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Master Thesis Economics and Business

ACQUIRING TRANSPORT COMPANIES: DOES IT CREATE VALUE?

Name student: Rick Bron
Student number: 430007

Supervisor: Dr. J. J. G. Lemmen
Second assessor: Dr. R. Wang Renjie

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Abstract

This study tries to find out whether M&As in the transport industry create value for acquirer shareholders. Event studies for abnormal returns, trading volume and volatility show that all three are positive, indicating short-term value creation. Comparing these three variables between public and private, horizontal, and vertical, and M&As going local or not, there seems to be no difference. The buy-and-hold abnormal return method shows value destruction for acquirer shareholders over a 1- and 3-year period. Lastly, a fixed effects regression analysis shows that acquirers with higher P/E ratios and a higher asset growth rate create less value around an M&A announcement. Concluding, M&As in the transport industry create short-term value but destroy long-term value for acquirer shareholders.

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

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Chapter 1: Introduction

1.1: Preface and Research Question

Mergers and acquisitions (M&As) in the transport industry occur frequently. According to PWC (2021a), the total deal value of M&As in the transport industry was US$116 billion in 2018 and rose to US$138 billion in 2019. There are many arguments for M&As. For example, in November 2020, it was announced that South Korean airline Korean Air would acquire its domestic competitor Asiana Airlines, with help from the South Korean government (Luchtvaartnieuws, 2020). The financial status of both airlines could be in jeopardy if the Covid-19 crisis lasts even longer and the aviation industry in South Korea could collapse if the companies do not merge (Baker, 2020). In a survey conducted by Suau-Sanchez, Voltes-Dorta and Cugueró-Escofet (2020), most companies in the aviation industry expect that consolidation in the industry will be necessary to preserve it; due to the expected slow recovery in demand, reducing the need for the supply levels available before Covid-19. PWC (2021b) expects consolidation to occur not only in the aviation industry, but throughout the transport industry.

This is a recent example of an argument for M&As. However, it is not always clear whether M&As benefit company shareholders. Companies should always focus primarily on the interests of their shareholders (Agrawal & Mandelker, 1990). This study attempts to answer the question of whether M&As in the transport industry in the 21st century have been successful for acquirers and whether they have created short- and long-term shareholder value. Therefore, the research question is:

To what extent is shareholder value created for acquirers in a merger or an acquisition in the transport industry in the 21st century?

In this study, the transport industry consists of acquirers specialised in transporting people or goods by plane, train, ship, truck, and other means of road transport such as taxis and buses, and of targets specialised in transporting people or goods, or support activities.

1.2: Scientific and Social Relevance

This research question was constructed because of the various issues that come up during the process of a merger or acquisition. El Zuhairy, Taher, and Shafei (2015) list 11 different motives for mergers, ranging from diversification benefits to growth acceleration and possible synergies. In addition, there seems to be a difference in value creation for acquirers with public and private targets. In the Capron and Shen (2007) study, acquirers that acquire private targets

(private acquirers) earn positive abnormal returns, while acquirers that acquire public targets (public acquirers) earn negative abnormal returns. This could be attributable to lack of market anticipation or financial characteristics of the acquirer (Capron & Shen, 2007). The reviewed literature on which this study is based consists of four subjects: what are merger motives, where do merger gains come from, what is the short- and long-term market reaction to M&A announcements, and what financial characteristics might affect the creation of shareholder value. This study differs from previous studies because this study also considers vertical M&As in the transport industry. Moreover, most previous studies discussing announcement effects or long-term effects of M&As in the transport industry were conducted in the 20th century or for a specific branch of the transport industry. It is possible that economic conditions have changed considerably over time (Eckes, 2011). This study is focused on M&As that took place in the 21st century and is focused on the transport industry as a whole. It will therefore contribute to the existing literature.

Furthermore, the world is currently in crisis and during a crisis period industries could be consolidated, and firms could be liquidated, downsized, or acquired to ensure their survival (Greenwood, Iverson, & Thesmar, 2020). In the global financial crisis of 2007 and 2008, only large companies made acquisitions to consolidate their industry and companies, and investors were willing to sell below market value because they were cash strapped (Grave, Vardiabasis, & Yavas, 2012). Companies constantly have to adjust to new situations that arise due to crises.

The current Covid-19 crisis is also expected to bring changes. In the wake of the Covid-19 crisis, Suau-Sanchez, Voltes-Dorta and Cugueró-Escofet (2020) believe that in the future more business meetings will be held online rather than face to face, or smaller teams will be sent to conferences. The same study also notes that people will have less money to spend during this recession, so there could be less need for business and vacation travel now and in the future. This study tries to conclude whether an M&A, and thus consolidation, creates value for acquirers in the short and long run.

Also, companies with global supply chains are shown to be prone to pandemic outbreaks (Ivanov, 2020) and help the spread of the pandemic (Bonadio, Huo, Levchenko, & Pandalai-Nayar, 2020). The pandemic that has started in China has hit many companies with great supply chain shocks, showing what can happen if something happens in one country that plays a role in the supply chain. Data analytics firm Dun and Bradstreet (2020) show that at least 5 million companies worldwide had a supplier from Wuhan, where the Covid-19 virus is believed to have come from. The current pandemic could be a starting sign to reduce dependence on one country in the supply chain (Govindarajan & Bagla, 2020). In addition, Bonadio, Huo, Levchenko and

Pandalai-Nayar (2020) found that the average GDP contraction during the global pandemic is 29.6% and around one quarter of this contraction is attributable to global supply chains, which helped the disease to spread throughout the world and put more countries in lockdown. This means that going local in the supply chain could be the way forward (De Sousa Jabbour, et al., 2020). This study tries to conclude whether going local in the supply chain is a value-creating decision.

In addition, the outcome of this research may lead to a different approach to shares trading during the period around an M&A announcement, when it appears that a merger or acquisition may create or destroy value for acquirers.

1.3: Report Structure

Chapter 2 consists of the literature review. First, the motives and gains of M&As, and the market reaction to M&As are discussed. Second, the financial characteristics that may affect value creation are explained. Following the literature review, Chapter 3 discusses the methods used to test the hypotheses. The datasets to which these methods are applied and how these datasets are constructed are described in Chapter 4. Chapter 5 presents the results of the tests conducted. Finally, Chapter 6 discusses the conclusion from this research.

Chapter 2: Literature Review

Companies may have different reasons to merge with other companies or to acquire them. In this chapter, merger motives and merger gains are described first, followed by short- and long-term value creation in mergers or acquisitions in general and mergers or acquisitions in the transport industry. Lastly, an overview is presented of previous research into which financial determinants affect value creation in M&As in the transport industry. At the end of each section, the hypotheses formulated to test the research question are presented. As mentioned in chapter 1, many types of transport vehicles are included in the definition of the transport industry. Thus, this literature review includes previous studies on multiple types of transportation such as air transportation, maritime transportation, railroad transportation and road transportation.

2.1: Merger Motives and Gains

2.1.1: Merger Motives and Gains in Horizontal Mergers and Acquisitions

Trautwein (1990) conducted a survey to explain the reasoning behind mergers. According to Trautwein (1990), the most plausible reasons for M&As are the building of an empire theory and valuation theory followed by the monopoly and efficiency theory. Empire building means that managers acquire companies to expand their own wealth instead of acting in the best interest of shareholders (Baumol, 1959, as cited in Trautwein, 1990). Valuation theory states that M&As happen because the managers of the acquiring company have more information about the value of the target than the market (Steiner, 1975). The monopoly theory states that targets are acquired to generate market power (Trautwein, 1990). Lastly, the efficiency theory of M&A states that companies merge to achieve, for example, financial synergies, operational synergies, and managerial synergies. For operational synergies, cost savings is one of the most common arguments for value creation in M&As (Houston, James, & Ryngaert, 2001).

These arguments for M&As are applicable to the transport industry. This study does not distinguish between the different forms of synergy, so for that reason they are all discussed. In the Japanese aviation industry, a merger between JAL Airlines and Japan Air System was carried out because of the market power that their competitor ANA had beforehand. The merger changed the structure of the Japanese aviation industry where the merged airline Japan Airlines was more similar to ANA and thus gained market power (Mizutani, 2011). Also, in the US Rail Freight industry was concluded that M&As took place to enhance market power because there are fewer and larger companies that serve the market (Chapin & Schmidt, 1999). Shahrur (2005) argued that the newly merged company's buying power will increase due to the reduced level of competition, even though the motivation to merge is attributable to efficiency reasons.

The efficiency theory is applicable to the Chinese aviation industry, where several large mergers took place in 2002 to consolidate the Chinese market. Before these mergers, the industry was inefficient and productivity was low. After consolidation, the average productivity and efficiency increased (Chow & Fung, 2012). Schosser and Wittmer (2015) have broken down synergies in cost synergies and revenue synergies for airlines. When airlines merge, cost synergies can be achieved through reduction of labour costs by elimination of redundancies (Merkert & Morrell, 2012), optimizing the network by removing overlapping routes and higher aircraft utilisation (Caves, Christensen, & Tretheway, 1984), and the use of joint infrastructure while also removing unnecessary infrastructure (Hansson, Neilson, & Belin, 2002). Revenue synergies consist of access to new markets and a larger network. This can mean greater customer attractiveness and higher revenue (Hansson, Neilson, & Belin, 2002), or increased market power which could lead to higher profit margins (Merkert & Morrell, 2012). Choi (2017) said that choosing M&As to combat external influences such as 9/11, the financial crisis and ever-rising oil prices, seemed like the right choice as merged airlines have a more streamlined network with no overlapping routes, efficient scheduling, and lower costs, allowing them to realize network synergies and cost synergies, as well as economies of scale.

In Norwegian public transport the efficiency of companies increased more in the years after a merger compared to the years before a merger. Second, merged companies outperform non-merged companies in terms of efficiency. Thus, they appear to have gained economies of scale resulting in improved performance (Odeck, 2008). British public transport has also been examined. According to Cowie (2002) British transport companies have grown solely through acquisitions and not organically. However, internal efficiency has been improved through mergers, as competition has been greatly reduced, allowing companies to operate closer to their optimal level of output. This resulted in a more stable industry. The same can be concluded for the American railway industry (Chapin & Schmidt, 1999) and for mergers in the aviation industry in the United States, Latin America, Europe, and China (Merkert & Morrell, 2012; Yan, Fu, Oum, & Wang, 2019).

In Portugal, the rail and road infrastructure companies merged to optimize the use of the road and rail network. This has led to better service, higher revenues, and cost reductions through synergies to allow a more sustainable operator (Cruz & Sarmento, 2017). However, it frequently happens that in the search of synergy gains the workforce is increased too much resulting in reduced efficiency and decreased profitability (Rozen-Bakher, 2018).

In addition, economies of size are another reason to merge and captures the effect of economies of scale and density together. In the freight transport industry, increasing returns to

size are defined in the cost structure of the industry. FedEx and UPS both have increasing returns to size and therefore it is profitable to merge to realize economies of size (Lakew, 2014).

2.1.2: Merger Motives and Gains in Vertical Mergers and Acquisitions

In the aviation industry, airlines are the centre of the supply chain and they realize the lowest return rate on assets, suggesting that financial sustainability may be a problem in the longer run. If an airline merges with another company in the supply chain, improved economic efficiency and financial viability can be realised (Tretheway & Markhvida, 2014). For increasingly more organisations, it is also important to plan, control and design their supply chain as a whole (Soylu, Oruç, Turkay, Fujita, & Asakura, 2006). This is where vertical mergers come into play. There are two types of vertical M&As: forward and backward. A forward acquisition occurs when a company acquires a downstream distributor or retailer. A backward vertical acquisition occurs when a company acquires an upstream supplier that, for example, manufactures raw materials (Zhu, 2012). A motive to merge vertically is that two independent companies in the same supply chain mark up their products above the marginal costs, which will result in a product that is marked up twice and thus does not reach the optimal output level. Vertical mergers eliminate this double markup to reach the optimal output level (Perry, 1989). Value can also be created through market foreclosure, which means that non-merged companies can be excluded from the supply chain. As a result, remaining suppliers will have less competitors, creating the possibility to increase profits (Zhu, 2012). Another large factor that creates value for vertical M&As is to what extent the acquirer and target match regarding strategic complementarity and culture (Bauer & Matzler, 2014).

However, large global supply chains are more exposed to possible disruptions with large consequences. Large supply chains have less visibility in their supply chain with more points where disruption is possible, which can result in slow decision-making (Sodhi & Tang, 2012). A recent example of this is the current Covid-19 crisis. Bonadio, Huo, Levchenko and Pandalai-Nayar (2020) found that part of the GDP contraction resulting from the crisis is attributable to the disease's spread through global supply chains. Because of the speed of modern transport and global supply chains, future diseases could be transmitted quickly (Tatem, Hay, & Rogers, 2006). There is also a possibility that countries do not want to rely as much on other countries, which is shown in the Fang, Ge, Huang and Li (2020) study concluding that Chinese companies with an international perspective performed worse compared to companies with a domestic view during the spread of the virus. Thus, it is expected that supply chains will go more local to some extent (Bonadio, Huo, Levchenko, & Pandalai-Nayar, 2020).

Another reason to go local and shorten the supply chain is to reduce the time needed for supply chain activities, thus creating a more agile firm, while also reducing the time needed to make decisions (Hwang & Rau, 2006). This also results in improved adaptiveness to respond to abrupt changes in demand and supply (Sodhi & Tang, 2012). A final argument to shorten the supply chain and go local is attributable to supply chain efficiency. Going local in the supply chain and having multiple supply chain regions close to the main country of operations means possible reductions in transporting and distribution costs and less dependence on one location in the supply chain (Chopra & Sodhi, 2014). PWC (2021b) expects companies in the transport industry to pay more attention to diversification of their supply chain in terms of location and better vertical integration in their future M&A attempts.

2.1.3: Merger Motives and Gains for M&As in a Crisis Period

In chapter 1, an example of a merger in the Korean airline industry was given. This was a forced merger to ensure the survival of the industry and to preserve jobs. But even in a crisis period not all M&As are forced. Salsberg (2020) stated that during a crisis period companies should always look for possible targets, because companies that acquire during a crisis outperform companies that do not. This strategy is particularly suitable for companies with large amounts of capital available. A PWC (2021c) study shows that companies that anticipated a recession have a combined US$7.6 trillion at their disposal for future endeavours such as M&A. The impact of the current Covid-19 crisis will become clear when government support stops. Weaker companies will experience much more financial stress in this period, making them a likely takeover target. Companies with lots of capital at their disposal could use this position to acquire these weak companies to become more efficient, acquire new or complementary skills to their original key business, acquire additional technologies or products, or increase their market share (Fernandes, 2020). However, an acquirer must consider whether it is able to carry the target's baggage, such as (bad) current and future cash positions, until the end of the recession (Rhodes & Stelter, 2009). Another reason to acquire during a recession is that there might be a possibility to restructure the industry that you are operating in through consolidation. This will need close monitoring of the financial and operational performance of the competitors because the acquirer does have to be more careful to help limit the risks of an acquisition during a recession (Salsberg, 2020). Taking advantage of a crisis in relation to M&As as discussed in this paragraph is applicable to both horizontal and vertical M&As.

2.2: Short-term Value Creation for Mergers and Acquisitions

2.2.1: Abnormal Returns in Mergers and Acquisitions

Various studies have been conducted on value creation in M&As, which are discussed in this paragraph. The general view is that M&As do not create value for acquirer shareholders and could even destroy it. Asquith (1983) derives from his research that the probability of a merger or acquisition already affects stock returns, arguing that an increase in the M&A probability benefits target shareholders, while a decrease in merger probability harms both the target and acquirer shareholders. Mandelker (1974), Franks and Harris (1989) and, Campa and Hernando (2004) conclude that acquirers at the very least do not lose from a merger or acquisition in three different time periods and regions. However, Campa and Hernando did find negative abnormal returns for acquirers in regulated industries. Jensen and Ruback (1983) and, Weidenbaum and Vogt (1987) also found that acquirer shareholders at the very least do not lose from a merger or acquisition and Datta, Pinches and Narayanan (1992) conclude no value destruction when cash is used as means of payment. Bruner (2002) concluded in his study that acquirer shareholders profit in half of the cases. The other half of the cases do not generate a loss for acquirer shareholders, nor a profit. Fich, Nguyen and Officer (2018) also found that globally, acquirers gain half of the time and lose half of the time.

Dodd (1980) found that acquirer shareholders earned between -5.50 and -7.12 percent abnormal returns in cancelled and completed mergers, respectively. Langetieg (1978) shows that M&As do not create value when the greatest incentive to merge or acquire is the creation of shareholder value. Datta, Pinches and Narayanan (1992) conclude that acquirers lose value when stocks are used as means of payment. Moeller, Schlingemann and Stulz (2004) indicate that each merger or acquisition in their 1998-2001 dataset destroyed value for the acquirer shareholders. One reason for value destruction in M&As may be attributable to the acquisition premium paid. According to Rappaport and Sirower (1999), expected performance of a company is already incorporated in the stock price. An acquisition premium is paid on top of the stock price. Which means that the acquirer pays more than the expected improvements, which will result in value destruction.

However, Asquith, Bruner and Mullins (1983) argue that acquirer shareholders do benefit from M&A announcements if an M&A bid is proven to be successful. Furthermore, Alexandridis, Petmezas and Travlos (2010) show that acquirers lose when M&As take place in competitive markets such as the United States, United Kingdom and Canada but gain from M&As if they take place in less competitive markets.

2.2.2: Abnormal Returns in Mergers and Acquisitions in the Transport Industry

Alexandrou, Gounopoulos and Thomas (2014) have conducted research into all M&As in the shipping industry. Their research shows a realisation of abnormal returns for both acquirers and targets. This abnormal return will be greater for deals that diversify companies rather than focus-increasing M&As. Panayides and Gong (2002), and Samitas and Kenourgios (2007) previously reached the same conclusion, stating that an M&A announcement in the shipping industry provided positive abnormal returns for both acquirer and target shareholders.

In the freight transportation industry target shareholders profit if the merger or acquisition is vertical rather than horizontal and acquirer shareholders are better off when M&As are friendly instead of hostile. For other merger or acquisition reasons, it is more likely that there will be no shareholder effects at all (Andreou, Louca, & Panayides, 2012).

Slovin, Sushka and Hudson (1991) studied the difference in abnormal returns for M&As in the aviation industry before and after the introduction of the airline deregulation act. This law meant that the government no longer controlled the ticket prices, airline routes and the entry of new airlines (Carter, 1978). Before the enactment of this law, abnormal returns were 8.39 percent for targets and 3.15 percent for acquirers. These figures rose to 15.75 percent for targets and fell to 1.37 percent for acquirers after the act came into force. Although the differences between target and acquirer shareholders are significant, the overall conclusion is that a merger or acquisition in the aviation industry produces positive abnormal returns for targets and acquirers (Slovin, Sushka, & Hudson, 1991). According to the studies discussed in section 2.1 until section 2.2.2, the following hypothesis is formulated:

Hypothesis 1: *The short-term cumulative abnormal return is positive for acquirer shareholders in mergers and acquisitions in the transport industry.*

2.2.3: Abnormal Trading Volume and Abnormal Volatility in Mergers and Acquisitions

In addition to abnormal returns, Ascioglu, McInish, and Wood (2002) find that in the period surrounding an M&A announcement, daily trading volume is higher than in periods without an M&A announcement. Jansen (2015) came to the same conclusion and adds that method of payment and firm size are important determinants to these sudden changes in trading volume. Also, Epps (1975) concluded that price changes are correlated with changes in trading volume, which may indicate that abnormal returns are correlated with abnormal trading volume. As discussed in sections 2.2.1 and 2.2.2, M&A announcements in the transport industry often lead to abnormal returns. It is therefore interesting to examine whether this also translates into

abnormal trading volumes. Furthermore, it emerged that an M&A announcement leads to increased stock price volatility around the announcement date (Mall & Gupta, 2019). Morellec and Zhdanov (2005) also found increased stock price volatility around the announcement date and add that the abnormal volatility is positively correlated with abnormal returns.

This increase in volatility during M&A announcements is present because, according to Yadav (1992), new information can change expectations and can change stock prices creating volatility. If an event, such as an M&A announcement, provides relevant information to the market, the absolute value of abnormal price changes should, on average, be greater on days when an event occurs than on days when no event occurs. As a result, the following hypotheses are formulated:

Hypothesis 2: *The short-term cumulative abnormal trading volume is positive for acquirer shareholders in mergers and acquisitions in the transport industry.*

Hypothesis 3: *The short-term cumulative abnormal volatility is positive for acquirer shareholders in mergers and acquisitions in the transport industry.*

2.2.4: Value Creation in Public vs. Private Target Mergers and Acquisitions

There are different reasons to choose between a public or a private target. Capron and Shen (2007) concluded that companies generally acquire private targets to expand their presence in industries they already operate in and acquire public targets when they seek to enter new industries. The same study found that acquirers who acquire private targets perform better compared to acquirers who acquire a public target. However, it should be noted that acquiring companies who acquired a private target perform better if they would have chosen to acquire a public target and vice versa (Capron & Shen, 2007). This may have to do with the type of company the acquirer is looking for. Fuller, Netter and Stegemoller (2002) elaborate on stock return for acquirer shareholders during a merger or acquisition. The acquirer shareholders gain when a private company or subsidiary is acquired but lose when a public company is acquired. Finally, Draper and Paudyal (2006) concluded that acquiring a privately held company is the most attractive option for shareholder value creation. The most common reason for worse performance of public acquirers compared to private acquirers is the premium paid for public targets (Bargeron, Schlingemann, Stulz, & Zutter, 2008). The following hypothesis is drafted from these insights:

Hypothesis 4: *Announcements of private mergers and acquisitions generate greater cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility compared to announcements of public mergers and acquisitions.*

2.2.5: Value Creation in Horizontal vs. Vertical Mergers and Acquisitions

Besides the in 2.1 mentioned motives and gains in horizontal and vertical M&As, there is a downside to the theory of merger or acquisition gains. According to Langabeer and Seifert (2003) the arguments for M&A gains only exist in theory and not in practice, and failing to properly incorporate the merger will result in underperformance of the newly merged firm. Furthermore, short-term performance is negatively affected by a vertical merger and it will take at least two years before the new vertically merged company is back to the industry average performance level. Even after five years, the performance level is still not higher than the industry average (Zhu, 2012). In addition, Meador, Church and Rayburn (1996) stated that there are less opportunities for vertical M&As compared to horizontal M&As, because it is harder to find a target that fits the acquirer in a vertical M&A. Rozen-Bakher (2018) concluded that horizontal M&As are more profitable and easier to integrate compared to vertical M&As. Because, according to previous studies, there are less downsides to horizontal M&As compared to vertical M&As, the following hypothesis is formulated:

Hypothesis 5: *Announcements of horizontal mergers and acquisitions generate greater cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility compared to announcements of vertical mergers and acquisitions.*

In section 2.1 is discussed that global supply chains are more exposed to possible disturbances. An example of such disturbances is the current Covid-19 crisis. Companies recognise that the current global economy is too vulnerable (Enderwick & Buckley, 2020). As a result, it could encourage companies to shorten their supply chain to reduce time needed to do business and be less prone to disturbances (Hwang & Rau, 2006). One example of shortening the supply chain is by going local. An acquirer goes local when it merges or acquires a vertical target that is based in the same country. Based on these arguments, the following hypothesis is drawn up.

Hypothesis 6: *Vertical mergers and acquisitions who shorten their supply chain by going local earn greater cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility than vertical mergers who do not go local.*

2.3: Long-term Value Creation

Earlier in this study, it is noted that acquirers in the transport industry earn short-term positive abnormal returns. In the period following the announcement of the merger and completion of the deal, operational improvements must be made before additional value is created, as is shown in the study of Brigl, Jansen, Schwetzler, Hammer and Hinrichs (2016). According to Brigl et al. (2016) up to 48% of the added value to an acquirer comes from operational improvements. Especially in diversified acquisitions, companies face large information asymmetries and coordination costs, which will decrease over time through learning and experience (Hammer, Knauer, Pflücke, & Schwetzler, 2017). Also, it is usually necessary to redeploy the target's resources before value is created, which is the case in the Capron (1999) study. Overall profitability increases by an average of 4.7% in the first three years after the acquisition when acquirers have had time to integrate the target (Cressy, Munari, & Malipiero, 2007). Another argument why M&As create value for long-term shareholders is market timing. This happens when acquirers acquire a target using their overvalued stock leading to short-term underperformance, but benefits shareholders in the long run (Savor & Lu, 2009). However, these arguments of value creation over time do not always show in stock returns. In the Black, Carnes and Jandik (2001) study 1-year abnormal returns are not significant and, 3- and 5-year abnormal returns are negative. This implies value destruction. Although their sample only consists of US acquirers and foreign targets, negative long-term abnormal returns are present in the study of Agrawal, Jaffe and Mandelker (1992) and Rau and Vermaelen (1998) as well, where the sample is constructed differently. Other arguments for long-term underperformance are poor governance or self-interest. When a CEO earns more stock options, he is more inclined to acquire companies to increase the stock price and then sell the options, which leads to a decline in the stock price over a longer period of time (Edmans, Fang, & Huang, 2017), or because he is overconfident (Renneboog & Vansteenkiste, 2019).

The trend in M&As is also changing. In the established markets, for example United States and Europe, more emphasis is placed on the short-term investor’s view in M&As, but companies from emerging markets such as China or India have a more long-term view where acquisitions take place to obtain additional skills, technology and knowledge that helps pursuing long-term goals (Kumar, 2009). The same study shows that acquirers from these emerging markets outperform acquirers from the established markets. However, the shift in short-term to long-term view in M&As is not yet a reality across the globe and most M&A activity still takes place with the view present in established markets (PWC, 2021c). As a result, the following two hypotheses are drawn up:

Hypothesis 7: *The 1-year buy-and-hold abnormal returns for acquiring shareholders are smaller than the market returns for mergers and acquisitions in the transporting industry.*

Hypothesis 8: *The 3-year buy-and-hold abnormal returns for acquiring shareholders are smaller than the market returns for mergers and acquisitions in the transporting industry.*

2.4: Financial Determinants

There are a lot of company characteristics that can indicate whether M&As create value or not. These characteristics range from governance determinants (Masulis, Wang, & Xie, 2007) to operational determinants (Barney, 1988) and financial determinants. This study focuses on financial determinants, because there has been a lot of research into which financial determinants affect stock returns and some conflicting conclusions have been drawn. This is discussed in the coming paragraph.

According to Basu (1977, 1983), companies with a low P/E ratio have greater returns compared to companies with a high P/E ratio. Further extensions were added to Basu's studies. Johnson, Fiore and Zuber (1989) concluded that there are indeed stocks with abnormal returns when selecting stocks based on P/E ratios in the period 1979-1984. Ball (1992) comes to the same conclusion and adds an extension that this anomaly is caused by inefficient markets, information processing costs and errors in the measurement of abnormal returns.

Banz (1981) establishes a relationship between stock returns and firm size, with smaller firms having higher stock returns than larger firms. Reinganum (1981) and Lakonishok and Shapiro (1986) confirm this size effect. However, it should be noted that Reinganum (1981) made an incorrect risk-adjustment that covered a P/E ratio effect (Basu, 1983). Cook and Rozeff (1984) tried to explain the different results between Reinganum (1981) and Basu (1983) and concluded that both studies are correct to some extent, because both firm size and P/E have an effect on stock returns. Jaffe, Keim and Westerfield (1989) draw the same conclusion in their study, which follows previous research by Banz (1981), Reinganum (1981) and Basu (1983). Chopra, Lakonishok and Ritter (1992) concluded that there was a clear overreaction of the market. This overreaction effect is greater for small companies than for large companies, hence the size effect. However, this size effect is partly rejected by Agrawal, Jaffe and Mandelker (1992), who argue in their study that company size does not have a significant effect on the negative long-term stock returns.

Chan, Hamao and Lakonishok (1991) studied returns on Japanese stocks and the relationship with 4 different financial characteristics: company size, earnings/price ratio, book-to-market ratio (B/M ratio) and cash flow-to-price ratio (C/P ratio). Their findings showed a significant effect between these financial characteristics and the return on Japanese stocks, and the B/M ratio and the C/P ratio have the largest significant positive effect on the expected returns. The same conclusion was drawn in the study of Rau and Vermaelen (1998). According to them, companies with a low book-to-market ratio underperform in the long run after the acquisition. The reason for their conclusion is that the market overstates the acquirer's past performance which is reflected in its market value. Fama and French (2017) also found a positive correlation between the B/M ratio and stock returns. However, there is contradictory research. Kothari, Shanken and Sloan (1995) conclude that the effect of the B/M ratio on returns is rather weak and less consistent compared to previous research.

Davis (1994) examined the returns on the stock market between 1940 and 1963. As in later research, this study found a significant positive effect of B/M ratio, P/E ratio and C/P ratio on the realized stock returns in this period. Bhandari (1988) comes to a completely different conclusion than the aforementioned studies. He concludes that the expected stock returns are most positive in relation to the debt-to-equity ratio (D/E ratio).

Another possible explanation for abnormal returns is the method of payment of the merger or acquisition. Wansley, Lane and Yang (1983) find that mergers or acquisitions paid for with cash accumulate significantly higher abnormal returns. They attribute this to a tax effect and regulatory variation in favour of cash acquisitions. In the long run, Loughran and Vijh (1997) also conclude that M&As paid for with stock earn negative abnormal returns and M&As paid for with cash earn positive abnormal returns. This may be because acquirers using stocks as means of payment signal to the market that they are not that confident in the acquisition, because in stock transactions the risk of the merger or acquisition is shared between acquirer and target shareholders. They both own a part of the new company (Rappaport & Sirower, 1999). On the other hand, Schlingemann (2004) finds that M&As paid for with debt do not have abnormal returns, mergers paid with cash have negative abnormal returns and mergers paid with stocks have positive abnormal returns for acquirers. Harford (1999) also concluded in an earlier study that merger or acquisition attempts paid for with cash are value decreasing for shareholders. Based on these studies hypothesis 9 is formulated.

Hypothesis 9: *The Book-to-Market ratio has the greatest positive effect on the cumulative abnormal returns for mergers and acquisitions in the transporting industry.*

Chapter 3: Methodology

This chapter discusses the methodology used in this study. The first part describes the event studies used for hypotheses 1 to 6. Then, the buy-and-hold abnormal return method used to test hypotheses 7 and 8 is explained. Lastly, the regression analysis method for hypothesis 9 is discussed. The datasets to which the methodology is applied are presented in chapter 4.

3.1: Event Study

According to MacKinlay (1997), the economic impact of an event can be estimated over a relatively short period of time, assuming that the market is rational and that the effects of the event are directly reflected in the stock price. The economic impact of an event can be calculated using an event study. An event study comprises of an estimation period and an event period. In this study the estimation period ranges from 120 days to 10 days prior to the M&A announcement, because the expected returns of stocks must be calculated without the M&A announcement having any effect and MacKinlay (1997) stated that the calculations are not affected by the M&A announcement during this estimation period. The event period ranges from 5 days before to 5 days after the M&A announcement. The market may have information prior to the announcement date which affects stock prices; and it may take time before all information is incorporated into the stock price, hence the chosen event period (MacKinlay, 1997). This estimation and event period is used for the calculation of abnormal returns, abnormal trading volume and abnormal volatility.

3.1.1: Abnormal Returns

Two different methodologies are used to test whether the abnormal returns differ from zero around an M&A announcement. These are the event study used in the MacKinlay (1997) study and the event study used in the study of Boehmer, Masumeci and Poulsen (1991) (BMP test). First, the methodology of the MacKinlay (1997) study is explained followed by the methodology and the reasoning behind the use of the BMP test. These methodologies are used to test hypothesis 1. However, because the BMP test accounts for event-induced volatility, it is considered to be an improved methodology to test abnormal returns compared to the MacKinlay methodology (Boehmer, Masumeci, & Poulsen, 1991), and the decision to reject hypothesis 1 or not is based on the BMP test. The abnormal returns resulting from the MacKinlay methodology are used in the regression analysis.

The method used to calculate the abnormal returns of M&A announcements is the same for both types of event studies used in this study, which means that both event studies use the

market model to calculate abnormal returns. Compared to the mean return model, the part of the return related to the variance in market returns is decreased and can lead to a better indication of M&A announcement effects (MacKinlay, 1997). For all M&As, daily stock returns of acquirers and market indices are calculated for the estimation period and event period. The market index is based on the country or region in which the company is located. M&As in the United States will use the S&P 500 and European M&As will use the STOXX 600, because the market reacts differently to news due to differences in culture and business operations (Kerlin, 2006). Subsequently, the correlation between the market returns and stock price returns in the estimation period can be calculated, which are used to calculate the abnormal returns in the event period. The formula to calculate abnormal returns in the event period is:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \quad (1)$$

In formula 1, AR_{it} is the abnormal return for company i at time t in the event period and is calculated by subtracting the expected return $(\alpha_i + \beta_i R_{mt})$ from the actual return (R_{it}). The expected return is based on the market return, with β_i being the correlation between the market and stock return and R_{mt} being the market return at time t in the event period. After the calculation of the abnormal returns, the methodologies of the two event studies start to differ. To test whether the abnormal returns differ from zero according to the MacKinlay (1997) method, a t-test to measure the significance level of the average daily abnormal return for each event day is used. A significance level of 5% will be used throughout this study. Formula 2 is used to calculate the t-statistic:

$$T - statistic = \frac{X_t - \mu_0}{\sigma/\sqrt{n}} \quad (2)$$

For formula 2, the null hypothesis is that the average daily abnormal return does not differ from zero and the alternative hypothesis is that the average daily abnormal return does differ from zero. Here, X_t is the average abnormal return on day t in the event period, μ_0 equals 0, σ equals the standard deviation of the daily abnormal returns and n equals the number of observations. If the t-statistic is significant, this means that the average abnormal return on day t in the event period differs from zero and this means that the M&A announcement affects the acquirer's value. All days in the event period with a significant abnormal return will be added up using formula 3 to calculate the cumulative abnormal return (CAR).

$$CAR_i = \sum_{t=t_1}^{t_n} AR_{it} \quad (3)$$

In formula 3 CAR_i equals the cumulative abnormal return for company i. AR_{it} is the significant abnormal return for company i at time t in the event period, where t_n stands for the number of significant event days. t_1 is the first event day with significant abnormal returns.

The BMP test is different compared to the MacKinlay test because the MacKinlay test does not account for stock price volatility induced through the M&A announcement. If the stock price volatility is underestimated, the t-test procedure as shown in formula 2 will lead to a more frequent rejection of the null hypothesis that abnormal returns do not differ from zero (Boehmer, Masumeci, & Poulsen, 1991). Boehmer, Masumeci and Poulsen (1991) therefore propose another methodology, based on the Patell (1976) method, which considers this increased stock price volatility. To test whether the abnormal returns differ from zero according to the BMP test, the abnormal returns as calculated in formula 1 are standardized first using the Patell (1976) method. This standardization procedure is presented in formulas 4 to 8:

$$SAR_{it} = \frac{AR_{it}}{S_{AR_{it}}} \quad (4)$$

Here, SAR_{it} is the standardized abnormal return of company i at time t in the event period, which is calculated by dividing AR_{it} (the abnormal return for company i at time t in the event period calculated using formula 1) by $S_{AR_{it}}$, which is the forecast error corrected standard deviation of the returns of company i at time t in the event period. The forecast error corrected standard deviation is calculated using formula 5:

$$S_{AR_{it}} = \sqrt{{S_{AR_i}}^2 * C_{it}} \quad (5)$$

Here, $S_{AR_{it}}$ is the square root of ${S_{AR_i}}^2$ - the variance of the abnormal returns of company i in the estimation period - multiplied by C_{it}, which is the forecast error. The abnormal returns in the event period are standardized using the variance of the abnormal returns in the estimation period, because the abnormal returns in the event period are calculated using the correlation between company and market returns in the estimation period (Patell, 1976). The variance of the abnormal returns in the estimation period is multiplied by the forecast error because the

abnormal returns in the event period are an out-of-sample forecast which will have a higher standard deviation. This is attributable to the fact that the abnormal returns from formula 1 are calculated using the correlation between stock and market returns in the estimation period, but the α_i and β_i from formula 1 used to calculate the abnormal returns do not incorporate the returns in the event period. This is accounted for in the forecast error factor C_{it} (Patell, 1976). ${S_{AR_i}}^2$ is calculated using formula 6 and the forecast error is calculated using formula 7 and 8:

$${S_{AR_i}}^2 = \frac{1}{(T_\tau - 2)} \sum_{\tau=1}^{T_\tau} (\hat{\varepsilon}_{i\tau})^2 \tag{6}$$

Here, T_τ is the number of time periods in the estimation period and $\hat{\varepsilon}_{i\tau}$ is the estimated abnormal return for company i at time τ in the estimation period.

$$C_{it} = 1 + \frac{1}{T_\tau} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{\tau=1}^{T_\tau} (R_{m\tau} - \bar{R}_m)^2} \tag{7}$$

Where:

$$\bar{R}_m = \frac{1}{T_\tau} \sum_{\tau=1}^{T_\tau} R_{m\tau} \tag{8}$$

Formula 7 is the forecast error factor, where $R_{m\tau}$ equals the market return at time τ in the estimation period, R_{mt} equals the market return at time t in the event period and $\bar{R}_m$ equals the average market return in the estimation period as calculated using formula 8. When the values of formulas 6 to 8 are known, they are used to calculate the values of formula 5, and the values of formula 5 are implemented in formula 4. Then, the values of formula 4 are used in formula 9 to calculate the sum of the standardized abnormal returns of all M&As (N) in the sample at time t in the event period:

$$ASAR_t = \sum_{i=1}^{N} SAR_{it} \tag{9}$$

When the sum of the standardized abnormal returns of all M&As in the sample at time t is known, Boehmer, Masumeci and Poulsen (1991) apply the cross-sectional technique to the standardized-residual technique which means that the sum of the standardized abnormal returns at time t is divided by the standard error for the sum. This calculation is presented in formula 12, but the standard deviation must be calculated first to be able to calculate the standard error

for the sum. The standard deviation of the standardized abnormal returns is calculated using formula 10 and 11:

$$S^2{}_{ASAR,t} = \frac{1}{N-1}\sum_{i=1}^{N}(SAR_{it} - \frac{1}{N}\sum_{l=1}^{N} SAR_{lt})^2 \quad (10)$$

$$S_{ASAR,t} = \sqrt{S^2{}_{ASAR,t}} \quad (11)$$

Here, $S^2{}_{ASAR,t}$ is the variance of the standardized abnormal returns at time t in the event period and $S_{ASAR,t}$ is the standard deviation of the standardized abnormal returns at time t in the event period. The Z-statistic will be calculated using formula 12, where the sum of the standardized abnormal returns is divided by the standard error for the sum.

$$Z_{BMP,t} = \frac{ASAR_t}{\sqrt{N} * S_{ASAR,t}} \quad (12)$$

In formula 12, $ASAR_t$ is the sum of the standardized abnormal returns at time t in the event period calculated using formula 9, $S_{ASAR,t}$ is the standard deviation of the standardized abnormal returns and $\sqrt{N}$ is the square root of the number of M&As in the sample. Multiplying $S_{ASAR,t}$ with $\sqrt{N}$ gives the standard error of the sum of the standardized abnormal returns. Formula 12 gives a test statistic that can be looked up directly in the z-table. Based on the test statistic can be decided whether the standardized abnormal returns at time t in the event period differ from zero or not.

3.1.2: Abnormal Trading Volume

In section 2.2.4, it was discussed that daily trading volume is higher around M&A announcements and that price changes are correlated with changes in trading volume. To test hypothesis 2, which states that M&A announcements in the transport industry cause abnormal trading volumes, procedure 3 of the Ajinkya and Jain (1989) study is followed, where daily trading volume is defined as the number of shares traded divided by the number of shares outstanding. The calculation of the daily trading volume is:

$$TV_{it} = \ln(1 + N_{it}) \,/\, \ln(1 + SO_{it}) \quad (13)$$

In formula 13, TV_{it} represents the trading volume of company i on day t, $\ln(1 + N_{it})$ is the natural logarithm of the number of shares traded for company i on day t plus 1 and $\ln(1 + SO_{it})$ is the natural logarithm of the number of shares outstanding for company i on day t plus 1. Natural logarithms are used because prediction errors for raw volume measures are positively skewed, and 1 is added to the number of shares traded and number of shares outstanding to prevent that the natural logarithm cannot be calculated when the number of shares traded or shares outstanding is zero (Ajinkya & Jain, 1989). The trading volume is calculated for each day in the estimation and event period for each acquirer in the sample.

Ajinkya and Jain (1989) also argue that the best results are achieved when the market model is used. Thus, formula 13 is also used to calculate daily trading volumes for each market index. However, to calculate the market index daily trading volume, the number of shares traded is the sum of shares traded for all companies listed on the market index. The number of shares outstanding is also the sum of shares outstanding for all companies listed on the market index.

When the daily trading volumes for the acquirers and the market indices are calculated the expected trading volumes are calculated and subtracted from the actual trading volume on an event day, which is shown in formula 14.

$$ATV_{it} = TV_{it} - (\alpha_i + \beta_i TV_{mt}) \tag{14}$$

Formula 14 corresponds with formula 1. Here, ATV_{it} is the abnormal trading volume for company i on day t in the event period and is calculated by subtracting the expected trading volume $(\alpha_i + \beta_i TV_{mt})$ from the actual trading volume (TV_{it}). The expected trading volume is based on the market trading volume. The daily abnormal trading volume will be tested for significance with a standard t-test using formula 2 and all event days where the abnormal trading volumes are statistically significant from zero will be added up using formula 3 to arrive at the cumulative abnormal trading volume.

3.1.3: Abnormal Volatility and Event-induced Volatility

In section 2.2.4, it was also discussed that an M&A announcement leads to more volatility of the stock price around the announcement date (Mall & Gupta, 2019). To test hypothesis 3, which states that abnormal volatility is present around M&A announcements, two methods are used. The first method is the Beaver-Patell method, which tests whether the volatility of abnormal returns differs from zero (Yadav, 1992). The second method is the Event-induced volatility method used by Savickas (2003). The reason to use this second method is because the

first method assumes constant volatility of abnormal returns and this is not always true (Balaban & Constantinou, 2006).

3.1.3.1: Abnormal Volatility

The Beaver-Patell method is developed by Beaver (1968) and statistically improved by Patell (1976). The purpose of the Patell (1976) procedure is to standardize the abnormal returns so that each abnormal return has the same variance. First, the abnormal returns during the estimation period will be estimated using formula 15:

$$\tilde{R}_{i\tau} = a_i + \beta_i \tilde{R}_{m\tau} + \tilde{\varepsilon}_{i\tau} \tag{15}$$

Here, $\tilde{R}_{i\tau}$ is the return for company i at time τ. τ is used as an indication of a day in the estimation period. a_i is the intercept, β_i is the correlation between $\tilde{R}_{i\tau}$ and $\tilde{R}_{m\tau}$ where $\tilde{R}_{m\tau}$ is the market return at time τ. Lastly, $\tilde{\varepsilon}_{i\tau}$ is the abnormal return for company i at time τ in the estimation period. The values for a_i and β_i are used to calculate the abnormal returns in the event period using formula 16:

$$\tilde{u}_{it} = \tilde{R}_{it} - (a_i + \beta_i \tilde{R}_{mt}) \tag{16}$$

Here, $\tilde{u}_{it}$ is the abnormal return for company i at time t. Note that notation for time is different in formula 16 compared to formula 15, because τ is used for the estimation period and t is used for the event period. Formula 16 corresponds with formula 1. Then, formula 17 is used to calculate the variance of the abnormal returns in the estimation period with $(T_\tau - 2)$ degrees of freedom.

$$S_i{}^2 = \frac{1}{(T_\tau - 2)} \sum_{\tau=1}^{T_\tau} (\hat{\varepsilon}_{i\tau})^2 \tag{17}$$

Here, $S_i{}^2$ is the variance of the abnormal returns in the estimation period for company i, T_τ is the number of time periods in the estimation period and $\hat{\varepsilon}_{i\tau}$ is the estimated abnormal return for company i at time τ in the estimation period. After calculating the variance of the abnormal returns in the estimation period, an additional forecast error factor is calculated. This prediction error factor is the same as in the BMP test and is calculated because abnormal returns in the event period are calculated using a_i and β_i from formula 15, but returns in the event period are

not included in the calculation of a_i and β_i. This will result in a lower variance present than should, which is accounted for in prediction error factor C_{it} (Patell, 1976; Yadav, 1992). Formula 7 and 8 show how the prediction error factor is calculated.

The variance of the abnormal returns in the event period for company i at time t, the variance of the abnormal returns in the estimation period for company i and the forecast error factor for company i at time t are then used to calculate the standardised ratio for abnormal volatility for company i at time t in the event period. This calculation is shown in formula 18.

$$U_{it} = \frac{{u_{it}}^2}{C_{it}{S_i}^2}\left[\frac{(T_\tau - 4)}{(T_\tau - 2)}\right] \tag{18}$$

Here, U_{it} is the standardized ratio for abnormal volatility. The calculation of U_{it} consists of two parts. The first part is a ratio of the variance of the abnormal returns in the event period (${u_{it}}^2$) for company i at time t in the event period divided by the variance of the abnormal returns for company i in the estimation period (${S_i}^2$) times the forecast error factor (C_{it}) for company i at time t in the event period. This ratio has an F distribution with a variance of $\frac{(T_\tau - 2)}{(T_\tau - 4)}$ (Stock & Watson, 2015c), which is the second part of the calculation of U_{it}. Patell (1976) argues that the expected value of the ratio $\frac{{u_{it}}^2}{C_{it}{S_i}^2}$ should be equal to the mean of the distribution $\frac{(T_\tau - 2)}{(T_\tau - 4)}$, which should be greater than 1. This is shown in formula 19:

$$E\left[\frac{{u_{it}}^2}{C_{it}{S_i}^2}\right] = \frac{(T_\tau - 2)}{(T_\tau - 4)} > 1 \tag{19}$$

Formula 19 is standardized to arrive at formula 18, where the factor $\frac{(T_\tau - 2)}{(T_\tau - 4)}$ is brought to the other side of the equal sign when comparing formula 18 to 19. This standardized value should have an expected value of 1 (Patell, 1976). The null hypothesis for hypothesis 3 is that U_{it} equals 1, while the alternative hypothesis states that U_{it} is greater than 1. This is then tested using formula 20:

$$ZU_t = \frac{\sum_{i=1}^{N}(U_{it} - 1)}{\left[\sum_{i=1}^{N}\frac{2(T_i - 3)}{(T_i - 6)}\right]^{1/2}} \tag{20}$$

Here, ZU_t is a unit normal variate which is the z-statistic for the average abnormal variance at time t. This value can be looked up directly in the z-table to check whether it is significant or not. The numerator is the sum of the U_{it} minus 1, at time t, because this study wants to test whether U_{it} is greater than 1. The denominator is the square root of the sum of the variances ($\frac{2(T_i-3)}{(T_i-6)}$) of all companies in the sample, following the F distribution as discussed for formula 19 (Stock & Watson, 2015c). All U_{it} values that differ significantly from zero will be added up using formula 3 to arrive at the cumulative abnormal volatility.

3.1.3.2: Event-induced Volatility

To test whether the event itself induces volatility the approach of Savickas (2003) is used. This approach estimates a GARCH (1, 1) model with a dummy variable for whether a day in the sample period is an event day or not, and accounts for the possible randomness that volatility has. It also does not require that the volatility effect of the event is the same across all M&As (Savickas, 2003). The following model is estimated:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_i D_t + \eta_{i,t}, \qquad \eta_{i,t} \mid \Omega_t \sim N\,(0, h_{i,t}) \tag{21}$$

$$h_{i,t} = \alpha_i + b_i h_{i,t-1} + c_i {\eta_{i,t-1}}^2 + d_i D_t \tag{22}$$

In formula 21, the coefficients α_i, β_i and γ_i have to be estimated. D_t is a dummy variable which equals 1 if t is an event day and equals 0 if t is not an event day. Ω_t is the set of all information available at time t including all company and market returns, volatility estimates and error estimates, which is needed to forecast the mean and variance of the return (Javed & Mantalos, 2013). Here, the average abnormal return on an event day for company i will be reflected in the γ_i coefficient. The null hypothesis which is tested here is whether the γ_i coefficient equals zero, but to test how close the γ_i coeffcient is to zero depends on the volatility of the market model residual. In formula 22, $h_{i,t}$ is the volatility of the market model residual, where the average volatility on an event day is incorporated in the d_i coefficient. Dividing $\hat{\gamma}_i$, which is the estimated daily average of the abnormal return for company i in the event period, by $\hat{h}_i$, which is the estimated standard deviation of the abnormal returns, will result in a value that accounts for company-specific event-induced volatility as well as return (Savickas, 2003). This method is presented in formula 23 and 24:

$$T - statistic = \sum_{i=1}^{N} \frac{S_{i,t}}{N} / \sqrt{\frac{1}{N(N-1)} \cdot \sum_{i=1}^{N} (S_{i,t} - \sum_{j=1}^{N} \frac{S_{j,t}}{N})^2} \quad (23)$$

Where

$$S_{i,t} = \frac{\hat{\gamma}_i}{\sqrt{h_{i,t}}} \quad (24)$$

The numerator in formula 23 is the estimated average of the abnormal return for each acquirer divided by the estimated standard deviation of the abnormal returns, which is shown in formula 24, averaged over the entire sample. The denominator in formula 23 is the standard deviation of the $S_{i,t}$ statistic compared to the average of the $S_{i,t}$ statistic across the entire sample, which is student-t distributed. This t-statistic is calculated for each event day and if this t-statistic is significant, this means that the event induces volatility on that event day.

3.2: Public vs. Private and Horizontal vs. Vertical

To test hypotheses 4 to 6, the complete sample is split up in three separate samples. The sample is split between public and private M&As for hypothesis 4 and between horizontal and vertical M&As for hypothesis 5. For hypothesis 6, the vertical M&As are split up again between M&As who go local and M&As who do not.

All three split samples are subjected to Welch's t-test to calculate whether the cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility are greater for private M&As, horizontal M&As or M&As who go local compared to public M&As, vertical M&As or M&As who do not go local, respectively. Welch's t-test is used because the sample sizes are unequal in all three samples and Welch's t-test takes this into account (Welch, 1938).

$$T - statistic = \frac{\mu_1 - \mu_2}{\sqrt{({S_1}^2/n_1 + {S_2}^2/n_2)}} \quad (25)$$

Formula 25 compares the averages of two groups based on the variance of the two groups. Group 1 comprises of private M&As, horizontal M&As or acquirers who go local. Group 2 comprises of public M&As, vertical M&As or acquirers who do not go local. In formula 25, μ_1 is the average cumulative abnormal return, average cumulative abnormal trading volume or average cumulative abnormal volatility for group 1. μ_2 is the average cumulative abnormal return, average cumulative abnormal trading volume or average cumulative abnormal volatility for group 2. ${S_1}^2$ equals the variance of group 1 and ${S_2}^2$ equals the variance of group 2. n_1 is the

number of observations for group 1 and n_2 is the number of observations for group 2. If the t-statistic is positive and significant, the average cumulative abnormal return, average cumulative abnormal trading volume or average cumulative abnormal volatility is greater for group 1 compared to group 2.

3.3: Buy-and-hold Abnormal Return Method

To calculate the long-term abnormal returns, this study follows the Lyon, Barber and Tsai (1999) study who use the buy-and-hold abnormal returns approach. This approach is used to test hypotheses 7 and 8. In this study, the long-term abnormal returns will be calculated over a 1-year and a 3-year period, starting on the day of the announcement. The acquirer's returns are compared to the returns of a reference portfolio. These portfolios are based on stocks in stock markets where the merger or acquisition takes place. For example, if a merger or acquisition takes place in the United States, a portfolio based on the S&P 500 will be used.

For each market index, 10 size reference portfolios are constructed. First, firm size (market value of the company) is calculated for all firms listed on the market index in January of each year. All firms listed on the market index are then ranked based on firm size and size reference portfolios are formed based on these rankings. Each portfolio consists of 1/10th of the total number of companies listed on the market index. The size reference portfolios are rebalanced every year. Subsequently, the monthly returns of each company listed on the market index are calculated from the first month after a merger has taken place until three years after the merger has taken place.

For each constructed portfolio, the 1- and 3-year returns are calculated by summing the compounded 1- and 3-year returns of all stocks in the portfolio and calculating the average compounded returns across the number of stocks in the portfolio using the following formula:

$$R^{bh} = \sum_{i=1}^{n_s} \frac{[\prod_{t=s}^{s+\tau}(1+R_{it})]-1}{n_s} \tag{26}$$

In this formula R^{bh} equals the 1- or 3-year buy-and-hold return of a portfolio, n_s equals the number of companies in the portfolio, s is the starting month, τ is the period of investment in months (12 or 36) and R_{it} is the return of company i in month t. The 1- and 3-year returns of the acquiring companies are calculated using formula 27:

$$LR_{it} = [\prod_{t=s}^{s+\tau}(1 + R_{it})] - 1 \tag{27}$$

In this formula LR_{it} equals the 1- or 3-year return of the acquirer, s is the starting month, τ is the period of investment in months (12 or 36) and R_{it} is the return of company i in month t.

The acquiring company is then linked to a portfolio by identifying the companies listed on the market index with a market value between 70% and 130% of the acquiring company's market value. From this selection of market index companies, the company with a B/M ratio that is the closest to the acquiring company is selected, and the market portfolio that this matched company belongs to is used to calculate the abnormal returns. There have been several studies on the effect of the B/M ratio on stock returns, and the consensus is that companies with a high B/M ratio earn high returns and vice versa (Rau & Vermaelen, 1998). As a result, the B/M ratio is chosen to match the acquiring company with a portfolio to compare their long-term returns. As in the Lyon, Barber and Tsai (1999) study, the 1- and 3-year abnormal returns are calculated by subtracting the portfolio return from the actual return of the acquiring company. This is shown in formula 28:

$$AR_{it} = LR_{it} - E(LR_{it}) \tag{28}$$

Here, AR_{it} equals the 1- or 3-year buy-and-hold abnormal return for acquiring company i at time t (1 year or 3 years). LR_{it} is the actual return for acquiring company i at time t (1 year or 3 years), and $E(LR_{it})$ is the expected return for acquiring company i. In this study, the expected return equals the buy-and-hold return of the size reference portfolio (R^{bh}), as calculated in formula 26. These abnormal returns will be subject to a conventional t-test and a skewness adjusted t-test to determine whether the buy-and-hold abnormal returns differ significantly from zero. The skewness adjusted t-test is used as well because, according to Barber and Lyon (1997), long-term buy-and-hold abnormal returns are skewed positively and this could lead to negatively biased t-statistics. Formula 29 is the formula for the conventional t-test and formula 30 is the formula for the skewness-adjusted t-test:

$$T - statistic = \frac{X}{\sigma/\sqrt{n}} \tag{29}$$

In formula 29, X is the average 1- or 3-year buy-and-hold abnormal return for acquiring companies in the sample, σ equals the standard deviation of the buy-and-hold abnormal returns and n equals the number of observations.

$$T - statistic = \sqrt{n}\,(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma}) \quad (30)$$

where

$$S = \frac{\overline{AR_t}}{\sigma\,(AR_t)}, \text{ and } \hat{\gamma} = \frac{\sum_{i=1}^{n}(AR_{it} - \overline{AR_t})^3}{n\sigma\,(AR_t)^3} \quad (31)$$

In this formula n equals the number of observations, S is the traditional t-statistic formula where $\overline{AR_t}$ is the sample average of the 1- and 3-year buy-and-hold abnormal returns, and $\sigma(AR_t)$ is the sample standard deviation of the buy-and-hold abnormal returns. $\hat{\gamma}$ is an estimate of the coefficient of skewness (Lyon, Barber, & Tsai, 1999). When the t-statistics are statistically significant, it is a real possibility that acquirers generate shareholder value or destroy shareholder value 1 year or 3 years after the M&A announcement.

3.4: Regression Analysis

Hypothesis 9 is tested by examining whether there are financial determinants which affect the cumulative abnormal return. Bessembinder and Zhang (2013) concluded that the financial determinants of a company indeed have an effect on the magnitude of abnormal returns. Which financial determinants are tested for their possible effect on the cumulative abnormal return is discussed in section 4.3.

Following the research of Lakonishok, Shleifer and Vishny (1994) the different financial determinants are tested individually for their significance by means of simple regression and are tested together by means of multiple regression. This method enables a conclusion whether a financial determinant affects abnormal returns and makes it able to conclude whether the effects found in the simple regression analyses change in the multiple regression analysis. In the Lakonishok, Shleifer and Vishny (1994) study is shown that this effect-change is present when financial determinants are tested together. This could partly be attributable to multi-collinearity, which will be discussed later in this section.

Because this study comprises of worldwide mergers and acquisitions over a period of 18 years (2000-2017), which will be discussed in chapter 4, the possibility of a year or region effect will be considered using a fixed effects regression analysis. Similarly to how abnormal returns are calculated, the region where the merger or acquisition takes place could react differently to news because of differences in culture and business operations (Kerlin, 2006). Which regions are included in the fixed effects regression analyses, can be found in Appendix B, column Regions. Year effects are considered because, for example, during the global financial crisis of 2008-2009 negative returns were recorded all over the world, which could

affect the market reaction following an M&A announcement (Mollick & Assefa, 2013). To test whether the financial determinants have an effect on abnormal returns, single and multiple fixed effects regressions as shown in formulas 32 and 33 are used:

$$CAR = \beta_0 + \beta_1 X_1 + \gamma_1 Y_1 + \cdots \gamma_n Y_n + \delta_1 R_1 + \cdots \delta_n R_n \quad (32)$$

$$CAR = \beta_0 + \beta_1 X_1 + \ldots \beta_n X_n + \gamma_1 Y_1 + \cdots \gamma_n Y_n + \delta_1 R_1 + \cdots \delta_n R_n \quad (33)$$

Formula 32 corresponds to the formula for a fixed effects regression with one financial determinant and formula 33 is for fixed effects regressions with multiple financial determinants. The dependent variable in all regression analyses is the cumulative abnormal return, as calculated according to formula 3. In both formulae β_0 is the intercept, which is the value for the first year and first region included in the analysis, or possible external factors. If the first year and first region are included in the formula, the regressors will be perfectly multicollinear which is also known as the dummy variable trap (Stock & Watson, 2015b). β_1 is the first, or in the case of formula 32, only coefficient for the financial determinant, γ_1 is the coefficient for the first year in the formula and γ_n is the coefficient for the last year. Lastly, δ_1 is for the first region in the formula and δ_n is the last region. In formula 33, β_2 is the second financial determinant and β_n will be the last final determinant, regardless of the number of financial determinants in the model.

As was stated earlier in this section. Part of the reason why the effect of a financial determinant can change in a multiple regression analysis compared to a single regression analysis is attributable to multi-collinearity. Multi-collinearity can be a problem because the standard error of coefficients will increase when multi-collinearity is present, which means that coefficients become sensitive to small changes to the model which makes them unstable and harder to interpret (Stock & Watson, 2015b). The multiple regression model is tested for multicollinearity using a Variance Inflation Factor test (VIF test). A VIF test measures how much of the variance of an independent variable – financial determinants in this study – is increased due to their correlation with another independent variable (Craney & Surles, 2002). The VIF test consists of two parts. First a regression analysis is ran with all independent variables as shown in formula 34:

$$X_1 = \alpha_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_n X_n \quad (34)$$

Here, X_1 is the first financial determinant, β_2 is the coefficient for the second financial determinant and β_n is the coefficient for the last financial determinant. All financial determinants tested in this study are the dependent variable of a multiple regression as presented in formula 34. Then, the r-squared of each multiple regression analysis is inserted in the VIF formula which is as follows:

$$VIF_i = \frac{1}{1-r_i^2} \tag{35}$$

In formula 35, VIF_i stands for the Variance Inflation Factor of financial determinant i and r_i^2 stands for the r-squared value of the regression analysis performed using formula 34 where financial determinant i was the dependent variable. If the VIF_i value for a financial determinant is greater than 5, it is argued that multi-collinearity is present and the respective financial determinant will be removed from the multiple fixed effects regression analysis as presented in formula 33 (Craney & Surles, 2002). This test is conducted for all financial determinants to identify which financial determinants should be removed from the model to arrive at the final model that tests the effect of the financial determinants on the cumulative abnormal return.

Lastly, all single and the final multiple regression analysis are tested on heteroskedasticity using a Breusch-Pagan test. If heteroskedasticity is found to be present, the regression model is inefficient and the OLS regression model is no longer the best non-biased estimator (Plackett, 1950). In the Breusch-Pagan test, the null hypothesis states that the model is subject to homoskedasticity and the alternative hypothesis states that the model is subject to heteroskedasticity. If the model is subject to heteroskedasticity, the robust variance estimations will be used in the regression analyses to solve this problem (Rigobon, 2003).

Chapter 4: Data

First, the data conditions are explained, followed by a breakdown of the mergers. Next, the long-term returns are discussed. Then, the independent variables used in the regression analysis and why they are used are talked about, followed by the presentation of the descriptive statistics of the independent variables.

4.1: Data Conditions

4.1.1: Data Sources

The Thomson One database is used to determine which M&As are suitable for this study and contains data on M&As for companies worldwide. When a merger or acquisition meets the criteria to be included in this study, all the financial information needed for the event studies, buy-and-hold abnormal return method and regression analysis will be retrieved from the Datastream database. The Datastream database is compatible with the Thomson One database and contains information about financial information such as stock prices or financial ratios. To calculate the benchmark in the event studies, information about market indices is needed as well. This information is also retrieved from the Datastream database.

4.1.2: Sample Selection

Multiple criteria apply to the M&As for this study, which are inserted in the Thomson One database. The M&A requirements to be included in this study can be found in table 1:

Table 1: Selection criteria for the M&As included in the sample

Note: This table shows how many M&As remain after applying the criterion. The SIC codes used can be found in Appendix A. It is possible that an acquirer already owned more than 50% of a target before the merger or (full) acquisition. These M&As are removed manually and are included in the criterion "Available Data". Other things included in "Available Data" are missing values for financial data that prevent performing at least one of the analyses, or if there is no data available at all for that merger or acquisition.

Criterion	Requirement	Number of M&As
Acquirer Primary SIC (Code)	See Appendix A	19189
Target Primary SIC (Code)	See Appendix A	17482
Acquirer Status	Public	6945
Target Status	Public or Private	4442
Date Announced	Between 01/01/2000 and 01/01/2018	2516
Percent of Shares Owned After Transaction	50 to 100 Percent	1149
Available Data	All Necessary Data Available	536

The core business of acquirers is the transportation of people or goods. It does not matter whether an acquirer specialises in either the transportation of people or the transportation of goods, or does both. The merger or acquisition must have taken place in the 21st century. Eckes (2011) stated that the economic circumstances are ever-changing. As a result, M&As that have taken place before the 21st century are not part of this analysis. The sample period is between the 1st of January 2000 and the 1st of January 2018 because otherwise the 3-year buy-and-hold abnormal return method cannot be performed. Furthermore, no criterion for nations or regions is incorporated in the search because a worldwide sample is chosen for both acquirers and targets. Which countries and regions are present in the sample can be found in Appendix B. Also, there is no minimum deal value or minimum size of the target to include all possible M&As in the industry. Lastly, it may occur that a merger or acquisition is omitted from the study due to missing data or incomplete data. This results in 536 useful M&As for this analysis. A breakdown of these 536 M&As can be found in tables 2 and 3:

Table 2: Breakdown between the types of M&As included in the sample

Note: This table shows a breakdown of the M&As in the sample based on three divisions as shown in the three panels. Each panel consists of all M&As in the sample, subdivided according to the respective sample split. The division in Panel A is used to test hypothesis 4, panel B is used to test hypothesis 5 and the vertical M&As in panel C are used to test hypothesis 6.

	Type of M&A	**Amount of M&As**	**Total M&As**
Panel A			536
	Public	72	
	Private	464	
Panel B			536
	Horizontal	361	
	Vertical	175	
Panel C			175
	Vertical Cross Border	64	
	Vertical Domestic	111	

In the dataset of 536 useful M&As, 72 of those were public and 464 were private M&As. 361 mergers were horizontal and 175 were vertical M&As, and of these 175 vertical M&As 64 were cross border and 111 were domestic M&As.

Table 3: Breakdown of all M&As between type of acquirer and type of target

Note: First, the sample is divided in horizontal and vertical M&As. Then, for horizontal M&As a breakdown between types of acquirers and targets is given. The acquirer type road transport consists of all types of transport on the road that is not done by truck. Think of taxicabs, other cars, and bus companies. For vertical M&As the acquirers are seen as one industry, where targets are subdivided in three parts of the supply chain.

M&A Categories	**Type of Acquirer**	**Breakdown of M&A**		**Breakdown Amount**	**Total Amount**
Horizontal M&As					361
	Aviation				46
		Aviation	Aviation	30	
		Aviation	Railroad	2	
		Aviation	Road Transport	7	
		Aviation	Shipping	3	
		Aviation	Trucking	4	
	Railroad				17
		Railroad	Railroad	9	
		Railroad	Road Transport	7	
		Railroad	Trucking	1	
	Road Transport				76
		Road Transport	Aviation	4	
		Road Transport	Railroad	6	
		Road Transport	Road Transport	57	
		Road Transport	Shipping	1	
		Road Transport	Trucking	8	
	Shipping				69
		Shipping	Aviation	2	
		Shipping	Railroad	1	
		Shipping	Road Transport	3	
		Shipping	Shipping	45	
		Shipping	Trucking	18	
	Trucking				153
		Trucking	Aviation	3	
		Trucking	Railroad	9	
		Trucking	Road Transport	7	
		Trucking	Shipping	10	
		Trucking	Trucking	124	
Vertical M&As					175
		Transport	Manufacturing	33	
		Transport	Trade	28	
		Transport	Company Services	114	

Of all horizontal M&As included in this sample, most M&As take place in the trucking sector and the fewest M&As take place in the railroad sector. For each category, most M&As take place within their own sector, but in each sector diversification is also present. Park, Babcock and Lemke (1999) found that diversifying horizontal M&As could help different types of transport companies to profit from each other's network and reach a larger amount of people. Of all vertical M&As, most M&As take place between transport companies and company

services like travel agencies or backroom services. Acquirers who try to incorporate the manufacturing process or try to transport and sell products themselves by acquiring such companies are also present.

4.2: Buy-and-hold Abnormal Returns Market Data

This paragraph presents average 1- and 3-year market returns in each decile, followed by a discussion of these average values. The average 1- and 3-year market returns are calculated using formula 36:

$$LTAR_d = \frac{1}{N_i}\sum_{i=1}^{N_i}(LTR_{id}) \tag{36}$$

In formula 36, $LTAR_d$ is the long-term average portfolio return for decile d. N_i is the number of market indices included in the sample and LTR_{id} is the long-term portfolio return of market index i for decile d. This will be calculated for the 1- and 3-year buy-and-hold returns. Note that these are not the values that the acquirer 1- and 3-year returns are compared with, but is a presentation of the general trend to see whether there is support for earlier theories about the size effect, and thus why size portfolios are constructed. All used market indices can be found in Appendix B.

Table 4: Average 1- and 3-year portfolio returns in each decile

Note: This table shows the average 1- and 3-year portfolio returns in each decile. 26 market indices are used in the calculation. The 10th decile consists of the top 10% largest companies listed on the market index based on market value. Also, the 1st decile consists of the top 10% smallest companies listed on the market index based on market value.

Decile	Average 1-year return	Average 3-year return
10th	7.44%	30.84%
9th	10.56%	34.41%
8th	10.71%	33.27%
7th	11.95%	44.37%
6th	13.52%	51.30%
5th	16.69%	49.91%
4th	16.61%	61.03%
3rd	26.37%	83.08%
2nd	34.46%	95.04%
1st	32.68%	64.68%

Table 4 shows that the smallest listed companies earn the greatest 1- and 3-year portfolio returns, and the largest listed companies earn the smallest 1- and 3-year portfolio returns in the market indices. This is the same general trend as in the Lyon, Barber and Tsai (1999) study, where the smallest firms earned the largest returns, and the biggest firms earned the smallest returns. This size effect was first analysed by Banz (1981). However, multiple studies confirmed but also rejected this effect, as discussed in section 2.4. This could be attributable to the observed time period, which could affect whether a size effect is persistent or not. This is also shown in the study of Banz (1981). Furthermore, a size effect could be affected by the January effect. This January effect means that investors sell losing stocks in December to reduce their tax burden attributable to capital losses. These stocks are bought back in January creating a spike in stock prices. Small companies are more volatile, hence why they are used for this strategy (Reinganum, 1983). The yearly size effect can be attributed to the first week of January for 27 percent (Keim, 1983).

There are some exceptions to the observed trend of positive 1-year returns as there are a few market indices with negative 1-year returns. Explanations for the negative 1-year returns could be the number of observations and the timing of the merger or acquisition. In the global financial crisis of 2008-2009, negative returns were present all over the world (Mollick & Assefa, 2013). This was also reflected in the portfolios, as indices included in the data saw negative returns for most of the listed companies in 2008 and 2009. In some countries there has only been one merger or acquisition that is compared to the market index. As a result, average returns could not be calculated over a period of boom and over a period of downturns and this could explain why some market indices have negative returns.

4.3: Financial Determinants of the Acquirers

This section discusses financial determinants that recur in the literature and which could affect abnormal returns. These financial determinants are independent variables for the fixed effects regression analyses. The financial determinants analysed are company size, P/E ratio, B/M ratio, D/E ratio, dividend per share and dividend growth, company growth and C/P ratio. Lastly, the effect of the method of payment is analysed as it could affect the value created in a merger or acquisition. The value of each financial determinant will be calculated for each day in the estimation period (-120, -10) and then averaged over this period, unless otherwise specified. First will be discussed why these financial determinants are included in the analysis, followed by the presentation of the descriptive statistics of the financial determinants.

4.3.1: Company Size

Moeller, Schlingemann and Stulz (2004) conclude that small acquirers earn a return that is 2.24 percent higher than the return for large acquirers. This difference can be attributable to the hubris of managers and how this hubris affects investment decisions. Larger companies also pay a larger acquisition premium than small companies. The company size is based on the market capitalisation of the acquirer, all of which are noted in the currency of the country where the company is listed. All market capitalisations are converted to US Dollars using the average exchange rate over the estimation period. Which countries are included in the dataset is presented in Appendix B.

Because of large differences in market capitalisation in the used dataset, which is presented in Tables 5 and 6, the natural logarithm of the market capitalisation is used in the fixed effects regression analyses to reduce the high skewness in the market capitalisation and to create a better normal distribution (Aitchison & Brown, 1958).

4.3.2: Price-to-Earnings Ratio

Basu (1977) notes that stocks from companies with a low P/E ratio perform better than stocks of companies with a high P/E ratio. The P/E ratio is calculated by dividing the stock price of an acquirer by the earnings per share of an acquirer. However, when a company does not make a profit and has a negative P/E ratio, this will give a distorted image of the effect of the P/E ratio on abnormal returns (Lakonishok, Shleifer, & Vishny, 1994). Lakonishok, Shleifer and Vishny circumvent this problem by creating a dummy variable, which has the value 1 if a P/E ratio is negative and 0 if a P/E ratio is positive. Furthermore, if a P/E ratio is negative, it is transposed to 0. This way, the effect of a negative P/E ratio will only show in the dummy variable and the effect of a negative and positive P/E ratio can be tested independently.

4.3.3: Book-to-Market Ratio

According to Rau and Vermaelen (1998), who studied the effect of the B/M ratio on long-term returns, companies with a high B/M ratio perform the best. In the study of Fama and French (1992), the same conclusion can be drawn. The B/M ratio is calculated by dividing the book value of an acquirer by the market value of an acquirer.

4.3.4: Debt-to-Equity Ratio

The D/E ratio could also affect abnormal returns. Higgins and Beckman (2006) show that a high D/E ratio has a negative effect, because the market can view the company’s resources as

insufficient to pay for a target. However, Maloney, McCormick and Mitchell (1993) state the opposite as a high D/E ratio generates more control from creditors. This would mean that it is not possible to invest in bad projects, hence a smaller likelihood of value destruction. The D/E ratio is calculated by dividing the debt value of an acquirer by the equity value of an acquirer.

4.3.5: Dividend Policy

Companies with a lot of free cashflows could choose to increase the dividend paid to shareholders, showing confidence in the future of the company. A decrease of the dividend pay-out will be punished by the market and will result in a lower stock price, with a less positive future perspective (Jensen, 1986). To test this, both the amount of dividend per share and the dividend growth is calculated over a 1-year period instead of the estimation period (-120, -10). Because dividends are generally revised during the annual presentation of the company's financial performance (Lintner, 1956) a yearly period has been chosen, to ensure that most possible increases and decreases of dividend per share are accounted for as each company presents its financial performance at different times of the year. The dividend per share is then converted to US Dollars using the average exchange rate over this 1-year period.

4.3.6: Company Growth

Cooper, Gulen and Schill (2008) argue that asset growth rates could strongly predict abnormal returns, where companies with an asset growth rate in the highest decile (83.57% for companies in this decile) earn negative abnormal returns and companies with an asset growth rate in the lowest decile (-21.15% for companies in this decile) earn positive abnormal returns. To test whether company growth rates affect abnormal returns, the asset growth rate for the last full year before the M&A announcement is used. Due to data limitations, no estimation can be made for the estimation period, because only yearly data is known and calculated at the end of the year. Therefore, if part of the year of the merger or acquisition is included in the calculation, the assets obtained in the merger or acquisition are incorporated in the growth rate and will result in an inflated value of asset growth rate.

4.3.7: Cashflow-to-Price Ratio

When a company has a high C/P ratio, this means that a firm generates enough cash to support the current market price (Chan, Hamao, & Lakonishok, 1991). Investors generally prefer a higher C/P ratio over a lower ratio, which can be seen in the study of Chan, Hamao and Lakonishok (1991) where the C/P ratio has a significant positive effect on the stock returns.

The C/P ratio is calculated by dividing the cashflow from operating activities per share by the stock price of the company. The C/P ratio dummy is calculated in the same way as the P/E ratio dummy and if a company has a negative C/P ratio, it is again transposed to zero to test the effect of a positive and negative C/P ratio separately.

4.3.8: Method of Payment

Besides the in section 2.4 mentioned results of the effect of the method of payment on value creation in an M&A, it came forward in the Chang (1998) study that acquirers earn positive abnormal returns when a merger or acquisition is paid for in stock and there are no abnormal returns when a merger or acquisition is paid for in cash. This could be attributable to the market timing theory, in which companies use their overvalued stock to acquire a target (Savor & Lu, 2009). The Savor and Lu (2009) study differs from Chang (1998) because, according to Chang, acquirers underperform in the short run due stock overvaluation. There are three different forms of payment present in the dataset: a cash payment, a stock payment, or a mixed payment. A dummy variable is created for each form of payment where this variable is 1 when a merger or acquisition is paid for in this respective way and the value 0 when the merger or acquisition is paid for in another way.

4.4: Descriptive Statistics of The Financial Determinants

The descriptive statistics of all financial determinants discussed in section 4.3 are presented in table 5 and 6, where the sample is subdivided between public and private acquirers. In table 7 is shown what the method of payment was in all M&As subdivided between public and private M&As.

Table 5: Descriptive statistics of the financial determinants of public acquirers
Note: The number of observations is 72. How the financial determinants are calculated is discussed in section 4.3. Most ratios are formatted as continuous values, but the D/E ratio is not, otherwise the D/E ratio coefficient for the regression analyses cannot be presented in the same way as the other ratios.

Variable	Average	Median	Standard Deviation	Minimum	Maximum
Company Size (million $)	3350.61	1822.13	4018.91	19.44	22869.28
P/E Ratio	60.53	16.10	193.84	0	1134.25
P/E Dummy	0.03	0	0.17	0	1
B/M Ratio	0.94	0.66	0.78	0.19	4.03
D/E Ratio (%)	154.76	80.67	237.91	0.13	1602.84
Dividend per Share ($)	1.50	0.10	6.22	0	44.55
Dividend Growth (%)	17.25	0	59.09	-100	300
Asset Growth (%)	29.51	4.79	79.64	-40.72	504.82
C/P Ratio	0.15	0.12	0.14	0	1.05
C/P Dummy	0.07	0	0.26	0	1

Table 6: Descriptive statistics of the financial determinants of the private acquirers
Note: The number of observations is 464. How the financial determinants are calculated is discussed in section 4.3. Most ratios are formatted as continuous values, but the D/E ratio is not, otherwise the D/E ratio coefficient for the regression analyses cannot be presented in the same way as the other ratios.

Variable	Average	Median	Standard Deviation	Minimum	Maximum
Company Size (million $)	3058.79	605.35	9196.30	2.93	79780.87
P/E Ratio	38.42	16.10	143.01	0.45	1903.07
P/E Dummy	0	0	0	0	0
B/M Ratio	0.68	0.54	0.63	-5.36	4.59
D/E Ratio (%)	80.64	70.14	552.85	-6473.96	3969.14
Dividend per share ($)	5.57	0.14	25.62	0	423.04
Dividend growth (%)	9.81	0	42.68	-100	500
Asset Growth (%)	37.50	7.48	285.92	-53.85	4566.18
C/P Ratio	0.16	0.12	0.14	0	1.30
C/P Dummy	0.03	0	0.16	0	1

Public acquirers are larger than private acquirers based on market value. Showing that larger companies usually go for other public companies (Draper & Paudyal, 2006).

The P/E ratio is greater for public acquirers than for private acquirers. A greater P/E ratio for public acquirers compared to private acquirers could mean that investors expect that public acquirers have greater investment performance potential in the future compared to private acquirers (Basu, 1977). The downside is that this potential could be overvalued. The P/E dummy equals 0.03 for public acquirers and 0 for private acquirers. This means that in this sample 3% of the public acquirers and no private acquirers have a negative P/E ratio.

In this sample, the B/M ratio is smaller than 1 for both public and private acquirers. This means that the market value is larger than the book value for both types of acquirers. However, the B/M ratio is smaller for private acquirers than for public acquirers, which means that in this sample private acquirers are more overvalued than public acquirers. This is not reflected in the method of payment and shows that overvalued stocks are not used more frequently to generate money for acquisitions (Majluf & Myers, 1984). This could have something to do with the size of the deals. According to Draper and Paudyal (2006), the deal size of public acquisitions is on average ten times larger than that of private acquisitions, therefore private acquisitions are more easily paid for in cash.

In addition, public acquirers have a higher D/E ratio on average and the amount of debt is on average higher than the amount of equity because the average is higher than 100%. For private acquirers, this average is smaller than 100% meaning that private acquirers consist of more equity than debt.

The amount of dividend paid to shareholders is greater for private acquirers, while the dividend growth rate is greater for public acquirers. This could mean that a private acquirer has higher earnings and free cash flows (Jensen, 1986) and could also have lower systematic risk (Grullon, Michaely, & Swaminathan, 2002), while a public acquirer has a more positive outlook on the future (Jensen, 1986).

The asset growth rate is higher for private acquirers than for public acquirers, which could mean that private acquirers have a larger expansive need.

The C/P ratio is almost equal for public and private acquirers, but because the ratio is smaller than 1 for both types of acquirers, this means both types of acquirers do not generate enough cash to support their market price, again showing possible overvaluation (Majluf & Myers, 1984; Shleifer & Vishny, 2003).

The C/P dummy equals 0.07 for public acquirers and 0.03 for private acquirers. This means that 7% of the public acquirers and 3% of the private acquirers have a negative C/P ratio. These values differ from those of the P/E ratio dummy, showing that negative earnings do not

necessarily mean a negative cashflow, which may be caused by, for example, accruals or deferred income (Penman & Sougiannis, 1998).

Table 7: Descriptive statistics of the method of payment for acquirers
Note: The number of observations is 72 for public acquirers and 464 for private acquirers.

Type	Variable	Average	Median	Standard Deviation	Minimum	Maximum
Public						
	Cash Payment (%)	51.39	1	50.33	0	1
	Stock Payment (%)	30.55	0	46.39	0	1
	Mixed Payment (%)	18.06	0	38.73	0	1
Private						
	Cash Payment (%)	90.08	1	29.92	0	1
	Stock Payment (%)	2.80	0	16.52	0	1
	Mixed Payment (%)	7.11	0	25.73	0	1

When the method of payment for public and private acquirers is compared, it can be seen that private acquisitions are paid for in cash in 90% of the cases, while public acquisitions are paid for in cash in only 51.39% of the cases. This may be attributable to the small amount that has to be paid for private acquisitions compared to public acquisitions (Draper & Paudyal, 2006). Furthermore, private acquisitions use stock payments in only 2.8% of the time, while public acquirers use stock payments in 30.55% of the cases. Lastly, public acquisitions have mixed payments in 18.06% of the time while private acquisitions use mixed payments for 7.11% of the time. Because the deal size is possibly larger for public acquisitions (Draper & Paudyal, 2006) and because the B/M ratio is smaller than 1 for public acquirers this could show market timing, where overvalued shares are used to acquire a company (Majluf & Myers, 1984).

Chapter 5: Results

The first part of this chapter concerns the performed event studies to test hypotheses 1 to 6. The second part presents and discusses the results of the buy-and-hold abnormal return method to test hypotheses 7 and 8, and the final part is about the regression analysis to test hypothesis 9. For each hypothesis is concluded whether it should be rejected.

5.1: Event Study

5.1.1: Event Study for Abnormal Returns

The daily abnormal returns are presented first in table 8 followed by a discussion of the MacKinlay (1997) results and the BMP test results. Finally, the results are compared to previous studies.

Table 8: Average abnormal returns of the acquirers per event day

Note: The number of observations is 536. The values presented in the column "Daily Abnormal Returns" are in percentages while the values presented in the column "Z-Score BMP test" are continuous values which can be looked up directly in the z-table. However, the value in the row "CAR" is in percentages for both columns to show the difference in abnormal returns between the MacKinlay methodology and the BMP test. CAR is calculated as the sum of the average daily abnormal returns that significantly differ from zero.

Day	Daily Abnormal Returns	Z-Score BMP test
-5	0.05%	-0.30
-4	0.08%	0.25
-3	-0.22%**	-1.13
-2	0.13%	-0.20
-1	0.06%	1.59
0	0.50%***	3.48***
1	0.35%**	3.19***
2	0.00%	-0.43
3	-0.20%	-1.36
4	0.07%	0.19
5	0.04%	-0.41
CAR	0.63%	0.85%

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

According to the MacKinlay event study, shareholders earn normal returns on most of the days around the M&A announcement, except for 3 days before announcement, the announcement day, and the day after announcement of the merger or acquisition. Here, shareholders earn negative abnormal returns 3 days before the announcement and earn positive abnormal returns

on the announcement day and day after announcement. There seems to be a run down on stock prices 3 days before the announcement, which could be attributable to media rumours on which the market anticipates (Borges & Gairifo, 2013). Because the abnormal returns are negative 3 days before announcement, the market may anticipate that the M&A will not work out. However, on the day of the announcement and the day after the announcement, the market thinks that the M&A will be beneficial to the acquirer because of the positive abnormal returns. The cumulative abnormal return is calculated by summing the abnormal returns on days where they significantly differ from zero. Overall, according to the MacKinlay test, an M&A announcement in the transport industry seems to create value for the acquirer, because, with a value of 0.63%, the average cumulative abnormal return is positive.

However, when event-induced volatility is accounted for, most of the standardized abnormal returns do not significantly differ from zero, except for the abnormal returns on announcement day and the day after the M&A announcement. The possible run down on stock prices 3 days before the announcement seems to disappear. The average cumulative abnormal return is 0.85%, which is the sum of the abnormal return on announcement day and the day after announcement. In section 3.1 is discussed that the consensus in previous studies is that the BMP test is better than the MacKinlay event study. Thus, the cumulative abnormal return that results from the BMP test is used for other tests in this study that include cumulative abnormal returns. Thus, whether hypothesis 1 which states that the short-term cumulative abnormal return is positive is rejected or not is based on the cumulative abnormal return that stems from the BMP test. Overall, an M&A announcement seems to create value for the acquirer in the transport industry, because, with a value of 0.85%, the average cumulative abnormal return resulting from the BMP test is positive. Thus, hypothesis 1 cannot be rejected. Previous studies do not always come to the same conclusion. Mandelker (1974) and Bruner (2002) found that shareholders of acquiring firms do not earn abnormal returns from an announcement, but also do not lose value. Weidenbaum and Vogt (1987) state that negative abnormal returns are more prevalent, which is also not the case in this study. However, in these studies more than one industry is included. For M&As in the aviation industry, Slovin, Sushka and Hudson (1991) did find positive abnormal returns for acquiring shareholders. For M&As in the shipping industry Panayides and Gong (2002) concluded the same as Slovin, Sushka and Hudson (1991) and for M&As in the freight transportation sector (mostly shipping, railroad and trucking) Andreou, Louca and Panayides (2012) also found positive abnormal returns for acquiring shareholders. This seems to be consistent with this study.

5.1.2: Event Study for Abnormal Trading Volume

The daily abnormal trading volumes are presented first in table 9 followed by the results of the cumulative abnormal trading volume. Finally, the results are compared to previous studies.

Table 9: Average abnormal trading volume of the acquirers per event day
Note: The number of observations is 536. CATV stands for cumulative abnormal trading volume.

Day	Daily Abnormal Trading Volume
-5	-0.15%
-4	-0.08%
-3	-0.15%
-2	0.11%
-1	0.20%
0	0.98%**
1	1.84%***
2	1.35%***
3	0.96%***
4	0.34%
5	0.30%
CATV (0, 3)	5.13%

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

Prior to the announcement of the merger or acquisition, no abnormal trading is found. However, on the day of the announcement until three days after the announcement, significant abnormal trading volume is present. Over the course of this four-day period, shares are traded on average over 5% more frequently than expected. As a result, hypothesis 2 is not rejected.

This result is different compared to earlier studies. Conrad and Niden (1992) find increased trading volume three days prior to the announcement. Ascioglu, McInish and Wood (2002) also found that abnormal trading was already present prior to the M&A announcement. Abnormal trading volume before the M&A announcement is not present in this study. This could indicate that there was no insider trading, which happens frequently (Keown & Pinkerton, 1981). Also, Keown and Pinkerton (1981) concluded that abnormal trading volume was present until 1 day after the announcement, while Ascioglu, McInish and Wood (2002) revealed abnormal trading until 42 days after the announcement. These periods of abnormal trading both differ from this study because, although the studied period ends on the 5th day after the announcement, the abnormal trading volume in this study is present only until three days after

the announcement. Furthermore, Epps (1975) found that stock price returns are correlated with trading volume. This would mean that there should be abnormal trading volume on the days when there are abnormal returns. However, the period of abnormal returns differs from the period of abnormal trading volume in this study. This means that correlation between the two is not necessarily present.

5.1.3: Event Study for Abnormal Volatility

5.1.3.1: Abnormal Volatility

The results of the daily abnormal volatility test are presented first in table 10. This is followed by a discussion of the event-induced volatility. Finally, the results are compared to previous studies.

Table 10: Average daily volatility of the acquirers

Note: The number of observations is 536. The daily volatility is calculated using formula 18 and has an expected value of 1. Daily volatility is presented instead of daily abnormal volatility because of interpretation purposes. If daily volatility has a value of 2, this means that the volatility of the stock price was 2 times as big on that event day compared to what was expected according to the volatility in the estimation period.

Day	**Daily Volatility**
-5	1.01
-4	1.13**
-3	1.58***
-2	1.33***
-1	1.67***
0	2.53***
1	3.61***
2	1.00
3	1.13**
4	1.20***
5	1.70***
CAV (-4 – 1, 3 – 5)	15.88

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The U_{it} ratio of formula 18 is greater than 1 on every event day. The ratio differs significantly from 1 on 9 event days at the 5% level and on 7 of these 9 event days, the ratios are statistically significant at the 1% level. This means that abnormal volatility is present around an M&A announcement and shows that the market is very active around an M&A announcement. On announcement day, the stock price is more than 2 times as volatile as expected. Over the entire

period of significant volatility, the stock price is over 15 times as volatile as expected.

Compared to previous studies, it appears that an announcement leads to more market volatility (Mall & Gupta, 2019), and that rumours about an announcement or the announcement itself may be relevant information for the market which is reflected in the increased volatility preceding the announcement (Yadav, 1992). Balaban and Constantinou (2006) also found abnormal volatility around M&A announcements in the UK. These results seem to align with this study. However, increased volatility is not always present. Tan and Hooy (2004) found in their study that an M&A announcement brought greater stability in stock returns in the post-merger period. Although the post-merger period only consists of 5 days in this study, abnormal volatility is still present in this period. Furthermore, in addition to the presence of abnormal volatility, Balaban and Constantinou (2006) found that an M&A announcement induces volatility. Whether that is true for this study as well, is discussed in section 5.1.3.2.

5.1.3.2: Event-induced Volatility

To test whether the event, an M&A announcement in this study, induces volatility, a GARCH (1, 1) analysis is performed. The results of this analysis can be found in table 11.

Table 11: Event-induced volatility of the acquirers per day in the event period
Note: The number of observations is 536. The reported values of the induced volatility are the event day dummy variable values and are calculated using formula 24.

Day	Event Day Induced Volatility
-5	0.1682
-4	0.0402**
-3	0.0297
-2	0.0178
-1	0.0077
0	0.0117
1	-0.0153
2	0.0124
3	0.0128
4	0.0081
5	0.0212

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The event-induced volatility is statistically insignificant on each day in the event period except for 4 days prior to announcement. This means that the M&A announcement does not cause a

change in volatility in the stock price except for 4 days prior to announcement (Savickas, 2003). This could indicate that an announcement rumour creates uncertainty in the market or that an acquirer is more exposed, if not temporarily, to uncertainty (Brown, Harlow, & Tinic, 1988). But this is not true in this sample for the announcement day or the post-announcement period.

When these values are compared to abnormal volatility, it shows that the statistically significant abnormal volatility disappears, which could mean that the actual volatility was underestimated or that the possibility of an event having a different effect on different firms was underestimated (Brown & Warner, 1985). Concluding, although abnormal volatility is present, this disappears when taking event-induced volatility into account. Thus, hypothesis 3 is not rejected. Although this should be nuanced by saying that the abnormal volatility is not necessarily attributable to the M&A announcement itself.

5.2: Abnormal Returns, Trading Volume and Volatility Compared

In this section, the results of the tests for abnormal returns, abnormal trading volume and abnormal volatility, in that order, are compared between the sample splits of public/private, horizontal/vertical and going local/not going local.

5.2.1: Public vs. Private

The results of the Welch t-tests are discussed first and are presented in table 12. This is followed by a comparison with previous studies.

Table 12: Average cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility of private and public M&As and the Welch t-test result

Note: The number of private M&As is 464. The number of public M&As is 72. CAR stands for cumulative abnormal return, CATV stands for cumulative abnormal trading volume and CAV stands for cumulative abnormal volatility.

Variable	Private M&As	Public M&As	T-statistic Welch t-test
CAR	0.71%	1.79%	-1.21
CATV	4.33%	10.19%	-1.25
CAV	14.83	22.54	-1.72*

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The average cumulative abnormal return is 1.08% higher for public acquirers than for private acquirers and around an M&A announcement, the shares of public acquirers are more frequently traded as well. Lastly, the stock volatility is more than 22 times as big as the normal stock volatility for public acquirers and almost 14 times as big for private acquirers. Hypothesis 4 stated that M&A announcements of private M&As generate greater cumulative abnormal

returns, cumulative abnormal trading volume and cumulative abnormal volatility. However, the average values of the three variables are all greater for public acquirers. The greater averages for public acquirers could be attributable to the difference in sample size. When the sample size difference is accounted for in the Welch t-test, the t-statistics of all three variables are insignificant. This means that, although the average values of the three variables are greater for public acquirers, the average values of the three variables do not differ significantly between public and private acquirers. This implies that, although M&A announcements create shareholder value for acquirers in the transport industry, the announcements of private M&As do not generate greater abnormal returns, abnormal trading volume and abnormal volatility than announcements of public M&As. As a result, hypothesis 4 is rejected.

When the results of this tests are compared to previous studies, it is found that the consensus is different. Capron and Shen (2007) concluded that private acquirer shareholders earned more abnormal returns than public acquirer shareholders. Bruner (2004) also stated that private acquirers tend to earn more abnormal returns, and thus create more value, than public acquirers. Fuller, Netter and Stegemoller (2002) found that shareholder value is destroyed when the target is public, and value is created when the target is private. This is not true in this study.

5.2.2: Horizontal vs. Vertical

As was the case in section 5.2.1, the results of the Welch t-tests are discussed first and are presented in table 13. This is followed by a comparison with previous studies.

Table 13: Average cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility of horizontal and vertical M&As and the Welch t-test result
Note: The number of horizontal M&As is 361. The number of vertical M&As is 175. CAR stands for cumulative abnormal return, CATV stands for cumulative abnormal trading volume and CAV stands for cumulative abnormal volatility.

Variable	Horizontal M&As	Vertical M&As	T-statistic Welch t-test
CAR	1.00%	0.55%	0.93
CATV	5.38%	4.59%	0.34
CAV	17.93	11.60	2.60***

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The average cumulative abnormal return is 0.45% higher for horizontal M&As compared to vertical M&As and the stock volatility is almost 17 times the normal stock volatility for horizontal M&As, and the stock volatility for vertical M&As is over 11 times the normal stock volatility. Furthermore, the average cumulative abnormal trading volume is also greater for horizontal M&As compared to vertical M&As. Hypothesis 5 stated that M&A announcements

of horizontal M&As generate greater cumulative abnormal returns, cumulative abnormal trading volume and cumulative volatility compared to vertical M&As. The averages of all three variables are indeed greater for horizontal M&As, but accounting for the difference in sample size shows that the averages for cumulative abnormal return and cumulative abnormal trading volume do not differ between horizontal and vertical M&As. Stock volatility around the announcement of a horizontal M&A is greater than around a vertical M&A announcement, with a significance level that is smaller than 1% even after accounting for the difference in sample size. However, hypothesis 5 stated that all 3 variables are expected to be greater for horizontal M&As and this is not true in this sample. As a result, hypothesis 5 is rejected.

In sections 2.1 and 2.2.5 potential motives and gains of horizontal and vertical M&As were discussed, and it was expected that the possible downsides of vertical M&As were greater than possible downsides of horizontal M&As. However, in this study vertical M&As do create short-term value, and this level of value creation is not smaller compared to horizontal M&As. This was not expected, compared to previous studies. Zhu (2012) stated that short-term performance is negatively affected by a vertical M&A and Rozen-Bakher (2018) also concluded that horizontal M&As are more profitable and easier to integrate compared to vertical M&As. In this study, the market does not necessarily expect that to be the case.

5.2.3: Going Local vs. Not Going Local

The sample of vertical M&As is split again between acquirers who go local and acquirers who do not. Then, the Welch t-tests are performed. First, the results of the Welch t-tests are presented in table 14. Then, the results are discussed and compared to previous studies.

Table 14: Average cumulative abnormal return, cumulative abnormal trading volume and cumulative abnormal volatility of vertical M&As who go local and who do not, and the Welch t-test result

Note: Of the 175 vertical M&As, 111 vertical M&As went local, while 64 M&As did not. In the table M&As that did go local are noted as "Local M&As", and M&As that did not go local are noted as "Not Local M&As". CAR stands for cumulative abnormal return, CATV stands for cumulative abnormal trading volume and CAV stands for cumulative abnormal volatility.

Variable	Local M&As	Not Local M&As	T-statistic Welch t-test
CAR	0.02%	1.34%	-1.38
CATV	6.05%	2.06%	1.01
CAV	12.74	9.62	1.44

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The average cumulative abnormal return is 1.32% higher for acquirers that do not go local with their M&As. On the other hand, the average cumulative abnormal trading volume and the

average cumulative abnormal volatility is greater for acquirers who do go local with their M&As. But, when the difference in sample size is accounted for, the Welch t-test shows that the averages of all three variables do not differ between the two samples. Hypothesis 6 stated that acquirers who go local generate greater cumulative abnormal returns, cumulative abnormal trading volume and cumulative abnormal volatility than acquirers who do not. As a result, hypothesis 6 is rejected. This implies that, although M&A announcements create shareholder value for acquirers in the transport industry and although table 14 shows that both types of vertical M&As create shareholder value, the announcements for local M&As do not generate greater cumulative abnormal returns, cumulative abnormal trading volume and cumulative abnormal volatility than announcements of non-local M&As.

Theory is divided whether vertical mergers who go local should create value or not. Sodhi and Tang (2012) argue that being less prone to possible disruptions in the chain is an argument to merge locally, and should be reflected in the stock price. This is not true in this sample, where going local does not earn more returns. It is also expected that companies go local in their supply chain in the current crisis (Bonadio, Huo, Levchenko, & Pandalai-Nayar, 2020), but this is not necessarily in the best interest of shareholders.

5.3: Buy-and-Hold Abnormal Return Method

To test hypotheses 7 and 8, all acquirers are matched to a size reference portfolio and the 1-year and 3-year returns of the acquirer are compared to the 1- and 3-year returns of their respective size reference portfolio to calculate the 1- and 3-year abnormal returns. These abnormal returns are discussed first, followed by the results of the t-tests performed. Finally, the results are compared to previous studies. In table 15, the descriptive statistics of the 1-year and 3-year abnormal returns can be found.

Table 15: Descriptive statistics of the 1- and 3-year buy-and-hold abnormal returns and results of the t-tests performed
Note: The number of observations is 536. How to calculate the t-statistic for both t-tests is presented in formula 29 to 31.

Descriptive Statistics	1-year BHAR	3-year BHAR
Average	-16.85%	-47.32%
Median	-10.66%	-32.35%
Standard Deviation	54.37%	136.06%
Minimum	-557.44%	-1937.79%
Maximum	197.16%	277.77%
T-statistic Conventional t-test	-7.186***	-8.053***
T-statistic Skewness-adjusted t-test	-10.311***	-14.526***

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

The 1-year return of acquirers is on average 16.85% lower than the portfolio returns. The spread in 1-year abnormal returns ranges between an underperformance of minus 557.44% and an overperformance of 197.16% compared to the acquirer's size reference portfolio. Over three years, acquirers in the transport industry earn returns that are on average 47.32% lower than the market returns. Furthermore, the spread in abnormal returns ranges between an underperformance of minus 1937.79% and an overperformance of 277.77%. The two t-tests are performed to test whether these values differ from zero are also presented in table 15.

Hypothesis 7 stated that the 1-year buy-and-hold abnormal returns for acquirer shareholders are lower than the portfolio returns for M&As in the transport industry. On average, the buy-and-hold abnormal return equals -16.85% for acquirer shareholders. When a conventional t-test and a skewness-adjusted t-test were performed, the t-statistics were found to be -7.186 and -10.311, respectively. This means that the results are significant at the 1% level and this implies that almost certainly the 1-year buy-and-hold abnormal returns of acquirers are lower than the size reference portfolio returns and thus, hypothesis 7 cannot be rejected.

Hypothesis 8 stated that the 3-year buy-and-hold abnormal returns for acquirer shareholders are lower than the portfolio returns for M&As in the transport industry. On average, the 3-year buy-and-hold abnormal returns are -47.32%. Again, a conventional and skewness-adjusted t-test was performed, and for the 3-year buy-and-hold abnormal returns, the t-statistic is found to be -8.053 and -14.526, respectively. Like the 1-year buy-and-hold abnormal returns, the results are statistically significant at the 1% level, and implies that almost certainly the 3-year returns of the acquirers are lower than the 3-year portfolio returns. Hence, hypothesis 8 cannot be rejected.

Theories of long-term post-M&A returns do not always correspond with the long-term post-M&A returns of this study. Rau and Vermaelen (1998) found that acquirers underperform after M&As and that this is predominantly attributable to a low book-to-market ratio, which are also called growth stocks. Companies with a high book-to-market ratio are called value stocks and are interesting to the market because their stocks appear to have a price that is too low relative to their fundamental value (Fama & French, 1992). Lubatkin (1987) argued that a merger or acquisition on average has a permanent positive impact on stock value, which is a different conclusion compared to the Rau and Vermaelen (1998) study and is also not found in this study. A side note from Lubatkin (1987) is that this could also be attributable to other effects during this longer period, which are not included in this study. Brigl et al. (2016) also expect long-term positive returns over time, because it takes time to capture additional value post-M&A. The long-term underperformance may be attributable to the failed attempts to integrate both companies appropriately (Langabeer & Seifert, 2003).

5.4: Regression Analysis

In the event study for abnormal returns is established that acquirers have positive abnormal returns around an M&A announcement. For hypothesis 9 is tested whether the cumulative abnormal returns can be explained based on financial determinants of the studied acquirers and states that the B/M ratio has the greatest positive effect on cumulative abnormal returns. This is tested using single and multiple fixed effects regression analyses. Table 16 and table 17 show the results of 13 different single fixed effects regressions, divided between the single fixed effects regression analyses for the financial determinants in table 16 and the single fixed effects regression analyses for method of payment in table 17. Table 18 shows the result of the multiple fixed effects regression analysis.

The presentation of the results is followed by a discussion of all coefficients and for the coefficients that are significant in the final multiple fixed effects regression model, the results are compared to previous studies. As was discussed in section 3.3, the coefficients from the multiple regression analysis are tested on multi-collinearity using a VIF test. The results of the VIF tests can be found in Appendix C. Both the single and multiple fixed effects regression analyses are tested for heteroskedasticity as well. The results of the Breusch-Pagan tests for each single and multiple fixed effects regression analysis are included in tables 16 to 18.

Table 16: Single fixed effects regression analyses results for financial determinants

Note: The dependent variable is the cumulative abnormal return for all fixed effects regression analyses in this table. The number of observations is 536. Furthermore, because all outcomes of the Breusch-Pagan tests are significant, the robust standard errors are presented in the parentheses.

Variable	**Size**	**P/E Ratio**	**P/E Dummy**	**B/M Ratio**	**D/E Ratio**	**Div. P. S.**	**Div. Growth**	**Asset Growth**	**C/P Ratio**	**C/P Dummy**
Intercept	-0.0130	-0.00849	-0.0131	-0.0122	-0.0125	-0.0131	-0.0129	-0.0130	-0.0129	-0.0138*
	(0.0083)	(0.00841)	(0.0080)	(0.0082)	(0.0080)	(0.0080)	(0.0080)	(0.0080)	(0.0080)	(0.0080)
Company Size (ln)	-0.0026*									
	(0.0014)									
P/E Ratio		-0.00003**								
		(0.00001)								
P/E Dummy			-0.0570							
			(0.0555)							
B/M Ratio				0.0064						
				(0.0042)						
D/E Ratio					0.0000					
					(0.0000)					
Dividend Per Share						-0.0001**				
						(0.0000)				
Dividend Growth							0.0022			
							(0.0037)			
Asset Growth								0.0000		
								(0.0000)		
C/P Ratio									-0.0080	
									(0.0161)	
C/P Dummy										-0.0200*
										(0.0114)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Breusch Pagan	50.18***	25.48***	25.30***	48.29***	31.57***	37.93***	30.40***	31.67***	31.89***	32.70***

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

Company size seems to have a negative effect on the cumulative abnormal return. Because the regression performed for the company size variable is a level-log regression, this means that when the company size increases with 1%, the cumulative abnormal return decreases with -0.0026% (-0.26%/100) (Kephart, 2013). The P/E ratio is statistically significant and has a coefficient of -0.00003. This means that when the P/E ratio increases with 1, the cumulative abnormal return appears to decrease with 0.003%. When an acquirer has a negative P/E ratio, its cumulative abnormal return looks to increase with 5.70%. The D/E ratio has a coefficient of 0, which means that it seems like that the D/E ratio does not affect the cumulative abnormal return at all. The second statistically significant variable is the dividend per share. If the dividend per share increases with 1 US dollar, the cumulative abnormal return decreases with 0.01%. When an acquirer enjoyed a 100% growth in dividend in the last year, this seems to increase the cumulative abnormal return by 0.22%. Asset growth seems to have no effect on the cumulative abnormal return when the assets grew with 100% in the previous calendar year. Furthermore, if the C/P ratio increases with 1, this seems to decrease the cumulative abnormal return with 0.80%. Lastly, when a company has a negative C/P ratio, this seems to result in a decrease of 2.00% in the cumulative abnormal return of acquirers. However, most discussed variables are statistically insignificant. For all these determinants, they seem to approximate the mentioned values, but do not reach significant levels and therefore, the observed values could occur by chance (Moore, McCabe, Alwan, Craig, & Duckworth, 2011).

Also, the intercept is statistically insignificant and negative in all the simple fixed effects regressions in table 16, which could indicate that there are no external factors not included in the model that may affect the cumulative abnormal return (Stock & Watson, 2015a).

Table 17: Single fixed effects regression analyses results for method of payment

Note: The dependent variable is the cumulative abnormal return for all regression analyses. The number of observations is 536. Furthermore, because all outcomes of the Breusch-Pagan tests are significant, the robust standard errors are presented in the parentheses.

Variable	Cash Payment	Stock Payment	Mixed Payment
Intercept	-0.0157*	-0.0130	-0.0136*
	(0.0087)	(0.0080)	(0.0082)
Cash Payment	-0.0144*		
	(0.0085)		
Stock Payment		0.0266	
		(0.0164)	
Mixed Payment			0.0035
			(0.0068)
Year Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Breusch Pagan	55.16***	110.62***	28.71***

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

It can be seen in table 17 that the coefficient for stock and mixed payment is positive and the coefficient of mixed payment is negative. However, all three coefficients are insignificant for acquirers. As a result, the method of payment does not seem to affect the cumulative abnormal returns in this study.

The next step in the regression analysis is to perform a multiple fixed effects regression analysis with all financial determinants from the single fixed effects regression models to check whether the variables that were statistically significant in the single fixed effects regressions are still significant, and to perform the VIF test to check if there is any multi-collinearity. The result of the multiple fixed effects regression analysis can be found in table 18. The result of the VIF test can be found in appendix C.

Table 18: Multiple fixed effects regression analysis results for acquirers

Note: The dependent variable is the cumulative abnormal return. The number of observations is 536. Furthermore, because the outcome of the Breusch-Pagan is significant, the robust standard errors are presented in the parentheses. In appendix C can be seen that there is no multi-collinearity present in the multiple regression model. Thus, no financial determinants are removed from the model, except for "Mixed payment" because of the dummy variable trap as discussed in section 3.3.

Variable	**Multiple Regression Model**
Intercept	-0.0089
	(0.0086)
Company Size (ln)	-0.0023
	(0.0016)
P/E Ratio	-0.00003**
	(0.00001)
P/E Dummy	-0.0495
	(0.0604)
B/M Ratio	0.0072
	(0.0052)
D/E Ratio	0.0000
	(0.0041)
Dividend Per Share	-0.0001**
	(0.0001)
Dividend Growth	0.0027
	(0.0041)
Asset Growth	0.0000
	(0.0000)
C/P Ratio	-0.0410*
	(0.0214)
C/P Dummy	-0.0234*
	(0.0136)
Cash Payment	-0.0052
	(0.0075)
Stock Payment	0.0190
	(0.0165)
Year Fixed Effects	Yes
Region Fixed Effects	Yes
Breusch Pagan	113.66***

***p-value <0.1, **p-value <0.05, ***p-value <0.01**

In the multiple fixed effects regression model, both the P/E ratio variable and the dividend per share variable are still statistically significant. Also, the signs and the magnitudes of the coefficients have not changed. Furthermore, there are no other financial determinants that have a statistically significant effect when tested in the multiple regression analysis compared to the single regression analysis. In the final model, the cumulative abnormal return still decreases with 0.003% when the P/E ratio increases with 1 and there are no changes in the other financial determinants, and the cumulative abnormal return still decreases with 0.01% when the dividend per share increases with 1 and there are no changes in the other financial determinants.

Hypothesis 9 stated that the B/M ratio has the greatest positive effect on the cumulative abnormal returns. However, it already showed in the single fixed effects model that the B/M ratio has no significant effect at all, unlike the P/E ratio and the dividend per share. As a result, hypothesis 9 will be rejected.

The effect of the P/E ratio is in line with earlier studies. Both Basu (1977) and Ball (1992) have concluded that there seems to be a P/E ratio anomaly that stocks of companies with a low P/E ratio have greater returns compared to companies with a high P/E ratio, where Ball (1992) extends this theory that this is due to market inefficiencies. In this study, the negative relationship between cumulative abnormal returns and P/E ratio is present as well.

However, the negative relationship between abnormal returns and dividend per share that is found in this study, is not present in previous studies. Jensen (1986) stated that companies with high dividends show confidence in the future of the company while a decrease in dividend will be punished by the market. Although dividend per share affects abnormal returns and not dividend growth, it is still expected that a higher dividend is accompanied by higher abnormal returns. In the Firth (1996) study is also shown that high dividends generate high abnormal returns.

Chapter 6: Conclusion and Discussion

6.1: Summary of the Study and Answering of the Research Question

This study focuses on M&As in the transport industry. For 536 M&As in the transport industry in the 21st century is studied whether they create value for acquirer shareholders. To answer the research question, nine hypotheses were formulated.

Hypothesis 1 stated that acquirers earn positive cumulative abnormal returns. An event study was conducted to compute cumulative abnormal returns for acquirers and to test whether they differ from zero. This event study resulted in significant abnormal returns on the day of announcement and the day after the announcement of the merger or acquisition. The average cumulative abnormal return in this period is positive, which suggests short-term value creation and that hypothesis 1 cannot be rejected.

Hypotheses 2 and 3 imply that besides abnormal returns, abnormal trading volume and abnormal volatility are also present around M&A announcements. According to the results of the event studies for abnormal trading volume and abnormal volatility, both abnormal trading volume and abnormal volatility are present and positive, but the abnormal volatility is not necessarily induced by the announcement itself as shown in the test for event-induced volatility. It seems that the market tries to capture the cumulative abnormal returns as evidenced by the abnormal trading volume and abnormal volatility. As a result, hypotheses 2 and 3 are not rejected, but the acceptance of hypothesis 3 has to be nuanced.

Hypothesis 4 suggested that cumulative abnormal returns, cumulative abnormal trading volume and cumulative abnormal volatility are greater for private acquirers compared to acquirers who public acquirers. Hypothesis 5 suggested that cumulative abnormal returns, cumulative abnormal trading volume and cumulative abnormal volatility are greater for horizontal M&As compared to vertical M&As. Hypothesis 6 argued that vertical mergers who shorten their supply chain earn greater cumulative abnormal returns, cumulative abnormal trading volume and cumulative abnormal volatility than vertical mergers who do not. To test hypotheses 4 to 6, the sample was split between public and private M&As for hypothesis 4, horizontal and vertical M&As for hypothesis 5 and vertical M&As who go local and vertical M&As who do not for hypothesis 6. All three hypotheses were tested using a Welch t-test. All three samples show that the three variables (abnormal returns, abnormal trading volume and abnormal volatility) do not differ between the two types of M&As in the sample, except for cumulative abnormal volatility between horizontal and vertical M&As. Here, cumulative abnormal volatility was greater for horizontal M&As compared to vertical M&As. All three hypotheses are rejected.

Instead of short-term M&A effects, hypotheses 7 and 8 say that negative 1-year and 3-year long-term effects of M&As are present around M&As in the transport industry. Applying the buy-and-hold abnormal return method, acquirer shareholders earn a 1-year abnormal return of -16.35% on average and a 3-year abnormal return of -47.32% on average. This implies long-term value destruction after the merger or acquisition. As a result, hypotheses 7 and 8 were both not rejected.

Lastly, hypothesis 9 was formulated to test which financial determinants, in particular the B/M ratio, can explain the cumulative abnormal returns, and thus possible value creation. The single and multiple fixed effects regression analyses showed that the B/M ratio does not have an effect on the cumulative abnormal returns, which was expected. Instead, positive P/E ratios and the dividend per share in US dollar can explain the cumulative abnormal returns. In this study, the cumulative abnormal return decreases with 0.003% when the P/E ratio increases with 1 and the cumulative abnormal return decreases with 0.01% when the dividend per share in US dollar increases with 1. As a result, hypothesis 9 was rejected.

The research question was:

To what extent is shareholder value created in a merger or an acquisition in the transport industry in the 21st century?

The answer is that short-term value is created for acquirers in a merger or acquisition in the transport industry and there seems to be no difference in short-term value creation between public and private, horizontal, and vertical, and between local vertical or non-local vertical M&As. This short-term value creation is smaller when its P/E ratio or dividend per share rises in the period before the merger or acquisition. In the long run, value destruction will most likely occur for acquirers participating in M&As in the transport industry in the 21st century.

6.2: Implications and Recommendations for Further Research

Theoretically, this study is consistent with previous studies on the subject. Most previous studies concluded that short-term value is created for acquirers in the transport industry in the period surrounding an M&A announcement. This is also the case in the 21st century according to this study. However, the expected greater returns for private M&As, horizontal M&As and vertical M&As who go local are not present in this study. Furthermore, according to previous studies long-term value creation will occur when the integration of the target is successfully completed. It could be the case that in this sample successful integration has not been

accomplished by the acquirers. The study for long-term value creation does not consider any external effects that may affect stock returns over a longer period. Lubatkin (1987) mentioned possible external issues such as characteristics of the industry, management capabilities and the strategy that the company pursues after the completion of the merger or acquisition. These are issues that were addressed in studies conducted in the 1980s, so it may be interesting to examine whether these issues are still relevant or whether there are any other influences. A current influence could be the market reaction considering the Covid-19 virus. Although this study was based on M&As in the 21st century, there are no M&As in the dataset that took place during the outbreak of the virus. Follow-up research may include studies of whether the market reacts differently in the current economic situation and what impact the current situation may have on longer-term returns. As shown in the introduction, there have already been examples of mergers or acquisitions in the transport industry, where one of the main motives was survival in the current economic state. Also, Salsberg (2020) stated that companies should always engage in M&As in a crisis period and PWC (2021c) found that there are companies with enough funds to engage in M&As in this current crisis period. Furthermore, the outcome of the regression analyses aligns with previous studies regarding the correlation between the P/E ratio and the cumulative abnormal return. But the correlation between dividend per share and cumulative abnormal return is different compared to previous studies. Also, where many studies conclude a significant effect of the B/M ratio, that is not present here. For follow-up studies, it is advisable to study the reason why there are mixed conclusions on the correlation between dividend per share and value creation and why the B/M ratio does not seem to have an effect on abnormal returns around M&A announcements in the transport industry. Lastly, follow-up research can look at M&As that occurred in the 21st century in other industries as well to test if the same conclusions can be drawn, since most of the research considering other industries took place in the 20th century. For example, M&As in industries that are heavily regulated, such as financial institutions, earned negative abnormal returns in the late 90s and this regulation is not expected to stay constant over time (Campa & Hernando, 2004). Especially after the global financial crisis, which resulted in more regulation for financial institutions (Moshirian, 2011).

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Appendix A

Table 19: Overview of the SIC codes used to select the M&As suitable to this study

Note: All SIC codes will be presented for the acquirers but because entire industries are used for the targets, only the industry will be presented. Nec stands for "not elsewhere classified".

Acquirer or Target	SIC Code	Industry/Sector
Acquirer Primary SIC		
	4011	Railroads, line-haul operating
	4013	Railroad switching and terminal establishments
	4111	Local and suburban transit
	4119	Local passenger transportation, nec
	4121	Taxicabs
	4131	Intercity and rural bus transportation
	4141	Local bus charter service
	4142	Bus charter service, except local
	4151	School buses
	4212	Local trucking
	4213	Trucking, except local
	4215	Courier services, except by air
	4311	United States Postal Service
	4412	Deep sea foreign transportation of freight
	4424	Deep sea domestic transportation of freight
	4432	Freight transportation on the Great Lakes
	4449	Water transportation of freight, nec
	4481	Deep sea transportation of passengers, exc. Ferry
	4482	Ferries
	4489	Water transportation of passengers, nec
	4512	Air transportation, scheduled
	4513	Air courier services
	4522	Air transportation, nonscheduled
	4789	Transportation services, nec
Target Primary SIC		
	1500-3999	Construction and Manufacturing
	4000-4799	Transportation and Shipping (except air), and Air Transportation and Shipping
	5000-5999	Wholesale Trade and Retail Trade
	7000-8999	Services

Appendix B

Table 20: Overview of the countries, regions and exchange indices present in the sample

Country	Region	Exchange Index
United Arab Emirates	Middle East	ADX General
Australia	Oceania	Standard and Poor's/Australian Stock Exchange 300
Thailand	East Asia	Bangkok S.E.T.
China – Shanghai	East Asia	Shanghai Stock Exchange
China – Shenzhen	East Asia	Shenzhen Stock Exchange
Europe	Europe	Euro Stoxx
Malaysia	East Asia	FTSE Bursa Malaysia KLCI
United Kingdom	Europe	FTSE 250
Vietnam	East Asia	Hochiminh Stock Exchange Vietnam Index
Hong Kong	East Asia	Hang Seng
Iceland	Europe	OMX Iceland All Share
India	East Asia	Nifty 500
Chile	South America	CLX IGPA CLP Index
Indonesia	East Asia	Jakarta Index Composite
Japan	East Asia	Nikkei 225 Stock Average
South Africa	Africa	FTSE/JSE All Share
South Korea	East Asia	Korea Stock Exchange Composite
Kuwait	Middle East	MSCI Kuwait
Mexico	North America	Mexico IPC
New Zealand	Oceania	Standard and Poor's/NZX 50
Russia	Europe	Moex Russia Index
United States	North America	Standard and Poor's 500
Singapore	East Asia	Straits Times Index Local Currency
Taiwan	East Asia	Taiwan Stock Exchange Weighed TAIEX
Turkey	Middle East	Bist National 100
Canada	North America	Standard and Poor's/Toronto Stock Exchange

Appendix C

Table 21: VIF test results

Note: For example, if Acquirer Size has a VIF value of 1.19, this means that in the performed regression analysis that has a VIF value of 1.19, Acquirer Size was the dependent variable. For the financial determinant "Mixed Payment" no VIF test is performed, because due to the dummy variable trap, which is discussed in section 3.3, the variables "Cash Payment", "Stock Payment" and "Mixed Payment" are perfectly multi-collinear and thus "Mixed Payment" was removed from the multiple regression analysis.

Financial Determinant	VIF Value
Acquirer Size	1.19
P/E Ratio	1.03
P/E Dummy	1.04
B/M Ratio	1.57
D/E Ratio	1.02
Dividend per Share	1.06
Dividend Growth	1.03
Asset Growth	1.02
C/P Ratio	1.56
C/P Dummy	1.11
Cash Payment	1.75
Stock Payment	1.76
Mixed Payment	-