken into account

The practical application of an event study leaves room for choice how to structure the actual design. While the basic structure is standardised, the calculation of abnormal returns can be performed in various ways. This research in particular prioritizes the application of the no-factor model as a baseline of market returns. The general stock market serves as the applied baseline for the normal return. All deviations from this baseline are evaluated as abnormal returns. The selection of the no-factor model is an exception rather than the norm, as most researchers have instead built their model upon the market model which is considered to be slightly more precise in some cases. The decision to use the no-factor model is justified by the fact that the research horizon is very short, and that previous tests have shown that the results of both methods are almost identical.

A further aspect that could be criticized is the short timeline of the event study. The empirical tests have solely been made on the 4- and 10-day timeframe. Most analyses rely on longer time frames of 60 days (+/- 30 days around the event date). This short timeframe could potentially limit the relevance of results for the approximation of long-term effects. Despite this limitation, the decision to focus on a short observation period has been undertaken for a good reason: The shorter the observation period, the lower the risk of flawed results due to the influence of unrelated events.

A further area of concern is the availability of meaningful and sufficient data points. Despite the use of several databases, many M&A deals could not be taken into consideration as historic stock market data was missing.[451] Generally, older stock market data and that of companies that have ceased to exist are more difficult to obtain. The limited trading data availability of older companies implies that more recent deals are more likely to be included in the sample. Due to the fact that the threshold value of $50 million for sample deals has not been lifted over the 25-year period, later deals are given preference over earlier M&A transactions.[452] In addition to the bias of newer deals, there is a survivorship bias. If a company still exists (often the case for market consolidators), then the likelihood of existing trading data is much higher.

A critique on the quality of results due to limited availability of data cannot be neglected. There is a likelihood that the survivorship bias leads to slightly more positive abnormal returns compared to other deals. Moreover, it must be accepted that this bias cannot be fully

[451] In the case of "Coral", the data of a significant number of M&A deals could not be retrieved.
[452] As an example, the sample is relatively balanced with 50 deals for the first ten years (1992-2001) and 71 deals for the last ten years (2007-2016).

ruled out as it is a systemic problem. Other event studies face the same problem, and must also deal with the unavailability of data.[453] Similarly, this dissertation does not fully mitigate the problem of data availability, but addresses it transparently.

Besides the data quality issue and methodological critique, this research (and academic research as a whole) may be confronted with the concern that the research results are not generalizable. The ability to transfer the specific results to a general finding is, however, regarded as a major quality factor.[454] This dissertation is focused on the defence industry and the results are generalizable due to the large data sample and statistically significant results. Several aspects of the underlying empirical research results can also be transferred to other industries, such as the overall positive value creation and the preference of closely related M&A deals by financial investors.

Aside from the transferability of these results, there is also the remaining concern about the use of small sub-samples and the wide span of abnormal return values. The large range of values indeed demonstrates that many M&A deals are unique, and an all-encompassing value creation formula is difficult, if not impossible, to find. Due to these two factors, the descriptive statistics are often not significant. This finding is neither new nor specific to this research, and has been confirmed by prior researchers.

In contrast to the acquiring shareholders' returns, the calculation of target shareholder returns were not the focus of this dissertation. The approximation of abnormal returns with the help of take-over premiums, rather than a complex event study, is a simplification that alters the accuracy of results; for this reason, the author has labelled these results as "proxies".

The evaluation of the critical factors leads to the conclusion that overall, they have a minor influence on the quality and meaningfulness of research results. Despite the minor limitations, this dissertation brings substantial academic results for M&A researchers and presents practical suggestions for executive managers in the defence industry.

7.4. Further research recommendations

The underlying dissertation has succeeded in addressing the three guiding research questions. During the research period, further research questions arose which were not sufficiently

[453] Morris, J. (2012): "Survivor bias in firm specific longitudinal studies: The case of ERP systems", *Journal of Business & Economics Research*

[454] Tashakkori, A. and Teddlie, C. (1998): "Mixed methodology: Combining qualitative and quantitative approaches." *Thousand Oaks: Sage*

answered by this dissertation, either due to an entirely different research focus or according to the fact that exploring these issues would have constituted a deviation from the primary research goals.

From a conceptual point of view, further aspects would complement the knowledge that has already been gained from this research. Further interesting and valuable research areas would be a longer time-horizon of analysis, a calculation of value effects for the combined entity, and a combination of micro- and macroeconomic perspectives on M&A transactions in the defence industry.

The time horizon of the value creation analysis in this study is relatively short, encompassing a 4-day and 10-day timeframe around the event date. For this reason, it would be interesting to see how the abnormal returns develop over a longer time period. Do the positive abnormal returns persist in the future? Do they even increase, as we have seen for the time period examined in this study? In order to achieve significant results by evaluating a longer time period, I would suggest analysing a 180-day time period around the event date.

Furthermore, it would be worthwhile to analyse performance over the years. For this research scope, the calculation of abnormal returns on the basis of an event study would not be recommended due to various other events that would strongly influence the long-term stock performance. A potential proxy to evaluate the long-term effects of M&A transactions could be the comparison of stock market performance of three company groups: Companies that perform many M&A transactions, firms which undertake some transactions, and firms with no M&A transactions at all.

The calculation of M&A value creation on a combined level (i.e. for target and acquirer shareholders) would offer a better view on the economic impact of the transaction as a whole, with the result being the value effect for the entire transaction. The entire transaction value has only been approximated with the help of take-over premiums in the context of this dissertation; this approximation has strong limitations[455] and cannot replace the meaningfulness of an event study. For this reason, it is recommended to perform an event study for M&A deals in the defence industry where both involved companies are stock market listed and stock market price data exists. For this research, a full-fledged calculation would not have been possible due to data constraints, as only 50 M&A deals fulfilled the

[455] See also Chapter 7.3.

requirements. Future research would therefore have to adjust the data selection requirements in order to increase the applicable data sample.

In contemporary literature regarding M&A value creation in the defence industry, the micro- and the macro-economic view are strictly separated from each other; that means that research tends to either focus on the value creation of the firm or the evaluation of consolidation on the public budget and the defence industrial base. There is a clear gap between these two perspectives. A research that bridges and combines the micro- and macroeconomic view of consolidation in the defence industry is missing. Such research could also address whether defence industry consolidation is a "lose-lose", a "zero sum", or even a "win-win" game for the involved firms, the major customer and the economy as a whole. On the basis of this holistic view, company executives and policy makers could develop a mutually beneficial consolidation strategy and state-imposed M&A restrictions could be adjusted or even completely lifted.

The insights of the dissertation could be further deepened and advanced by intensifying the research on the concept of the minimum-size effect and by increasing the understanding of the strong value destruction of unrelated deals. Additionally, It would be highly beneficial to statistically demonstrate the existence of the minimum-size effect and to separate it from the general growth hypothesis. Investigating further into the type and size of firms that potentially benefit from the minimum-size effect would bring valuable insights. Do only small or medium-sized firms benefit from the minimum-size effect, or do larger firms profit as well?

One of the key findings of this dissertation is the highly positive and significant value creation of related deals. Economies of scale, efficiency gains and the monopoly hypothesis serve as explanations for this result. The complete opposite can be observed for unrelated deals, in that they are demonstrably more destructive to overall value. This value destruction seems to be stronger in the defence industry than for other civil industries, where diversification can even serve as a hedge to balance out market fluctuations.[456] While this dissertation has answered a few important research questions, but it has also opened the door for new topics of academic and managerial interest. Why do investors believe that defence firms cannot successfully

[456] Kuppuswamy, V. and Villalonga, B. (2010): "Does Diversification Create Value in the Presence of External Financing Constraints? Evidence from the 2007–2009 Financial Crisis", *Working Paper, Harvard Business School*

integrate an “outside-the-core” firm? Does the negative initial assessment of the investor community persist over a longer period of time, or does it eventually revert to a neutral or even positive assessment? If the effect persists, what is the reason for it? Are defence firms not flexible enough to learn how to compete in new markets? Are defence firms unable to integrate new company cultures and different working styles?

The presented subjects offer a rich field of further research options, and could surely yield useful insights for managerial and strategic studies.

7.5. Final remarks

This dissertation is not the first research dedicated to M&A and consolidation in the defence industry. However, there are several important, previously untapped research aspects which have been addressed and answered by this dissertation.

From a qualitative perspective, the main contribution is the exploration of defence industry-specific M&A motives and the presentation of M&A hurdles, which are predominantly imposed by the local governments. It is also the first attempt to empirically test the value creation of US and European M&A transactions in the defence industry on the basis of a representative sample.[457]

The findings are very valuable with regards to the highly positive level of value creation for shareholders of acquiring firms, and especially for the acquisition of closely-related firms. These statistically significant values were not expected prior to this study.

With all due respect to previous research in this field, it is fair to claim that this dissertation represents a new perspective for the understanding of M&A value creation for equity investors in the defence industry. The research questions have been successfully answered, and the findings are relevant for academic researchers and for managers in the defence industry.

[457] With a focus on shareholders of the acquiring firm.

Appendix

Appendix 1: T-test table

p-quantiles of the student t-distribution with n degrees of freedom									
	p=0.9	**0.95**	**0.96**	**0.975**	**0.98**	**0.99**	**0.995**	**0.999**	**0.9995**
n=1	3,078	6,314	7,916	12,710	15,890	31,820	63,660	318,300	636,600
2	1,886	2,920	3,320	4,303	4,849	6,965	9,925	22,330	31,600
3	1,638	2,353	2,605	3,182	3,482	4,541	5,841	10,210	12,920
4	1,533	2,132	2,333	2,776	2,999	3,747	4,604	7,173	8,610
5	1,476	2,015	2,191	2,571	2,757	3,365	4,032	5,893	6,869
6	1,440	1,943	2,104	2,447	2,612	3,143	3,707	5,208	5,959
7	1,415	1,895	2,046	2,365	2,517	2,998	3,499	4,785	5,408
8	1,397	1,860	2,004	2,306	2,449	2,896	3,355	4,501	5,041
9	1,383	1,833	1,973	2,262	2,398	2,821	3,250	4,297	4,781
10	1,372	1,812	1,948	2,228	2,359	2,764	3,169	4,144	4,587
11	1,363	1,796	1,928	2,201	2,328	2,718	3,106	4,025	4,437
12	1,356	1,782	1,912	2,179	2,303	2,681	3,055	3,930	4,318
13	1,350	1,771	1,899	2,160	2,282	2,650	3,012	3,852	4,221
14	1,345	1,761	1,887	2,145	2,264	2,624	2,977	3,787	4,140
15	1,341	1,753	1,878	2,131	2,249	2,602	2,947	3,733	4,073
16	1,337	1,746	1,869	2,120	2,235	2,583	2,921	3,686	4,015
17	1,333	1,740	1,862	2,110	2,224	2,567	2,898	3,646	3,965
18	1,330	1,734	1,855	2,101	2,214	2,552	2,878	3,610	3,922
19	1,328	1,729	1,850	2,093	2,205	2,539	2,861	3,579	3,883
20	1,325	1,725	1,844	2,086	2,197	2,528	2,845	3,552	3,850
21	1,323	1,721	1,840	2,080	2,189	2,518	2,831	3,527	3,819
22	1,321	1,717	1,835	2,074	2,183	2,508	2,819	3,505	3,792
23	1,319	1,714	1,832	2,069	2,177	2,500	2,807	3,485	3,768
24	1,318	1,711	1,828	2,064	2,172	2,492	2,797	3,467	3,745
25	1,316	1,708	1,825	2,060	2,167	2,485	2,787	3,450	3,725
26	1,315	1,706	1,822	2,056	2,162	2,479	2,779	3,435	3,707
27	1,314	1,703	1,819	2,052	2,158	2,473	2,771	3,421	3,690
28	1,313	1,701	1,817	2,048	2,154	2,467	2,763	3,408	3,674
29	1,311	1,699	1,814	2,045	2,150	2,462	2,756	3,396	3,659
30	1,310	1,697	1,812	2,042	2,147	2,457	2,750	3,385	3,646
35	1,306	1,690	1,803	2,030	2,133	2,438	2,724	3,340	3,591
40	1,303	1,684	1,796	2,021	2,123	2,423	2,704	3,307	3,551
45	1,301	1,679	1,791	2,014	2,115	2,412	2,690	3,281	3,520
50	1,299	1,676	1,787	2,009	2,109	2,403	2,678	3,261	3,496
60	1,296	1,671	1,781	2,000	2,099	2,390	2,660	3,232	3,460
70	1,294	1,667	1,776	1,994	2,093	2,381	2,648	3,211	3,435
80	1,292	1,664	1,773	1,990	2,088	2,374	2,639	3,195	3,416
90	1,291	1,662	1,771	1,987	2,084	2,368	2,632	3,183	3,402
100	1,290	1,660	1,769	1,984	2,081	2,364	2,626	3,174	3,390
150	1,287	1,655	1,763	1,976	2,072	2,351	2,609	3,145	3,357
200	1,286	1,653	1,760	1,972	2,067	2,345	2,601	3,131	3,340
250	1,285	1,651	1,758	1,969	2,065	2,341	2,596	3,123	3,330
300	1,284	1,650	1,757	1,968	2,063	2,339	2,592	3,118	3,323
400	1,284	1,649	1,755	1,966	2,060	2,336	2,588	3,111	3,315
500	1,283	1,648	1,754	1,965	2,059	2,334	2,586	3,107	3,310
600	1,283	1,647	1,754	1,964	2,058	2,333	2,584	3,104	3,307
800	1,283	1,647	1,753	1,963	2,057	2,331	2,582	3,100	3,303
1000	1,282	1,646	1,752	1,962	2,056	2,330	2,581	3,098	3,300
100000	1,282	1,645	1,751	1,960	2,054	2,326	2,576	3,090	3,291

Appendix 2: Applicable digit Codes for Aerospace and Defence companies

Companies that are active in industries which are marked ***in bold*** are included in the sample. Further companies that are missing in the overview but which mainly provide products or services (e.g. IT services) for military customers are included in the data sample, too.

8 DIGIT CODE	8 DIGIT DESCRIPTION	Aerospace & Defence
33249901	**Aerospace investment castings, ferrous (only for military aircraft)**	yes
33650201	**Aerospace castings, aluminium (only for military aircraft)**	yes
33699901	**Aerospace castings, nonferrous: except aluminium (only for military aircraft)**	yes
34439910	**Missile silos and components, metal plate**	yes
34620500	**Missile and ordnance forgings**	yes
34620501	**Missile forgings, ferrous**	yes
34630200	**Missile and ordnance forgings**	yes
34630201	**Missile forgings, nonferrous**	yes
34820000	**Small arms ammunition**	yes
34829900	**Small arms ammunition, nec**	yes
34830000	**Ammunition, except for small arms, nec**	yes
34830100	**Ammunition components**	yes
34830101	**Arming and fusing devices for missiles**	yes
34830104	**Fin assemblies: mortar, bomb, torpedo, etc.**	yes
34839900	**Ammunition, except for small arms, nec, nec**	yes
34839901	**Ammunition loading and assembling plant**	yes
34839903	**Bazooka rockets**	yes
34839904	**Bombs and parts**	yes
34839905	**Chemical warfare projectiles and components**	yes
34839907	**Grenades and parts**	yes
34839908	Jet propulsion projectiles	yes
34839909	**Mines and parts (ordnance)**	yes
34839910	**Missile warheads**	yes
34839911	**Mortar shells, over 30 mm.**	yes
34839912	**Rockets (ammunition)**	yes
34839913	**Torpedoes and parts (ordnance)**	yes
34840100	**Machine guns and grenade launchers**	yes
34840101	**Grenade launchers**	yes
34840102	**Machine guns or machine gun parts, 30 mm. and below**	yes
34920100	Fluid power valves for aircraft	yes
34920101	Control valves, aircraft: hydraulic and pneumatic	yes
34920102	Valves, hydraulic, aircraft	yes
34929900	Fluid power valves and hose fittings, nec	yes
34999924	**Target drones, for use by ships: metal**	yes
35199903	Jet propulsion engines	yes
35370101	Aircraft engine cradles	yes
35599901	**Ammunition and explosives, loading machinery**	yes
35920101	Valves, aircraft	yes
36479901	Aircraft lighting fixtures	yes

36630101	Airborne radio communications equipment	yes
36690105	**Sirens, electric: vehicle, marine, industrial, and air raid**	yes
37110300	**Military motor vehicle assembly**	yes
37110305	Universal carriers, military, assembly of	yes
37130212	Tank truck bodies	yes
37159903	**Semitrailers for missile transportation**	yes
37210000	Aircraft	yes
37210100	Motorized aircraft	yes
37210101	**Airplanes, fixed or rotary wing (only military)**	yes
37210102	**Helicopters (only military)**	yes
37210201	Airships	yes
37219900	Aircraft, nec	yes
37219902	Research and development on aircraft by the manufacturer	yes
37240000	Aircraft engines and engine parts	yes
37249900	Aircraft engines and engine parts, nec	yes
37249901	Air scoops, aircraft	yes
37249902	Airfoils, aircraft engine	yes
37249903	Cooling systems, aircraft engine	yes
37249904	Engine heaters, aircraft	yes
37249905	Engine mount parts, aircraft	yes
37249906	Exhaust systems, aircraft	yes
37249907	External power units, for hand inertia starters, aircraft	yes
37249908	Jet assisted takeoff devices (JATO)	yes
37249909	Lubricating systems, aircraft	yes
37249910	Nonelectric starters, aircraft	yes
37249911	Pumps, aircraft engine	yes
37249912	Research and development on aircraft engines and parts	yes
37249913	Rocket motors, aircraft	yes
37249914	Starting vibrators, aircraft engine	yes
37249915	Turbines, aircraft type	yes
37249916	Turbo-superchargers, aircraft	yes
37280000	Aircraft parts and equipment, nec	yes
37280100	Aircraft body and wing assemblies and parts	yes
37280101	Ailerons, aircraft	yes
37280102	Aircraft body assemblies and parts	yes
37280103	Airframe assemblies, except for guided missiles	yes
37280104	Bodies, aircraft	yes
37280106	Empennage (tail) assemblies and parts, aircraft	yes
37280107	Fins, aircraft	yes
37280108	Flaps, aircraft wing	yes
37280109	Fuel tanks, aircraft	yes
37280110	Fuselage assembly, aircraft	yes
37280111	Nacelles, aircraft	yes
37280112	Pontoons, aircraft	yes
37280113	Rudders, aircraft	yes
37280114	Stabilizers, aircraft	yes
37280115	Wing assemblies and parts, aircraft	yes
37280200	Aircraft propellers and associated equipment	yes
37280201	Accumulators, aircraft propeller	yes
37280203	Aircraft power transmission equipment	yes
37280204	Blades, aircraft propeller: metal or wood	yes

37280205	Gears, aircraft power transmission	yes
37280206	Governors, aircraft propeller feathering	yes
37280207	Hubs, aircraft propeller	yes
37280208	Propeller aligning tables	yes
37280209	Pumps, propeller feathering	yes
37280210	Roto-blades for helicopters	yes
37280211	Spinners, aircraft propeller	yes
37280300	Aircraft landing assemblies and brakes	yes
37280301	Aircraft arresting device system	yes
37280302	Airplane brake expanders	yes
37280303	Alighting (landing gear) assemblies, aircraft	yes
37280304	Brakes, aircraft	yes
37280305	Dive brakes, aircraft	yes
37280306	Landing skis and tracks, aircraft	yes
37280307	Wheels, aircraft	yes
37280400	**Military aircraft equipment and armament**	yes
37280401	**Aircraft armament, except guns**	yes
37280402	**Bomb racks, aircraft**	yes
37280403	Chaff dispensers, aircraft	yes
37280404	Countermeasure dispensers, aircraft	yes
37280405	Turret test fixtures, aircraft	yes
37280406	Turrets and turret drives, aircraft	yes
37280500	Aircraft training equipment	yes
37280501	Link trainers (aircraft training mechanisms)	yes
37280502	**Target drones**	yes
37280503	Targets, trailer type: aircraft	yes
37280504	Tow targets	yes
37289900	Aircraft parts and equipment, nec, nec	yes
37289901	Aircraft assemblies, subassemblies, and parts, nec	yes
37289906	Oleo struts, aircraft	yes
37289907	Oxygen systems, aircraft	yes
37289908	Panel assembly (hydromatic propeller test stands), aircraft	yes
37289909	R and D by manuf., aircraft parts and auxiliary equipment	yes
37289910	**Refueling equipment for use in flight, airplane**	yes
37289911	Seat ejector devices, aircraft	yes
37310200	**Military ships, building and repairing**	yes
37310201	**Combat vessels, building and repairing**	yes
37310205	**Submarine tenders, building and repairing**	yes
37310206	**Submarines, building and repairing**	yes
37310207	**Transport vessels, troop: building and repairing**	yes
37610000	**Guided missiles and space vehicles**	yes
37619900	**Guided missiles and space vehicles, nec**	yes
37619901	**Ballistic missiles, complete**	yes
37619902	**Guided missiles and space vehicles, research and development**	yes
37619903	**Guided missiles, complete**	yes
37619904	**Rockets, space and military, complete**	yes
37619905	Space vehicles, complete	yes
37640000	Space propulsion units and parts	yes
37649900	Space propulsion units and parts, nec	yes
37649901	**Engines and engine parts, guided missile**	yes
37649902	**Guided missile and space vehicle engines, research & devel.**	yes
37649903	**Propulsion units for guided missiles and space vehicles**	yes

37649904	Rocket motors, guided missiles	yes
37690000	Space vehicle equipment, nec	yes
37699900	Space vehicle equipment, nec, nec	yes
37699901	**Airframe assemblies, guided missiles**	yes
37699902	**Bellows assemblies, missiles: metal**	yes
37699903	**Casings, missiles and missile components: storage**	yes
37699904	**Guided missile and space vehicle parts and aux. equip., R&D**	yes
37699905	**Nose cones, guided missiles**	yes
37699906	Space capsules	yes
37950000	**Tanks and tank components**	yes
37959900	**Tanks and tank components, nec**	yes
37959901	**Amphibian tanks, military**	yes
37959902	**Specialized tank components, military**	yes
37959904	**Tanks, military, including factory rebuilding**	yes
38120100	Aircraft/aerospace flight instruments and guidance systems	yes
38120101	Acceleration indicators and systems components, aerospace	yes
38120103	Airspeed instrumentation (aeronautical instruments)	yes
38120109	Driftmeters, aeronautical	yes
38120110	Electronic detection systems (aeronautical)	yes
38120117	Heads-up display systems (HUD), aeronautical	yes
38120308	Space vehicle guidance systems and equipment	yes
38120500	**Defense systems and equipment**	yes
38120501	**Missile guidance systems and equipment**	yes
38120603	Electronic field detection apparatus (aeronautical)	yes
48999902	**Missile tracking by telemetry and photography**	yes
50880200	**Combat vehicles**	yes
50880201	**Tanks and tank components**	yes
50880300	Aircraft and space vehicle supplies and parts	yes
50880301	Aeronautical equipment and supplies	yes
50880302	Aircraft and parts, nec	yes
50880303	Aircraft engines and engine parts	yes
50880304	Aircraft equipment and supplies, nec	yes
50880305	**Guided missiles and space vehicles**	yes
50880306	Helicopter parts	yes
50880307	Space propulsion units and parts	yes
56990101	**Military goods and regalia**	yes
59410201	**Ammunition**	yes
76992204	**Fire control (military) equipment repair**	yes
87119902	Aviation and/or aeronautical engineering	yes
96610000	Space research and technology	yes
97110000	**National security**	yes
97110400	**National security, level of government**	yes
97110401	**National security, Federal government**	yes
97110402	**National security, State government**	yes
97110403	**National security, County government**	yes
97110404	**National security, Local government**	yes
97119900	**National security, nec**	yes
97119901	**Air Force**	yes
97119902	**Army**	yes
97119903	**Civil Defense**	yes

Appendix 3: Data sample overview

The data sample consist of the following 174 M&A transactions. Only selected data are shown here. Sorting according to deal announcement period.

Number	Year	Acquiror	Country	Target	Country	Geography type	Acqu. price in $ mio	Size: Target/ Acquiror*	Payment type	Strategic direction
1	2016	Smith & Wesson	USA	Crimson Trace	USA	national	95	5-10%	cash	close to core
2	2016	L3-Communications Inc.	USA	MacDonald Humfrey	UK	cross border	278	1-5%	cash	close to core
3	2016	KBR	USA	Honeywell Technology Sol.	USA	national	300	5-10%	cash	close to core
4	2016	Albany	USA	Harris/Exelis	USA	national	210	10-25%	cash	core
5	2016	Mercury Systems	USA	Microsemi Security Sys.	USA	national	300	25-50%	cash	close to core
6	2016	Kongsberg	Norway	Patria Finaland	Finland	cross border	318	10-25%	cash	close to core
7	2016	Leidos	USA	Lockheed Martin IT	USA	national	5.930	75-100%	cash and shares	close to core
8	2016	Transdigm	USA	ILC / Data Device Corp.	USA	national	1.000	5-10%	cash	close to core
9	2016	OSI Systems Inc.	USA	American Science	USA	national	269	10-25%	cash	core
10	2016	Qinetiq Plc.	UK	Meggit Target Systems	UK	national	71	1-5%	cash	close to core
11	2015	Harris Corp.	USA	Exelis	USA	national	4.750	50-75%	cash	core
12	2015	L-3 Communications Inc.	USA	CTC Avaiation Group	UK	cross border	220	10-20%	cash	outside core
13	2015	Ultra Electronics Holdings PLC	UK	Kratos Electronics Products Div.	USA	cross border	265	10-20%	cash	close to core
14	2015	Lockheed Martin Corp	USA	Sikorsky Aircraft Corp. (UTC)	USA	national	9.000	5-10%	cash	close to core
15	2015	TransDigm Group Inc	USA	Breeze-Eastern Corp.	USA	national	206	1-5%	cash	close to core
16	2015	Cubic Corporation	USA	GATR Technologies	USA	national	233	1-5%	cash	close to core
17	2014	Engility Holdings Inc.	USA	TASC	USA	national	1.100	25-50%	stock	core
18	2014	L-3 Communications Inc.	USA	Data Tactics Corp.	USA	national	75	<1%	cash	close to core
19	2014	Babcock International Group plc	UK	Avinics Services	Spain/Italy	cross border	1.520	10-20%	cash	outside core
20	2014	Saab AB	Sweden	Thyssen Krupp Marine Systems	Sweden	national	50	5-10%	cash	close to core
21	2014	Alliant Techsystems Inc. (NYSE ATK)	USA	Orbital Science Corp.	USA	national		10-20%	merger, stock exchange	core
22	2014	Cobham PLC	UK	Aeroflex Holding Corp.	USA	cross border	920	10-20%	cash	outside core
23	2014	Analog Devices Inc (Nasdaq ADI)	USA	Hittite Microwave Corp.	USA	national	2.450	5-10%	cash	close to core
24	2013	TransDigm Group Inc	USA	Airborne Systems	USA	national	250	5-10%	cash	close to core
25	2013	CACI International	USA	Six3 Systems Inc.	USA	national	820	10-20%	cash	outside core
26	2013	AMTEC (National Presto Industries)	USA	DES Inc.	USA	national		10-20%	cash	core
27	2013	Cobham PLC	UK	Axell	UK	national	131	1-5%	cash	close to core
28	2012	GenCorp Inc	USA	Pratt & Whitney Rocketdyne Inc. / UTC	USA	national	550	75-100%	cash	core
29	2012	Ultra Electronics Holdings PLC	UK	Giga Communications Ltd.	UK	national	57	1-5%	cash	close to core
30	2012	Kratos Defense & Security	USA	Composite Engineering Inc.	USA	national	155	10-20%	sahres	close to core
31	2011	Mercury Computer Systems Inc	USA	KOR Electronics Inc.	USA	national	70	10-20%	cash	close to core
32	2011	General Dynamics Corp	USA	Force Protection Inc.	USA	national	266	1-5%	cash	core
33	2011	Cobham PLC	UK	Trivec Avant Corpp.	USA	cross border	144	1-5%	cash	close to core
34	2011	General Dynamics Corp	USA	Vangent Holding Corp.	USA	national	960	1-5%	cash	outside core
35	2011	Saab AB	Sweden	Sensis Corp.	USA	cross border	195	1-5%	cash	close to core
36	2011	Esterline Technologies Corp	USA	Souriau Holding SAS	France	cross border	697	10-20%	cash	close to core
37	2011	Chemring Group PLC	UK	General Dynamics Armament	USA	cross border	90	10-20%	share	outside core
38	2011	Ducommun Inc	USA	LaBarge Inc.	USA	national	332	50-75%	cash	close to core
39	2011	Kratos Defense & Security	USA	Herley Industries Inc.	USA	national	270	20-50%	cash	outside core
40	2011	Cobham PLC	UK	Telerob GmbH	Germany	cross border	105	1-5%	cash	outside core

Number	Year	Acquiror	Country	Target	Country	Geography type	Acqu. price in $ mio	Size: Target/ Acquiror*	Payment type	Strategic direction
41	2011	BAE Systems(Holdings)Ltd	UK	Norkom Technologies Ltd.	Ireland	cross border	198	1-5%	cash	close to core
42	2010	Raytheon Co	USA	Applied Signal Tech. Inc.	USA	national	475	1-5%	cash	outside core
43	2010	Safran SA	France	L-1 Identity Inc.	USA	cross border	1.595	1-5%	cash	close to core
44	2010	Boeing Co	USA	Argon Inc.	USA	national	775	1-5%	cash	outside core
45	2010	FLIR Systems Inc	USA	Raymarine Holdings	UK	cross border	180	10-20%	cash	close to core
46	2010	Rheinmetall AG	Germany	Simrad Optronics ASA	Norway	cross border	95	1-5%	cash	outside core
47	2010	Kratos Defense & Security	USA	Gichner Systems Group	USA	national	133	50-75%	cash	outside core
48	2009	Chemring Group PLC	UK	Allied Defense	USA	cross border	131	5-10%	cash	close to core
49	2009	Raytheon Co	USA	BBN Technologies	USA	national	350	<1%	cash	outside core
50	2009	Safran SA	France	GE Homeland Protection	USA	cross border	580	1-5%	cash	outside core
51	2009	Harris Corp	USA	Tyco Electronics Wireless	USA	national	675	5-10%	cash	outside core
52	2008	Esterline Technologies Corp	USA	Racal Acoustics Ltd.	UK	cross border	170		cash	close to core
53	2008	General Dynamics Corp	USA	Jet Avaiation Int'l	Switzerland	cross Norder	2.245	5-10%	cash	outside core
54	2008	BAE Systems(Holdings)Ltd	UK	Detica Group PLC	UK	national	1.043	1-5%	cash	outside core
55	2008	Thales UK Ltd	France	nCipher PLC	UK	cross border	90	1-5%	cash	outside core
56	2008	Chemring Group PLC	UK	Martin Electronics Inc.	USA	cross border	70	<1%	cash	core
57	2008	Safran SA	France	SNPE Materiqux Energetiques SA	France	cross border	467	1-5%	cash	core
58	2008	Cobham PLC	UK	M/A COM Inc.	USA	cross border	425	10-20%	cash	close to core
59	2008	Finmeccanica SpA	Italy	DRS Techn. Inc.	USA	cross border	5.482	20-50%	cash	close to core
60	2008	TransDigm Group Inc TDG	USA	CEF Inustries Inc.	USA	national	83	5-10%	cash	close to core
61	2008	L-3 Communications Hldg Inc (LLL)	USA	Electro Optical Sys./NG	USA	national	175	1-5%	cash	close to core
62	2008	Cobham PLC	UK	Sparta Inc.	USA	cross border	416	20-50%	cash	outside core
63	2007	Cobham PLC	UK	Bus. Unit of BAE Sys.	USA	cross border	240	5-10%	cash	close to core
64	2007	Finmeccanica SpA	Italy	VEGA Group PLC.	UK	cross border	127	1-5%	cash	outside core
65	2007	Cohort Plc	UK	Sea Group Ltd.	UK	national	50	20-50%	cash & shares	close to core
66	2007	Textron Inc	USA	United Indsutrial Corp.	USA	national	1.100	5-10%	cash	outside core
67	2007	ITT Corp	USA	EDO Corp.	USA	national	1.882	10-20%	cash	close to core
68	2007	FLIR Systems Inc	USA	Cedip Infrared Sys.	France	cross border	57	1-5%	cash	close to core
69	2007	Harris Corp	USA	Multimax Inc.	USA	national	400	5-10%	cash	close to core
70	2007	BAE Systems Inc	UK	Armor Holdings Inc.	USA	cross border	4.790	10-20%	cash	outside core
71	2007	Chemring Group PLC	UK	Simmel Difesa - FIAT	Italy	cross border	103	10-20%	cash & shares	core
72	2007	Thales SA	France	DCNS SA	France	national	759	10-20%	cash	close to core
73	2006	Northrop Grumman Corp	USA	Essex Corp.	USA	national	542	1-5%	cash	close to core
74	2006	Harris Corp	USA	Stratex Networks Inc.	USA	national	366	1-5%	share	outside core
75	2006	Meggitt	UK	Firearms Training Sys. Inc.	USA	cross border	139	5-10%	cash	close to core
76	2006	Teledyne Technologies Inc	USA	Rockwell Scientific	USA	national	168	5-10%	cash	core
77	2006	EDO Corp	USA	Impact Science	USA	national	124	5-10%	cash	outside core
78	2006	EDO Corp	USA	CAS Inc.	USA	national	176	10-20%	cash	outside core
79	2006	Saab AB	Sweden	Ericsson Microwave Sys.	Sweden	national	517	10-20%	cash	close to core
80	2006	L-3 Communications Hldg Inc	USA	Crestview Aerospace Sys.	USA	national	135	1-5%	cash	outside core

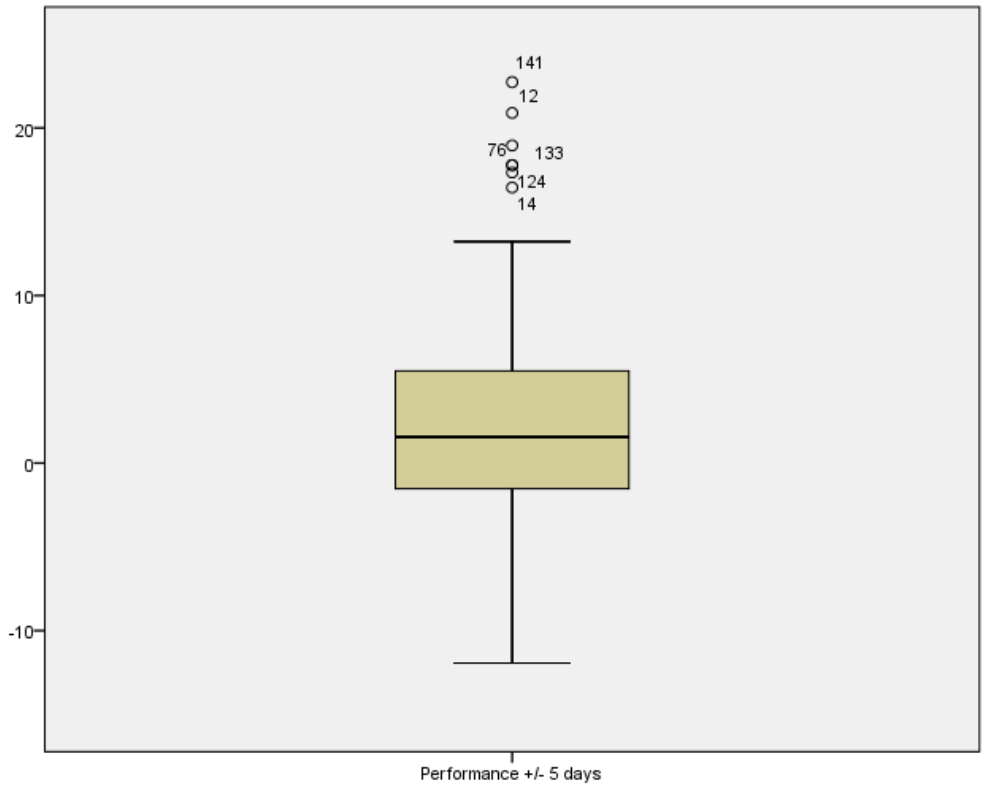
Number	Year	Acquiror	Country	Target	Country	Geography type	Acqu. price in $ mio	Size: Target/ Acquiror*	Payment type	Strategic direction
81	2006	Thales SA	France	Alcatel Satellite SA	France	national	2.330	5-10%	cash & shares	outside core
82	2006	Esterline Technologies Corp	USA	Wallop Defence Sys. (Cobham PLC)	UK	cross border	76	1-5%	cash	outside core
83	2006	Armor Holdings Inc	USA	Stewart & Stevenson Services	USA	national	755	50-75%	cash	core
84	2006	General Dynamics Corp	USA	SNC Technologies Inc.	Canada	cross border	273	1-5%	cash	core
85	2005	General Dynamics Corp	USA	Anteon Int'l Corp.	USA	national	2.176	5-10%	cash	close to core
86	2005	DRS Technologies Inc DRS:US	USA	Engineered Support Systems	USA	national	1.866	50-75%	cash & shares	close to core
87	2005	Ultra Electronics Holdings PLC	UK	Audiopack Technologies	USA	cross border	60	5-10%	cash	close to core
88	2005	United Technologies Corp	USA	Lenel Systems Intl.	USA	national	400	1-5%	cash	close to core
89	2005	Rockwell Collins Inc	USA	Teldix GmbH (NG)	Germany	cross border	94	1-5%	cash	close to core
90	2005	BAE Systems Inc	UK	United Defense Industries Inc.	USA	cross border	4.200	20-50%	cash	outside core
91	2005	Curtiss-Wright Corp	USA	Indal Technologies Inc.	Canada	cross border	63	1-5%	cash	close to core
92	2005	Northrop Grumman Corp	USA	Integic Corp.	USA	national	313	1-5%	cash	outside core
93	2005	Lockheed Martin Corp	USA	Systex Group Inc.	USA	national	440	1-5%	cash	outside core
94	2005	L-3 Communications	USA	Tital	USA	national	2.650	20-50%	cash	close to core
95	2004	Elbit Systems Ltd	Israel	Tadiran Communicatons Ltd.	Israel	national		10-20%	cash	close to core
96	2004	Cobham PLC	UK	H Koch & Sons	USA	cross border	65	1-5%	cash	close to core
97	2004	Engineered Support Systems Inc EASI	USA	Spacelink International	USA	national	180	5-10%	cash	close to core
98	2004	L-3 Communications Hldg Inc	USA	General Dynamics Propulsion	USA	national	185	1-5%	cash	close to core
99	2004	Armor Holdings Inc	USA	Bianchi Int'l	USA	national	60	1-5%	cash	close to core
100	2004	L-3 Communications Hldg Inc	USA	North Grumman Canada	Canada	cross border	65	1-5%	cash	close to core
101	2004	Armor Holdings Inc	USA	Specialty Group Inc.	USA	national	92	10-20%	cash	close to core
102	2004	Alliant Techsystems Inc (ATK)	USA	PSI Group	USA	national	165	1-5%	cash	core
103	2004	Esterline Technologies Corp	USA	Leach Holding Corp.	USA	national	145	10-20%	cash	close to core
104	2004	Harris Corp	USA	Orkand Corp.	USA	national	66	1-5%	cash	close to core
105	2004	GE Infrastructure Inc	USA	InVision Techn. Inc	USA	national	900	1-5%	cash	outside core
106	2004	Heroux-Devtek Inc	Canada	Progressive Inc.	USA	cross border	70	10-20%	cash	close to core
107	2004	Alliant Techsystems Inc (ATK)	USA	Mission Research Corp.	USA	national	215	5-10%	cash	close to core
108	2003	FLIR Systems Inc	USA	Indigo Systems Corp.	USA	national	190	10-20%	cash	core
109	2003	DRS Technologies Inc DRS:US	USA	Integrated Defense Tech.	USA	national	537	20-50%	cash & shares	close to core
110	2003	Moog Inc	USA	Northrop Grumman Poly Div.	USA	national	169	10-20%	cash	close to core
111	2003	Lockheed Martin Corp	USA	ACS Fed. Gov. Business	USA	national	658	1-5%	cash	outside core
112	2003	General Dynamics Corp	USA	Intercontinental Manufacturing Co.	USA	national	141	1-5%	cash	close to core
113	2003	Armor Holdings Inc	USA	Simula Inc.	USA	national	111	5-10%	cash	close to core
114	2003	General Dynamics Corp	USA	Veridian Corp.	USA	national	1.573	5-10%	cash	close to core
115	2003	Cobham PLC	UK	Litton Life Support (NG)	USA	cross border	73	1-5%	cash	outside core
116	2003	L-3 Communications Hldg Inc	USA	Goodrich Avionics Sys.	USA	national	288	1-5%	cash	close to core
117	2002	General Dynamics Corp	USA	GM Defense	USA	national	1.100	5-10%	cash	close to core
118	2002	L-3 Communications Hldg Inc	USA	Northrop Grumman Electronics	USA	national	135	5-10%	cash	core
119	2002	Esterline Technologies Corp	USA	BAE Systems NA Electr.	USA	national	68	5-10%	cash	close to core
120	2002	DRS Technologies Inc DRS:US	USA	Eaton Corp Navy	USA	national	92	10-20%	cash	close to core

Number	Year	Acquiror	Country	Target	Country	Geography type	Acqu. price in $ mio	Size: Target/ Acquiror*	Payment type	Strategic direction
121	2002	EDO Corp	USA	Condon Systems	USA	national	112	10-20%	cash	close to core
122	2002	General Dynamics Corp	USA	Advanced Technical Products	USA	national	250	1-5%	cash	close to core
123	2002	Northrop Grumman Corp	USA	TRW Inc.	USA	national	11.953	20-50%	stock	outside core
124	2002	L-3 Communications Hldg Inc	USA	Raytheon Aircraft Integr.	USA	national	1.130	20-50%	cash	close to core
125	2001	Alliant Techsystems Inc (ATK)	USA	Blount Ammunition Bus.	USA	national	262	10-20%	stock	core
126	2001	General Dynamics Corp	USA	Motorola Integrated Sys.	USA	national	825	5-10%	cash	core
127	2001	DRS Technologies Inc DRS:US	USA	Boeing Sensors	USA	national	67	10-20%	cash	core
128	2001	Ducommun Inc	USA	Compsotite Structures LLC	USA	national	54	20-50%	cash	core
129	2001	L-3 Communications Hldg Inc	USA	KDI Precision Ltd.	USA	national	68	1-5%	cash	close to core
130	2001	General Dynamics Corp	USA	Galaxy Aerospace Corp.	USA	national	668	5-10%	cash	close to core
131	2001	Northrop Grumman Corp	USA	Aeroject Gencorp	USA	national	315	1-5%	cash	outside core
132	2001	CAE Inc	Canada	BAE Syst. Flight & Training	USA	cross border	80	5-10%	cash	core
133	2001	Cobham PLC	UK	Omnipless Ltd.	South Africa	cross border	59		cash & shares	outside core
134	2000	Northrop Grumman Corp	USA	Litton Industries Inc.	USA	national	5.152	50-75%	cash	close to core
135	2000	Cobham PLC	USA	BAE Syst. Power & Control	UK	cross border	92	10-20%	cash	close to core
136	2000	General Dynamics Corp	USA	Primex Techn.	USA	national	511	5-10%	cash	close to core
137	2000	Northrop Grumman Corp	USA	Sterling Software	USA	national		1-5%	cash	close to core
138	2000	Northrop Grumman Corp	USA	Federal data corp	USA	national	300	5-10%	cash	close to core
139	2000	Finmeccanica SpA	Italy	Aermacchi SpA	Italy	national	194	5-10%	cash	core
140	2000	Ultra Electronics Holdings PLC	UK	DF Group Ltd.	UK	national	70	10-20%	cash	close to core
141	2000	Boeing Co	USA	Hughes Eltectronics Satellite	USA	national	3.750	1-5%	cash	close to core
142	2000	EDO Corp	USA		USA	national	87	50-75%	cash & shares	core
143	1999	Engineered Support Systems Inc EASI	USA	Systems & Electronics Inc.	USA	national	85	10-20%	cash	core
144	1999	General Dynamics Corp	USA	GTE Corp. / Gov. Sys.	USA	national	1.050	20-50%	cash	close to core
145	1999	Meggitt PLC	UK	Whittaker Corp.	USA	cross border	381	20-50%	cash	core
146	1999	General Dynamics Corp	USA	Gulfstream Aerospace Inc.	USA	national	5.686	20-50%	stock	outside core
147	1998	FLIR Systems Inc	USA	Inframetrics Inc.	USA	national	60	20-50%	stock	core
148	1998	Moog Inc	USA	Montek	USA	national	160	10-20%	cash	close to core
149	1998	General Dynamics Corp	USA	Nassco Holdings Inc.	USA	national	415	10-20%	cash	close to core
150	1998	Lockheed Martin Corp	USA	Comsat Corp.	USA	national	3.488	1-5%	stock	outside core
151	1998	DRS Technologies Inc DRS:US	USA	NAI Technologies Inc.	USA	national	53	1-5%	stock	close to core
152	1997	General Dynamics Corp	USA	Ceridian	Canada	cross border	600	10-20%	cash	outside core
153	1997	Cobham PLC	UK	ML Holdings Aerospace & Marine Div.	UK	national	62	10-20%	cash	close to core
154	1997	General Dynamics Corp	USA	Advanced Techn.Sys.	USA	national	284	5-10%	cash	outside core
155	1997	FLIR Systems Inc	USA	Agema Infrared Sys. AB	Sweden	cross border	89	5-10%	stock	close to core
156	1997	Northrop Grumman Corp	USA	Logicon Inc.	USA	national	1.028	5-10%	stock	outside core
157	1997	Raytheon Co	USA	Hughes Aircraft	USA	national	9.500	75-100%	cash	close to core
158	1997	Raytheon Co	USA	Texas Instruments Electronics	USA	national	2.950	10-20%	cash	core
159	1996	Boeing Co	USA	McDonnell Douglas Corp.	USA	national	15.282	75-100%	stock	core
160	1996	General Dynamics Corp	USA	Lockheed Martig Defense Div.	USA	national	450	10-20%	cash	core

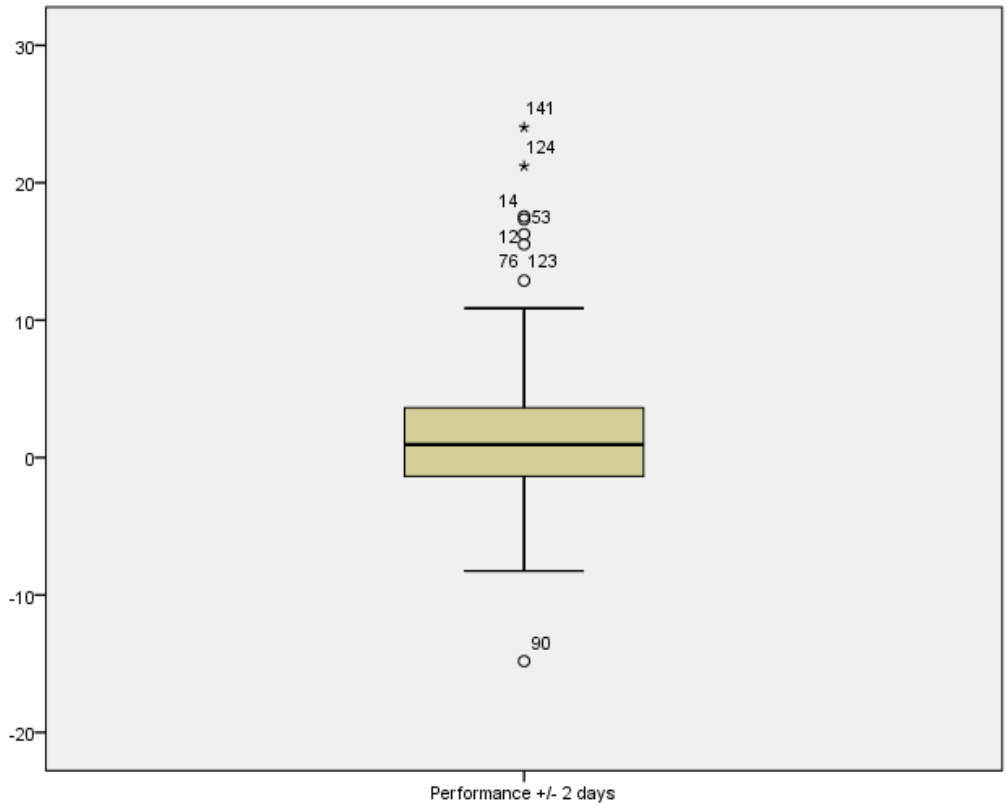
Number	Year	Acquiror	Country	Target	Country	Geography type	Acqu. price in $ mio	Size: Target/ Acquiror*	Payment type	Strategic direction
161	1996	Boeing Co	USA	Rockwell Int'l Corp.	USA	national	3.086	10-20%	stock	outside core
162	1996	Lockheed Martin Corp	USA	Loral Corp.	USA	national	8.762	20-50%	cash	close to core
163	1996	Northrop Grumman Corp	USA	Westinghouse Defense	USA	national	3.600	20-50%	cash	close to core
164	1995	Cobham PLC	UK	Westwind Air Bearings Ltd.	UK	national	117	10-20%	cash & shares	close to core
165	1995	General Dynamics Corp	USA	Bath Ironn Works	USA	national	300	10-20%	cash	outside core
166	1995	Raytheon Co	USA	E-Systems Inc.	USA	national	2.255	20-50%	cash	outside core
167	1994	Rolls-Royce Plc	UK	Allison Engine Co.	USA	cross border	525	10-20%	cash	core
168	1994	Lockheed	USA	Martin Marietta Corp.	USA	national	7.653	50-75%	stock swap	core
169	1994	Alliant Techsystems Inc (ATK)	USA	Hercules Aerospace	USA	national	424		cash & shares	close to core
170	1994	Orbital Sciences Corp	USA	Fairchild Space and Defense	USA	national	80	50-75%	cash & shares	close to core
171	1994	Northrop Corp	USA	Grumman Corp	USA	national	2.114	50-75%	cash	core
172	1994	Moog Inc	USA	Allied Signal Mechanical Div.	USA	national	71	10-20%	cash	core
173	1993	Raytheon Co	USA	British Aerospace Corp. Jets	UK	cross border	387	5-10%	cash	close to core
174	1992	Lockheed Corp	USA	General Dyn. Fort W. Div.	USA	national	1.525	10-20%	cash	close to core

Appendix 4: Outlier identification by the boxplot logic

Appendix 4.1: Boxplot for +/- 5 days



Appendix 4.2: Boxplot for +/- 2 days



Appendix 5: Table of take-over premiums for selected defence deals 1997-2016

Number	Year	Deal	Premium in %
1	1997	Northrop - Logicon	23%
2	1996	Boeing - McDonnell Douglas	21%
3	1996	Lockheed - Loral	26%
4	1995	Raytheon - Esystems	41%
5	1994	Northrop - Grumman	35%
6	1987	Boeing - Argo Systems	49%
7	1986	Lockheed - Sanders	45%
8	1985	GD-Cessna	46%
9	1985	Olin - Rockkor	28%
10	1998	Lockheed Comsat	33%
11	2000	General Dynamics and Primex	4%
12	1999	Meggitt - Whittacker	4%
13	2000	Northrop-Litton	28%
14	2002	GD - Advanced Technical Products	17%
15	2003	BAE - Alvis	18%

16	2004	General Dynamics-Alvis	33%
17	2003	GD - veridian	28%
18	2003	UTC - Chubb (UK)	13%
19	2003	DRS-Integrated Defense Systems	17%
20	2003	Precision Castparts-SPS	28%
21	2003	Armor - Simula	40%
22	2004	GE - Invision	23%
23	2005	BAE Systems - United Defense	29%
24	2005	DRS-Engineered support systems	29%
25	2005	General Dynamics - Anteon	36%
26	2005	L3-Titan	20%
27	2006	Armor - Stewart & Stevenson Services	29%
28	2006	L3-TRL	13%
29	2006	Meggitt-Firearms Training	35%
30	2007	BAE Systems - Armor	7%
31	2007	ITT - EDO	9%
32	2007	Textron - United Industrial Corp	7%
33	2007	Finmeccanica - Vega	27%
34	2007	Finmeccanica - DRS	32%
35	2008	Thales - ncipher plc	138%
36	2008	BAE - Detica	57%
37	2010	Rheinmetall - Simrad	21%
38	2010	Boeing - Argon	41%
39	2010	Flir - Icx	12%
40	2010	Safran - L1	32%
41	2011	Duocommun-LaBarge	10%
42	2011	Private Eqity - GTEC	51%
43	2011	Raytheon-Applied Signal	15%
44	2011	BAE Systems - Norkom	36%
45	2011	Kratos-Herley	17%
46	2011	General Dynamics - Force Protection	31%
47	2014	Analog - Hittite	29%
48	2014	Cobham-Aeroflex	26%
49	2015	Harris - Exelis	36%
50	2016	CCL-Checkpoint	29%
51	2016	Lehmann-API Technologies	98%
52	2016	OSI - American science	14%
53	2016	Teledyne-e2v technologies	47%

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