ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
BSc Economics & Business
Bachelor Specialisation Financial Economics

Corporate Restructuring in the Automotive Industry as a Result of a Changing Market

BSc Thesis

Author:	A. D. van Deelen
Student number:	469933
Thesis supervisor:	Dr. J.J.G. Lemmen
Second reader:	S.R. Mayer
Finish date:	29 October 2020

Abstract

This research examines the role which corporate restructuring, through divestitures and acquisitions, will play in the automotive industry due to a changing market. The respective mean CAR of acquirements and sell-offs is 7.32% and 3.83%, both significantly positive at the 1% level. The expected CAR differs significantly between regions, similar to the results from Bühner et al. (1997). Acquirers and divesting companies experience the highest significant CAR in Asia-Pacific and Europe, respectively. Furthermore, recessions do not significantly expedite corporate restructuring, contrasting Domański et al. (2013). It was concluded that the CAR is dependent on where a company is based and that the number of acquirements decreases during recessions.

Keywords: Automotive, Innovation, Corporate Restructuring, Event Studies, Pandemics, Recessions

JEL Classification: *G01, G12, G14, G34, L62*

Table of Contents

List of Tables

I. Introduction

The automotive industry is in the middle of adapting itself to a changing market. The focus is shifting from fossil fuels based modes of transport to less polluting means of transport like EVs (Electric Vehicle), FCVs (Fuel Cell Vehicle) and FCEVs (Fuel Cell Electric Vehicles). The growth of Tesla, arguably the biggest name in the Western EV market, can be interpreted as representing the growth of the EV market. Especially the speed at which Tesla's number of vehicles delivered per quarter has grown is indicative of how the market has been changing the last couple of years (see Appendix A). It might not come as a surprise that an increasing number of car manufacturers are investing in the development of EVs. An example of this were the plans, prior to the COVID-19 pandemic induced recession, of Volkswagen to invest heavily in the EV industry (CrispIdea, 2020). The global stock of EVs is also apparent of this as it is unrealistic to assume that this growth was sustainable without the number of market participants increasing (see Appendix B).

The last couple of years have been difficult for the automotive industry as the annual number of vehicle sales has been decreasing rapidly. Before the outbreak of the COVID-19 pandemic, analysts forecasted a further decrease in the annual number of vehicle sales. The COVID-19 pandemic however has drastically worsened these expectations. These poor expectations are validated by the data collected by LMC Automotive. Their data shows that there was a 37.9% decrease in the number of vehicles sold in March 2020 compared to March 2019 (LMC Automotive, 2020). The COVID-19 pandemic might however fulfil the role of the catalyst in this scenario, similar to how the financial crisis in 2008 was the catalyst for the automotive industry to quickly focus on fuel economy.

The problem that will be addressed here is that little is known about the corporate restructuring aspect of the automotive industry. Many research papers seem to neglect the automotive industry, especially those focusing on corporate restructuring. The current economic climate only strengthens the need for information on this topic as we are on the edge of another economic crisis. This subject is of relevance because of multiple reasons. The first reason is that the automotive industry is a key sector of the economy. The second reason is that the automotive industry is in the middle of adapting itself to a changing market, this means the introduction of new opportunities in the market. The third reason is that the automotive industry has been hit hard by the COVID-19 pandemic which might result in further implications in the future.

In order for companies in the automotive industry to adapt to this changing market, this being caused by both the transition to EVs and the presence of the COVID-19 pandemic, it is likely that corporate restructuring will take place. It is, however, unknown in what ways corporate restructuring will take place and how big of a role corporate restructuring will have. The main research question will address and attempt to answer this. As a result, the main research question will be as follows:

How big of a role will corporate restructuring have in the automotive industry as a result of a changing market?

The main findings of this research suggest that the size of the role of corporate restructuring in the automotive industry, as a result of a changing market, is dependent on where a company is based and whether there is a recession. The findings show that the mean cumulative abnormal return (CAR) of corporate restructuring is significantly positive for both divesting companies and acquirers. However, it was also found that the CAR of similar deals differs significantly between some regions. The results show that acquirers in the Asia-Pacific (excluding Central Asia) region experience a far higher CAR than acquirers in Japan for similar deals. The results also show that divesting companies in Europe and Asia-Pacific (excluding Central Asia) experience a far higher CAR than divesting companies in Africa, the Middle East or Central Asia for similar deals. This means that the market reacts differently to announcements of corporate restructuring in certain regions compared to other regions. Additionally, this research suggests that the role of corporate restructuring in the automotive industry is sensitive to the presence of recessions. The findings show that there is a significant decrease of around 1.25 announcements in the monthly number of corporate restructuring announcements, where a company in the automotive industry fulfils the role of the acquirer, during recessions compared to the times when there is no recession present.

This thesis is split up into multiple chapters. Chapter 1 introduces the problem and subject that is of interest while chapter 2 addresses the existing literature that relates to the topics at hand. Chapter 2 accomplishes this by addressing the different topics and aspects separately. Chapter 3 will detail the methodology that has been used and chapter 4 will detail the data that has been used. The purpose of chapter 5 is to describe the overall results of the hypotheses. Chapter 5 accomplishes this by presenting the results for each of these hypotheses in separate subchapters. Lastly, chapter 6 concludes and summarizes the findings and limitations of this research while also leaving recommendations for future research.

II. Theoretical Framework

This chapter is split up into multiple subchapters, each of which focusing on a different aspect of the theoretical framework. The first subchapter will focus on the existing theory about corporate restructuring and other, non-automotive or non-pandemic related, findings that are of relevance. This subchapter will resemble the conventional theoretical framework the most. The second subchapter focuses on the theory relating to the economic effects of pandemics and recessions. This subchapter will prove to be vital to get a good understanding of the market's reaction to pandemics and recessions such as the COVID-19 pandemic and recession. The third subchapter looks at the economic theory that directly relates to the automotive industry. The fourth subchapter looks solely at the theory and findings on China that might be of relevance when researching the role of corporate restructuring in the automotive industry. The fifth subchapter outlines the hypotheses of this research.

2.1 Corporate Restructuring

In a way, divestitures are the opposite of investments, which most likely won't come as a surprise due to the fact that both these terms are based on the same Latin word "vestire". Instead of the company investing in an asset the company now intends to fully or partly dispose of an asset. There are a plethora of reasons why a company might want to dispose of an asset. One of such reasons might be that a company is forced to divest as a result of antitrust laws that have been put in place to prevent monopolies from forming (Chen, 2020). Another reason might be that an asset is simply not performing well enough which can hurt the company's bottom line, this could result in the disposal of a certain division or assets in a certain region (Picardo, 2020). There are multiple ways in which a company can divest an asset and, as a result, their portfolio. One of these ways is by performing a so-called carve-out; carve-outs are a type of divestiture where the parent company cuts out a division or subsidiary of the parent company and sells the shares of this new entity through an initial public offering (IPO). The shares are distributed through an IPO, this means that the shares in this new entity are not distributed between the shareholders of the parent company. It is also common for the parent company to experience an inflow of cash a result of the carve-out (Picardo, 2020). In order for the parent company to be exempt from paying taxes over this carve-out, it is important that the IPO does not contain more than 20% of the parent company's stock (AskAnyDifference, n.d.). Carve-outs are also commonly observed as taking place before a spin-off, which is another way through which a company can divest. In order for this entity to be exempt from paying taxes in a future spin-off, it is important that this entity meets the 80% control requirement. This means that the IPO of the carve-out cannot contain more than 20% of the new entity's stock (Picardo, 2020). Two other ways in which a parent company can divest are through either performing a so-called split-off or, as was mentioned earlier, a spin-off. These two options are very similar but there is also a key difference between them. When performing a spin-off the shares of the new entity are proportionately distributed between the shareholders of the parent company. In order for the parent company to be exempt from paying taxes over this, it is important that a number of conditions are met. The most prominent of these is that the parent company is not allowed to control more than 20% of the shares of this new entity (Picardo, 2020). Generally speaking, the parent company does not experience an inflow of cash as a result of the spin-off. When performing a split-off the shares of the new entity are not distributed proportionately between the shareholders of the parent company, instead the shareholders need to choose if they want to exchange their shares in the parent company for shares in the new entity. The exchange ratio between these shares is based on the market value of the new entity and the parent company. The main purpose of a split-off is to separate the transactions made by the parent company and those made by the new entity. A big disadvantage of a split-off is the fact that it is not possible for the parent company to be exempt from paying taxes as a result of performing the split-off (AskAnyDifference, n.d.). Another way in which a company can divest is through performing a sell-off. In sell-offs the parent company simply sells a subsidiary, division or product line to another company or entity for

either cash, securities or a combination of the two. Due to the properties of this sale the divesting company is not exempt from paying taxes which means the sale proceeds are taxable (Prezas & Simonyan, 2015). Sell-offs differ from carve-outs, spin-offs and split-offs in the fact that there can only be one buyer in sell-offs. The divestiture data used in this thesis consists of sell-offs.

In order to evaluate the divestitures in the automotive market, it will be necessary to analyse how the market perceives announcements of said divestitures. Montgomery, Thomas & Kamath (1984) published a paper on this general topic of divestitures and how to analyse them. In particular, they researched the relationship between the type of divestiture and the financial market valuation. Their main finding was the existence of a relationship between the two previously mentioned factors. They found that the market valued divestitures positively when those divestitures were linked to strategic goals in the company's publications. It was found that the market valued divestitures negatively when these divestitures were not linked to any of the strategic goals in the company's publications. It can be concluded that the market doesn't react kindly to divestiture announcements that, in a way, catch them off-guard. Montgomery et al. (1984) obtained these findings by calculating the CAR of multiple divestitures. The paper of Pynnönen (2005) delves deeper into the application of regression estimation of abnormal returns. His paper states that, when estimating the average cumulative abnormal returns, it is optimal to use either of two certain types of estimators. These estimators are the *maximum likelihood* (ML) and the *weighted least average* (WLS).

As can be expected from a study that has a scope greater than those that are defined by normal country borders it is important to also test on the existence of regional effects. The paper by Bühner, Rasheed & Rosenstein (1997) delves deeper into this by comparing the corporate restructuring patterns in the United States and Germany. The results of this research show that there are indeed differences in the behaviour between the two countries. The results from that paper can at most serve as an idea of what might be expected for corporate restructuring in the automotive industry. The results from that paper cannot be considered as conclusive as it did not focus specifically on the automotive industry and only focuses on the differences between Germany and the United States. The fact that they found differences in the patterns of corporate restructuring between the countries only serves as proof that there might be differences between other countries and regions as well.

2.2 Pandemics and Recessions

The paper of McKibbin & Sidorenko (2006) focuses on the macroeconomic consequences of pandemic influenza. In their paper they find, among other things, that there will be a shift in the capital distribution between countries. The capital located in the countries that are most affected will start to shift towards the countries that are least affected by the influenza pandemic. These countries are referred to as 'safe havens' as they are expected to be more robust against the market volatility. A similar, if not identical, conclusion can be found in the paper of Zeren & Hizarci (2020) which focuses on the impact of the COVID-19 pandemic on stock markets. In this paper, they state that investing in

country markets where COVID-19 cases are low is one of the few right investment options. Neither these papers explicitly mention the effects of such a pandemic on corporate restructuring however, a possible explanation for this might be that there is too much uncertainty to make claims on this with confidence.

The paper from Zeren & Hizarci (2020) does not look into the existence of a relationship between COVID-19 cases and GDP. The paper from Fernandes (2020) does show that China's GDP is estimated to stack up far better against the COVID-19 pandemic than that of other countries. In the 1.5 month scenario, China even appears to be the only country to still have a positive estimated GDP growth in 2020. The observation of China having the healthiest estimated GDP growth is not only present in the 1.5-months scenario but also in the 3-months and 4.5-months scenarios. An important assumption that will have to be made in this paper is that neither the Chinese government nor other governments are withholding any information about the number of COVID-19 cases in their country. The importance of this assumption relates back to the paper of Zeren & Hizarci (2020) where they state the few right investment options during pandemic influenza.

2.3 The Automotive Industry

The automotive industry is one that spreads the entire globe, and as such has a strong presence in almost every region. It, therefore, shouldn't come as a surprise that the automotive industry is considered as a key industry by the majority of the world. The paper from Saberi (2018) shows that the automotive industry represents around 3.65% of the world GDP in 2017. The automotive industry, however, is not flourishing as one might have hoped for. Even prior to the COVID-19 pandemic the automotive industry was facing declining sales numbers with data from LMC Automotive showing that annual vehicle sales in 2018 were down 0.8% in comparison to 2017, the annual vehicle sales in 2019 suffered an even bigger drop with a 4.4% decline in comparison to 2018 (Riley, 2020). This decline in annual sales has only gotten drastically worse as a result of the ongoing COVID-19 pandemic which has caused declines of potentially unprecedented scale. The data from LMC Automotive shows that there was a 37.9% decline in the number of vehicles sold in March 2020 compared to March 2019 (LMC Automotive, 2020) which is far greater than the decline in 2019 compared to 2018. Prior to the arrival of the COVID-19 pandemic, it could already be observed that automotive companies were starting to work together in an attempt to fight the declining sales numbers of cars. Partnerships between some of the largest entities in the industry started to emerge with the goal of developing more advanced technologies (Riley, 2020). This includes technology related to electric cars, ride-sharing and autonomous vehicles.

In the paper of Wad (2010) the author describes the automotive industry as a "brown industry" that has the potential of becoming a "green industry". The author describes the automotive industry as a brown industry as they are producing products that consume non-renewable resources while also generating pollution in the process of consuming said resources. In this context, a green industry is an

industry that produces products that do not consume non-renewable resources and do not cause pollution. In addition to classifying the automotive industry based on the characteristics of their products the author also highlights how this industry is far more sensitive to economic downturns than your average industry. The reason for this is that cars are a very expensive product in combination with the fact that people are far less willing to spend large amounts of money during economic downturns. An economic downturn will cause a strong decline in the number of vehicles sold as people will postpone big purchases such as cars.

The paper of Pavlínek (2015) mentions similar events. In this paper the findings from Dicken (2011) are brought forward, this paper describes the effect economic uncertainty has on consumer behaviour regarding the purchase of a new vehicle. Said findings state that economic uncertainty, such as recessions, are very likely to result in the postponement of new vehicle purchases. The result of this would be a strong decline in the number of vehicles sold as was mentioned earlier. The findings from the paper of Klier & Rubenstein (2010) and Stanford (2010) are also brought forward in the paper of Pavlínek (2015). This paper argues that saturated vehicle markets, such as those that can be found in North America and Western Europe, were disadvantaged more than the less saturated vehicle markets. They argue that this was worsened by a decrease of access to consumer credit, which is used in a big portion of new vehicle purchases. This means that even the consumers that are still interested in buying a new vehicle might not be able to follow through on this due to not having access to the necessary amount of consumer credit.

As was mentioned earlier in this paper, the automotive industry is going through a change where the focus is shifting towards EVs. This change can be best seen in the fast growth of Tesla's delivered vehicles per quarter (see Appendix A). Tesla can be seen as both the pioneer as the market leader of mass EV producers. EVs have been around since the 19th century but quickly fell out of favour as a result of innovations being made to the internal combustion engine (ICE). It can be argued that it was Tesla that changed the perception of EVs in the 21st century from a niche product to a mainstream product. The fact that Tesla is a market leader in the field of EVs makes its performance a good benchmark for the entire sector.

The paper by Domański, Guzik, Gwosdz & Dej (2013) looks into the effects the 2008 financial crisis had on the automotive industry in Poland. They state that, for many automotive companies, the economic crisis has been a time of major corporate restructuring. An example they give is the divestiture by Delphi in 2009, this company namely sold their entire suspension division to BeijingWest Industries, a Chinese based designer and manufacturer of brake and suspension systems, for an approximate $100 million. Conclusions regarding the effects of the financial crisis on the automotive industry are not straightforward though. This paper namely states that, as a result of the reduced vehicle sales, the amount of investment activity has been reduced in the automotive industry. Counterintuitively the opposite was observed for a number of large market participants, with a portion of the plants from these companies undergoing extensive expansion. These companies in question

include Volkswagen, Bridgestone, NGK and 3M. Surprisingly the paper by Pavlínek (2015), which focuses on central Europe compared to limiting their research to Poland like Domański et al. (2013), does not make the same claims for the Czech and Slovak automotive industries. This paper states that in most cases for the automotive industry, the economic crisis neither caused large-scale bankruptcies nor relocations of suppliers in favour of cheaper, international suppliers.

2.4 China

The presence of the automotive industry in China is talked about far less than it arguably should. China has one of the biggest automotive industries in the world with annual vehicle sales of around 25 million units in 2019 according to the Global Light Vehicle Sales Update for March by LMC Automotive (2020). This number gains even more significance when comparing it to those of the USA and Western Europe which take up the other spots in the top three. The USA boasted vehicle sales of around 17 million units in 2019 and Western Europe of around 16 million units according to this same report by LMC Automotive (2020). Based on this same report by LMC Automotive (2020) the combined sales of the top three equal around 65% of the global sales in total. The paper by Yang, Xu & Neuhäusler (2013) further analyses the EV technology in China and have found that China's EV technology is developing twice as fast as its general technology. Their results suggest that China's EV sector is far more active than China's other technology sectors. The paper from Altenburg, Schamp & Chaudhary (2016) additionally mentions why China is looked at rather favourably when it comes to its future in EV production. Not only does China have a lot of experience in the manufacturing of lithium-ion batteries but it also possesses a substantial amount of rare-earth elements including 13% of all the lithium reserves known in the world.

Furthermore the paper by Fernandes (2020) addresses the expected GDP growth in 2020 for a number of countries. The results of this paper show that the expected GDP growth for China is far better than any other country. This can potentially be explained by the fact that the COVID-19 pandemic originated in China and the Chinese government was very successful in stopping the spread of the virus after the initial outbreak. As a result, China will be a very interesting market as its GDP will suffer the least from the ongoing pandemic and recession. National Bureau of Statistics Spokesman Mao Shengyong stated that, while talking about the data regarding COVID-19, the economy would see a significant rebound in the second quarter relative to the first quarter. This rebound was predicted as being the result of the many policy measures finally becoming widely effective ("China's Economy Suffers", 2020). It might not come as a surprise to hear that, among large scale shutdowns of production in Europe, Volkswagen still intends to move forward with their initial plans of strengthening their position in the Chinese market (Taylor & Schwartz, 2020). Prior to the COVID-19 pandemic induced recession Volkswagen was rumoured to buy a 20% stake in Quoxuan High-tech, a Chinese producer of batteries for EVs. This 20% stake would have had a value of around $560 million at the time of the rumours surfacing (CrispIdea, 2020).

2.5 Hypotheses

It is important to know if the market generally responds positively to announcements of corporate restructuring. This can be done by looking into the CAR for corporate restructuring events. Based on this the first hypothesis will be:

The CAR of corporate restructuring in the automotive industry is greater than zero.

After the CAR has been calculated it will be possible to do further testing on the subject of corporate restructuring in the automotive industry. One of these tests will focus on the geographical impact of how corporate restructuring events in the automotive industry are received by the market, and how these events, in general, might differ between regions. It is possible that some regions will be far more willing to enter into corporate restructuring than other regions. Evidence for this can be found in the paper by Bühner et al. (1997), in this paper they conclude that, under the pressure to reduce agency gaps, US companies were more active in portfolio and financial restructuring than German companies. This leads to the second hypothesis:

There are no differences in the expectations of corporate restructuring for the automotive industry between regions.

Lastly, the effects of the COVID-19 pandemic induced recession on the expectations of corporate restructuring in the automotive industry will be analysed. The COVID-19 pandemic might have only just started yet it can be noted that it has already left its marks on the world's economy. The automotive industry is no exception to this as it has already taken a massive hit in its Q1 sales in comparison to last year. This hit has resulted in most automotive companies withdrawing their outlooks for 2020 as they do not expect to be able to make up for the losses in the remainder of the year. This leads to the third and final hypothesis:

The COVID-19 pandemic induced recession will not expedite corporate restructuring in the automotive industry.

III. Methodology

The methodology in this paper will mainly be based on the cumulative abnormal returns (CAR) method that was used in the paper by Montgomery et al. (1984). This type of analysis also goes by the name of residual analysis which is based on a market model that was described by Fama (1976).

The CAR of corporate restructuring in the automotive industry is greater than zero.

The CAR method has been chosen due to its useful properties when analysing the stock returns of companies. One of the useful properties of the CAR method relates to the presence of event date uncertainty. In the presence of event date uncertainty, it is preferable to use the CAR method instead of the abnormal return method (Dyckman, Philbrick & Stephan, 1984). This is because the CAR

method, unlike the abnormal returns method, doesn't require the user to choose a random day in the event window as the event date. The CAR method namely looks at how the real market reacts to any given event by analysing the stock returns of any given company over a number of consecutive trading days. These stock returns are then compared to the stock returns that would have been expected if no event had taken place. The expected stock returns are calculated by looking at the historical relationship that lies between said company's stock returns and the index returns of the index that has been perceived as being most relevant. An important assumption in this method is the assumption that there exists a stable and linear relation between the index return and the company's stock return. This assumption is of importance because the expected return to the company on any given day is calculated with a linear formula that directly relies on the index returns. This formula looks as follows:

$$ER_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

Here $ER_{i,t}$ represents the expected stock return for company *i* at point in time *t* under normal circumstances. In essence, this represents the company's stock return that can be directly attributed to the market and not to any specific events that take place at only the company level and not the market level. Here α_i is the constant term, this means this is the invariable part of company *i*'s stock return. The index return of index *m* at point in time *t* is represented by $R_{m,t}$ in the formula and β_i shows how big of a role the index return plays in the prediction of company *i*'s expected return. If β_i is equal to 1.00 it would mean that company *i*'s stock return moves in parallel with the return of the index. In essence, β_i shows how much of the expected stock return for company *i* can be attributed solely to the overall market. The error term in the prediction of company *i*'s stock return at point in time *t* is represented by $\varepsilon_{i,t}$. This means that this error term will be equal to the difference between the company's actual stock return and the expected stock return. On average it is assumed that the model perfectly predicts the real world, the error term is, therefore, assumed to be equal to zero on average. The estimating of the parameters α_i and β_i is done over a period that ends before the test period begins. This makes it possible to have parameters that are both accurate and unaffected by the events taking place in the test period. The period over which the parameters are estimated is called the estimation window. The results, however, do not seem to be sensitive to the length of the estimation window. The papers by Armitrage (1995) and Park (2004) have demonstrated that the difference between estimation windows is negligible when these estimation windows are at least a 100 days long (Schimmer, Levchenko, & Müller, n.d.). Based on these findings an estimation window with a length of 101 days, from t = -120 to t = -20, is used.

Traditionally the CAR method uses short event windows of around 3 days (-1, +1), however, Meznar, Nigh & Kwok (1994, 1998) report no significant price reactions when analysing the stock returns on short event windows. Instead, they only start to find significant results when they increase the event window and decrease the sample size. The work of Brown & Warner (1985) only aligns with the claims by Meznar et al. (1994, 1998) surrounding the event window. Brown & Warner (1985)

namely claim that longer event windows are only suitable when the sample size is quite large. Brown & Warner (1985) justify this by showing that longer event windows are only appropriate when the confounding events are truly random, which is only plausible if and only if the sample size is quite large (McWilliams, Siegel & Teoh, 1999). Brown & Warner (1985) use a sample size of 50 in their study, this means that, as long as the sample size is at least equal to 50, it is appropriate to use a longer event window. Brown & Warner (1985) use an event window with a length of 11 days, from t = -5 to t = 5. This means that event windows of similar length are justified as long as the sample size is large enough. These findings justify an event window with a length of 9 days, from t = -4 to t = 4.

The next step is to calculate the abnormal return for the company on a specific day. The calculation method of the abnormal returns is relatively straightforward. The abnormal return method looks at the difference between the actual stock return and the expected stock return of a company on a specific day, traditionally to analyse the effects of a certain event. The abnormal return method, therefore, isolates the company's return that can be directly attributed to one, or a number of, event(s) from the 'normal' return. This 'normal' return is the expected stock return that was touched upon in the previous paragraph. The calculation for the abnormal return follows the following formula:

$$AR_{i,t} = R_{i,t} - ER_{i,t}$$

which looks as follows when written out further:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t})$$

Here $AR_{i,t}$ represents the abnormal return for company *i* at point in time *t*. As was mentioned earlier, $ER_{i,t}$ represents the expected return of company *i* at point in time *t*. Lastly, $R_{i,t}$ simply represents the actual return for company *i* at point in time *t*.

The remaining step to calculate the CAR is to simply cumulate the abnormal returns in the chosen event window. This is where the chosen event window actually starts to influence the results as this window decides which abnormal returns are accumulated. The calculation of the CAR follows the same method as the one that was used in the paper by Montgomery et al. (1984):

$$CAR_{K,L} = \sum_{t=k}^{L} AR_{i,t}$$

where $K = t - 4$

$K < L \leq t + 4$

Lastly, the reasoning behind choosing a one-way factor model relates back to the stock index that has been used. The used stock index namely consists solely of companies active in the automotive industry. This means that, by using the chosen index, all industry effects are already filtered out of the CAR. As a result, the chosen one-way factor model can be used without any problems.

The first step that has to be taken to answer the main research question is to take a deeper look into the CAR of corporate restructuring in the automotive industry. This will be done by first answering the hypothesis that is the least specific of the chosen three hypotheses, namely the first hypothesis. The aim of the first hypothesis is to answer the question of whether corporate restructuring in the automotive industry has a significantly positive CAR. The answer to this question will be obtained by performing a significance test, namely the one-sample t-test. The one-sample t-test will test the significance of the CAR surrounding the announcement of corporate restructuring. There is a big advantage in using the one-sample t-test compared to a linear regression model, the one-sample t-test namely does not look into potential explanatory relationships between the dependent variable and the independent variables. This is an advantage because these relations are not of importance for the first hypothesis, only the overall result is of interest here. The null hypothesis and the alternative hypothesis for the one-sample t-test are as follows:

> H_0: *mean CAR = 0,* the CAR for corporate restructuring in the automotive industry is equal to zero.
>
> H_1: *mean CAR > 0,* the CAR for corporate restructuring in the automotive industry is significantly larger than zero.

While the first hypothesis will be mainly answered with the use of the one-sample t-test it is still important to at least test for explanatory relationships. If any are found, it is important that these relationships are acknowledged as they hold valuable information. A linear regression analysis will be set up to test for the existence of these relationships.

There are no differences in the expectations of corporate restructuring for the automotive industry between regions.

This same linear regression analysis will also be used to answer the second hypothesis, whether the expectations of corporate restructuring in the automotive industry differs between regions. The paper by Pynnönen (2005) will be used for further guidance regarding the building of the linear regression models used. This linear regression model will not only include the regional dummy variables but also additional control variables to achieve a higher degree of explanatory power. The control variables in question are the domestic, horizontal and high-value transaction dummy variables. Additionally, this linear regression model and all other linear regression models in this research, use robust standard errors. The use of robust standard errors addresses the issue of heteroskedasticity. The resulting linear regression model that has been created to answer the second hypothesis, and give more depth to the results of the first hypothesis, looks as follows:

$$CAR = A + B\ domestic\ dummy + C\ horizontal\ dummy + D\ high\text{-}value\ transaction\ dummy + E\ region\ dummies + error\ term$$

The corresponding null and alternative hypotheses for this linear regression model are as follows:

H_0: *region dummy variables = 0,* the coefficient estimates for the region dummy variables are equal to zero.

H_1*: region dummy variables ≠ 0,* the coefficient estimates for the region dummy variables are not equal to zero.

Hypothesis three will put an emphasis on data during the 2008 financial crisis and on data during the COVID-19 pandemic induced recession.

The COVID-19 pandemic induced recession will not expedite corporate restructuring in the automotive industry.

The data from the 2008 financial crisis has been chosen for a number of reasons. One of these reasons is that the decrease in vehicle sales as a result of the COVID-19 pandemic induced recession is most similar to the decrease in vehicle sales that was observed during the 2008 financial crisis, this is derived from the global light vehicle sale data (LMC Automotive, 2020). Another reason is that, at the time of data collection, there was insufficient data available to solely test the third hypothesis with data from the COVID-19 recession. Data regarding the spread of the COVID-19 virus will also be used to increase the depth of the research. A linear regression model on the effects of a recession on the amount of corporate restructuring will also be carried out. Here the *activity* variable represents the average amount of corporate restructuring that can be expected on a monthly basis. This, like all other analysis, has been separated for divesting companies and acquirers. Additionally, this linear regression model uses robust standard errors like all other linear regression models in this research. The use of robust standard errors addresses the issue of heteroskedasticity. The linear regression model that analyses the activity of the industry will look as follows:

$$Activity = A + B\ recession\ dummy + error\ term$$

The corresponding null and alternative hypotheses for this linear regression model are as follows:

H_0: *recession dummy variable = 0,* the coefficient estimate for the recession dummy variable is equal to zero.

H_1*: recession dummy variables > 0,* the coefficient estimate for the recession dummy variable is greater than zero.

The second regression that will be used is a modified version of the linear regression analysis used for the first and second hypotheses, this regression will show the market reaction to corporate restructuring during recessions. This linear regression model uses robust standard errors like all other linear regression models in this research. This linear regression model introduces the recession dummy variable and changes the region dummy variables into control variables, in addition to the existing control variables. As a result, this modified linear regression model will look as follows:

$$CAR = A + B\ recession\ dummy + C\ domestic\ dummy + D\ horizontal\ dummy + E\ high\text{-}value\ transaction\ dummy + F\ region\ dummies + error\ term$$

IV. Data

The data that will be used in this paper will mainly consist of stock returns data from companies active in the automotive industry that have recently undergone corporate restructuring. The effects for divesting companies and acquirers are analysed separately, this means two different datasets will be used side by side at all times. The stock returns will be collected from the market on which the relevant company's stock is traded, an example of this would be the Nasdaq. The relevant companies will be collected on ThomsonOne by looking through the M&A data. This data can be accessed in the advanced search tool for M&A under the "Deals & League Tables" tab which can be found in the "Screening & Analysis" tab. In this search tool the data is filtered on a number of characteristics (see Appendix C). These filters result in the divestiture data consisting fully of sell-off divestitures as was mentioned in the theoretical framework regarding corporate restructuring. All announcements that suffered from insufficient stock return data were dropped to prevent the datasets from being compromised. After the filters have been applied there remains a total of 282 announcements for divesting companies and 651 announcements for acquirers.

In order to analyse and predict the role corporate restructuring will have on the automotive industry as a result of a changing market, the data of automotive companies, collected over the period starting on the 1st of January 2002 and lasting up and to the 2nd of June 2020, will be used. Additionally, the data from the MSCI ACWI Automobiles and Components Index (USD) will be used. This index has been chosen because it perfectly fits the industry that is being investigated. The MSCI ACWI Automobiles and Components Index (USD) consists solely of companies that are active in the automotive industry. As a result, this index will encompass all industry-specific effects that would otherwise be overlooked if a more general index were to be chosen. The returns for both the companies and the index are provided by DataStream and collected on a daily basis.

Subsequently, the abnormal returns for the companies, which uses the index returns and historic company returns in its calculation, are retrieved from the Event Study Tool provided by Eikon. These values will show the difference between the expected market reaction of a company on any given day and how the market reacted in reality. Combining the abnormal returns around an event,

such as the announcement of corporate restructuring, will result in the CAR for any given event. This CAR is represented by the 'CAR44' variable.

Dummy variables for the different regions have also been added to compare how the market reacts to announcements in different regions. There are a total of five unique regions in the datasets (see Appendix D). For the divesting companies, this region dependent variable looks at the region in which the parent company is based. For the acquirers, this region dependent variable looks at the region in which the acquiring company is based.

To investigate the role recessions might play in corporate restructuring a dummy variable named 'Recession' has been introduced. This dummy variable will have a value of one for all announcements that take place during a recession and a value of zero for all remaining announcements.

Control variables have also been created in addition to the previously mentioned variables. These control variables have been created to reduce the problem of certain effects being illegitimately attributed to the main variables of interest. The first of these control variables is the 'HighValueTransaction' dummy variable. This variable makes it possible to split the announcements into two groups. Only the announcements that have a deal value that is greater than 2/3 of the other announcements are allowed into this group. This dummy variable makes it possible to see if the deal value plays a role in the CAR of announcements. The second control variable is the 'Domestic' dummy variable. This variable will show which announcements are between parties from the same nation. This means that this dummy variable will show for which announcements the targeted/divested company and the acquiring/buying company are from the same nation. The third control variable is the 'Horizontal' dummy variable. The idea behind this variable is that horizontal corporate restructuring may have an effect on how the market responds to corporate restructuring in the automotive industry. This variable will show for which announcements the targeted/divested company operates in the same mid industry as the buying/acquiring company.

The variable 'Activity' has also been created, this variable displays the monthly amount of corporate restructuring for any month in a dataset. This variable makes it possible to investigate if the presence of certain factors has any effect on the monthly amount of corporate restructuring. The recession dummy variable that was described earlier also appears here. Due to the fact that the activity variable only looks at the data on a monthly basis, it is no longer possible to display a value for each unique announcement. As a result, each month in which a recession was present will have a value of one. This means that, even if a recession started in the last week of a specific month, this month will still have a value of one for this dummy variable. Subsequently, all other months that lacked the presence of a recession, will have a value of zero.

Data relating to the vehicle sales has been obtained from LMC Automotive. LMC Automotive presents themselves as "The leading independent and exclusively automotive focused global forecasting and market intelligence service provider of automotive sales, production, powertrain and

electrification." (https://www.lmc-auto.com). The fact that LMC Automotive is an independent company means that their reports can be taken at face value. This is because they have no incentive to mislead their users. Especially their data regarding the yearly number of vehicle sales will be of interest.

The number of active cases and other details regarding the COVID-19 pandemic are derived from Worldometer, this is a highly regarded website that keeps track of all reported COVID-19 cases. The COVID-19 data from Worldometer is trusted and used by multiple governments such as the UK Government. This same data is also trusted and used by highly respected news outlets such as the Financial Times and the BBC. Lastly, Worldometer has been cited as a source in over 6,000 professional journal articles and in over 10,000 published books. This reinforces the claim that the data by Worldometer is highly trustworthy. Due to the nature of how cases are reported it is vital to assume that all cases are accounted for and government branches don't withhold any information regarding the spread of the virus. The importance of this assumption is becoming increasingly more important as tensions and distrust between countries is growing regarding the reporting of COVID-19 cases.

Tables 1 & 2 show the descriptive statistics of the data regarding the activity of corporate restructuring. Here the mean activity is the mean monthly activity of corporate restructuring. Meanwhile, the standard deviation of the activity represents the standard deviation of the monthly activity of corporate restructuring. The sum of the activity represents the total amount of corporate restructuring that took place in the year in question. The count value represents the number of months for which there was data in a given year at the time of data collection. This is why the count value is equal to twelve for every year except for the year 2020 where it is equal to five. The value of transactions represents the total value of all transactions that took place in a given year. In Table 1 this value consists solely of transactions where the companies in question were divesting companies. Meanwhile, the value of transactions in Table 2 only counts the transactions where the companies in question were acquirers.

Table 1. Descriptive statistics by year for divesting companies

Year	Mean Activity	Standard Deviation Activity	Sum Activity	Month Count	Value of Transactions ($mil)
2002	.917	1.084	11	12	10.624,94
2003	.917	1.084	11	12	1.854,38
2004	.833	.835	10	12	2.655,99
2005	1.083	.996	13	12	2.627,02
2006	1.083	.669	13	12	3.433,09
2007	1.583	1.311	19	12	5.760,23
2008	1.167	1.467	14	12	4.654,33
2009	1.5	1.087	18	12	1.407,24
2010	1.5	1.243	18	12	9.043,10
2011	1.417	1.379	17	12	1.442,85
2012	1.417	1.311	17	12	15.715,89
2013	1.333	1.155	16	12	2.636,05
2014	1.583	1.379	19	12	13.971,50
2015	2	1.279	24	12	5.994,65
2016	1.083	1.881	13	12	5.380,33
2017	1.667	1.303	20	12	6.695,46
2018	1.083	1.24	13	12	20.141,47
2019	1.083	.996	13	12	3.925,42
2020	.6	.894	3	5	212,75

Table 2. Descriptive statistics by year for acquirers

Year	Mean Activity	Standard Deviation Activity	Sum Activity	Month Count	Value of Transactions ($mil)
2002	2.417	1.379	29	12	1.331,01
2003	2.833	2.167	34	12	3.786,14
2004	2.583	1.832	31	12	3.689,52
2005	3.333	1.826	40	12	4.437,75
2006	3.5	1.679	42	12	6.832,24
2007	4.417	1.832	53	12	20.120,61
2008	2.333	1.875	28	12	5.820,06
2009	1.833	1.586	22	12	8.748,59
2010	2.167	1.528	26	12	6.633,52
2011	2.5	1.446	30	12	8.877,77
2012	2.667	1.923	32	12	13.468,10
2013	2.833	1.899	34	12	5.333,74
2014	3.75	1.357	45	12	9.608,82
2015	3.417	1.929	41	12	17.120,57
2016	3.25	1.658	39	12	13.749,21
2017	4.083	2.021	49	12	12.015,13
2018	3.25	2.094	39	12	18.389,35
2019	2.75	1.288	33	12	10.922,16
2020	.8	.447	4	5	419,56

Tables 3 & 4 show additional descriptive statistics of the data regarding the activity of corporate restructuring. Here the mean activity is the mean monthly activity of corporate restructuring

for a given month of the year. Meanwhile, the standard deviation of the activity represents the standard deviation of the monthly activity of corporate restructuring for a given month. The min and max activity values represent the minimum and maximum amount of activity that has been observed in a given month. The count value represents the number of times a month has been observed in the dataset. Due to the data being collected during the year 2020 the count value is not equal for all months.

Table 3. Descriptive statistics of activity by month for divesting companies

Month	Mean Activity	Standard Deviation Activity	Min Activity	Max Activity	Month Count
1	.895	.937	0	3	19
2	1.368	1.606	0	5	19
3	1.474	1.349	0	4	19
4	.947	1.433	0	4	19
5	1.105	1.049	0	3	19
6	.944	1.11	0	4	18
7	1.556	.984	0	3	18
8	1.167	1.15	0	4	18
9	1.5	1.043	0	4	18
10	1.389	1.092	0	3	18
11	1.333	1.188	0	4	18
12	1.667	1.495	0	6	18

Table 4. Descriptive statistics of activity by month for acquirers

Month	Mean Activity	Standard Deviation Activity	Min Activity	Max Activity	Month Count
1	2.368	1.342	0	5	19
2	2.684	1.857	0	7	19
3	3.526	2.065	1	7	19
4	2.474	1.744	0	6	19
5	2.789	1.813	1	6	19
6	2.667	1.645	0	6	18
7	3.444	2.093	0	7	18
8	3.167	2.229	0	8	18
9	2.944	1.955	0	7	18
10	3.278	1.809	0	8	18
11	3.222	1.768	1	8	18
12	2.833	1.505	1	6	18

Tables 5 & 6 show the descriptive statistics regarding the most active companies in the dataset. Here the rank represents where these companies rank in the top 10. The combined value of transactions represents the combined value of all transactions where the company in question was either the divesting company or the acquirer, dependent on the dataset. This means that the combined value of transactions in Table 5 only counts the transactions where the company in question was the

divesting company. Meanwhile, the combined value of transactions in Table 6 only counts the transactions where the company in question was the acquirer.

Table 5. Top 10 divesting companies based on number of unique transactions

Rank	Name of Divesting Company	Number of Divestitures	Combined Value of Transaction ($mil)
1	DPH Holdings Corp	7	558,3
2	Visteon Corp	6	1758,213
3	China Jialing Industrial Co	5	325,519
3	Goodyear Tire & Rubber Co	5	1757,059
3	Meritor Inc	5	623,27
6	Volvo AB	4	1939,085
6	Accuride Corp	4	200,525
6	TRW Automotive Holdings Corp	4	13300,831
6	Valeo SA	4	805,903
6	Fleetwood Enterprises Inc	4	61,3

Table 6. Top 10 acquirers based on number of unique transactions

Rank	Name of Acquiring Company	Number of Acquirements	Combined Value of Transactions ($mil)
1	GKN PLC	14	3054,074
2	CIE Automotive SA	13	1391,058
3	Thor Industries Inc	11	3468,246
4	Commercial Vehicle Group Inc	10	276,85
4	Federal Signal Corp	10	766,054
4	LKQ Corp	10	4589,348
7	Standard Motor Products Inc	9	367,9
7	Magna International Inc	9	4833,724
9	AMA Group Ltd	8	46,148
9	The Bidvest Group Ltd	8	1045,775
9	Monro Muffler Brake Inc	8	116,65

Tables 7 & 8 show the descriptive statistics regarding the companies in the dataset with the highest combined value of transactions. Here the rank represents where these companies rank in the top 10. The combined value of transactions represents the combined value of all transactions where the company in question was either the divesting company or the acquirer, dependent on the dataset. This means that the combined value of transactions in Table 7 only counts the transactions where the company in question was the divesting company. Meanwhile, the combined value of transactions in Table 8 only counts the transactions where the company in question was the acquirer. In addition to

these descriptive statistics, there are also descriptive statistics available regarding the used variables (see Appendix E).

Table 7. Top 10 divesting companies based on the combined value of transactions

Rank	Name of Divesting Company	Number of Divestitures	Combined Value of Transaction ($mil)
1	TRW Automotive Holdings Corp	4	13300,831
2	GKN PLC	2	11232,598
3	Porsche Automobil Holding SE	2	9054,361
4	TRW Inc	1	6677,805
5	Fiat Chrysler Automobiles NV	1	6492,52
6	Hankook Tire Co Ltd	1	5309,93
7	Denway Motors Ltd	1	4110,087
8	CLARCOR Inc	1	4094,324
9	Autoliv Inc	1	3710,553
10	Ford Motor Co	3	3151,41

Table 8. Top 10 acquirers based on the combined value of transactions

Rank	Name of Acquiring Company	Number of Acquirements	Combined Value of Transactions ($mil)
1	Continental AG	7	19785,755
2	Volkswagen AG	3	13443,683
3	Tenneco Inc	4	5450,001
4	Magna International Inc	9	4833,724
5	Faw Car Co Ltd	1	4788,139
6	LKQ Corp	10	4589,348
7	SAIC Motor Corp Ltd	1	4507,395
8	Michelin	5	3733,449
9	Oshkosh Truck Corp	4	3603,403
10	Thor Industries Inc	11	3468,246

V. Results

The purpose of this section is to answer the main research question by answering the hypotheses that have been lined out earlier. Firstly, the results regarding the reception of corporate restructuring will be described. Secondly, the role of regions on this reception will be addressed. Lastly, the results of the hypothesis regarding the COVID-19 pandemic induced recession will be described.

5.1 Overall CAR

In principle the first hypothesis can be answered solely by a one-sample t-test. This would, however, leave a lot of relevant questions regarding the ‘why’ and ‘how’ unanswered. As a result, a one-sample

t-test and a linear regression model, that identifies the effects of dummy variables on the CAR, will be used to answer the first hypothesis:

The CAR of corporate restructuring in the automotive industry is greater than zero.

For starters, the results from the one-sample t-test will be covered for both divesting companies and acquirers. The results from the one-sample t-test strongly support the notion that the CAR of corporate restructuring in the automotive industry is greater than zero (see Appendix F). The one-sample t-test reports a mean CAR for divesting companies of around 7.32% with a standard error of around 2.11%. Subsequently, the alternative hypothesis, which states that the mean CAR is greater than zero, has a p-value of 0.0003. This means that there is statistically significant evidence that the mean CAR for divesting companies is greater than zero. The results for the acquirers tell a similar story, for starters, the one-sample t-test reports a mean CAR for acquirers of around 3.83% with a standard error of around 0.97%. Subsequently, the alternative hypothesis, which states that the mean CAR is greater than zero, has a p-value of less than 0.0001. This means that there is statistically significant evidence that the mean CAR for acquirers is greater than zero.

Even though the question, which was asked by the first hypothesis, has technically already been answered there are still a lot of unknowns surrounding the answer. As was stated before, a linear regression model will be used in an attempt to give more context and explanatory power to the results. Unlike the results from the one-sample t-test, the results from the linear regression analysis differ between divesting companies and acquirers (see Appendix G). For starters, the coefficient estimate of the constant term for the divesting companies is equal to around -10.48%. This coefficient estimate has a p-value of around 0.042 and is, therefore, significant at the 5% level. As a result, it can be observed that divesting companies in automotive corporate restructuring experience a CAR equal to around -10.48% when all dummy variables in the model are equal to zero. This means that companies in the automotive industry, that are divesting through international corporate restructuring, that are based in either Africa, the Middle East or Central Asia, whose deal value is not relatively high and whose divestiture is not a part of horizontal corporate restructuring, have an expected CAR of around -10.48%. As mentioned earlier, the experiences for acquirers differ from those of divesting companies. The coefficient estimate of the constant term for acquirers is equal to around 3.47%. This coefficient estimate has a p-value of around 0.025 and is, therefore, also significant at the 5% level. The CAR that acquirers in automotive corporate restructuring experience is equal to around 3.47% when all dummy variables in the model are equal to zero. This means that acquirers in the automotive industry, that are participating in international corporate restructuring, that are located in the Asia-Pacific (excluding Central Asia) region, whose deal value is not relatively high and whose acquiring plans are not a part of horizontal corporate restructuring, have an expected CAR of around 3.47%.

The linear regression analyses show that the coefficient estimates of the dummy variables are not all significant at the 5% level or the 10% level. The dummy variable that represents domestic

corporate restructuring is significant at the 5% level for both divesting companies and acquirers. However, this coefficient estimate does differ between divesting companies and acquirers. The coefficient estimate for this dummy variable is equal to around 7.77% for divesting companies and 3.42% for acquirers. The p-values associated with these coefficient estimates are equal to around 0.032 and 0.027 for divesting companies and acquirers, respectively. This difference in the coefficient estimates demonstrates that the domestic factor plays a larger role for divesting companies than for acquirers. The dummy variable that represents horizontal corporate restructuring does not meet the significance requirements at the 5% or the 10% level. The lack of significance at the 10% level is present for both divesting companies and acquirers. The face value of the insignificant at the 10% level coefficient estimate is very similar for both divesting companies and acquirers at roughly -3%. However, the p-value for these coefficient estimates differ strongly. The p-value of this coefficient estimate is equal to around 0.490 for divesting companies and to around 0.167 for acquirers. This means that there is not enough statistically significant evidence to conclude that this coefficient estimate is significantly different from zero. The dummy variable that represents announcements with a relatively high transaction value is only significant at the 10% level for acquirers and not for divesting companies. The coefficient estimate for this dummy variable is equal to around 4.91% for divesting companies and to around 2.94% for acquirers. Meanwhile, the p-value of the coefficient estimate is equal to around 0.189 for divesting companies and to around 0.084 for acquirers, this means only the coefficient estimate for acquirers is significant at the 10% level, as alluded to earlier. This means that there is not enough statistically significant evidence to conclude that this coefficient estimate is significantly different from zero.

The remaining dummy variables relate to the region where the company, whose stock returns are being investigated, is based. The results differ strongly between divesting companies and acquirers, for this reason, they will be described on a group basis instead of on a variable basis. Firstly, the regional results for divesting companies will be presented, for which the coefficient estimates of all included region dummy variables appear to be strongly positive. The dummy variable representing the Americas has the largest coefficient estimate with a value of around 15.40%. The three remaining region dummy variables that were used have similar coefficient estimates, the coefficient estimates for Europe, Japan and Asia-Pacific (excluding Central Asia) being equal to around 11.40%, 9.28% and 9.12%, respectively. Sadly these strongly positive coefficient estimates are not all strongly significant. Technically only the coefficient estimate for Europe is significant at the 5% as the corresponding p-value is equal to 0.044, however, the coefficient estimate for Asia-Pacific (excluding Central Asia) has a p-value that is equal to 0.051, this leads to the conclusion that the coefficient estimate for Asia-Pacific (excluding Central Asia) is marginally significant at the 5% level. Out of the two remaining coefficient estimates, only the one that relates to the Americas is significant at the 10% level, with a p-value of 0.064. Meanwhile, the p-value the coefficient estimate that relates to Japan is not even significant at the 10% level as it has a p-value of 0.121. This means there is not enough statistically

significant evidence to conclude that the coefficient estimate relating to Japan is significantly different from zero. In summary, it seems that, with varying degrees of certainty, divesting companies in Europe, Asia-Pacific (excluding Central Asia) and the Americas experience far higher CARs than divesting companies in the remaining regions.

Secondly, the regional results for acquirers will be presented, for which the coefficient estimates of all used region dummy variables appear to be negative, contrasting the strongly positive coefficient estimates that were observed for divesting companies. The dummy variable representing Japan has the largest, absolute, coefficient estimate at a value of around -4.34%. The three remaining region dummy variables have smaller, absolute, coefficient estimates, the coefficient estimates for Europe, the Americas, and Africa, the Middle East and Central Asia being equal to around -2.80%, -0.78% and -3.17%, respectively. While the coefficient estimates are somewhat similar for these dummy variables, the same can't be said about their p-values and significance. The coefficient estimate relating to Japan has the highest significance with a p-value of around 0.002, meaning it is significant at the 5% level. The coefficient estimate relating to Europe has a p-value of around 0.070 meaning it is less significant than the one relating to Japan, nonetheless, the coefficient estimate relating to Europe is still significant at the 10% level. The coefficient estimate relating to Africa, the Middle East and Central Asia has a p-value of around 0.088 meaning it is less significant than the one relating to Europe, nonetheless, the coefficient estimate relating to Africa, the Middle East and Central Asia is, just like that of Europe, still significant at the 10% level. The same cannot be said about the coefficient estimate relating to the Americas, this coefficient estimate has a p-value of around 0.786 meaning it has to be interpreted as being insignificantly different from zero. In summary, it seems that, with varying degrees of certainty, acquirers in Europe, Japan, Africa, the Middle East and Central Asia experience lower CARs than acquirers in the Asia-Pacific (excluding Central Asia) region. Due to the earlier emphasis, it is important to mention that China is located in the Asia-Pacific (excluding Central Asia) region.

It appears that the different dummy variables contribute strongly to the CAR, this can clearly be seen for divesting companies when the mean CAR value from the one-sample t-test is compared with the constant term of the linear regression model. The mean value of the CAR is equal to around 7.32% while the significant at the 5% level constant term in the regression model has a value of around -10.48%. The results from the linear regression model show that the CAR is strongly dependent on the presence of certain factors. Nonetheless, this does not change the answer to the first hypothesis as the first hypothesis is interested in the mean CAR. It does, however, introduce an asterisk to the answer as there is significant evidence that certain factors have an influence on the CAR of corporate restructuring in the automotive industry. As was mentioned earlier, a one-sample t-test was run for divesting companies and for acquirers to determine whether the mean CAR of corporate restructuring in the automotive industry is larger than zero. The probability of observing a sample mean of 0.073 or more for divesting companies, when both the number of observations and the

standard deviation are taken into account, is equal to 0.0003 under the assumption that the population mean is equal to zero. The probability of observing a sample mean of 0.038 or more for the acquirers, when both the number of observations and the standard deviation are taken into account, is equal to less than 0.0001 under the assumption that the population mean is equal to zero. Due to the fact that this probability is smaller than 5% for both divesting companies and acquirers, the null hypothesis, which states that the mean CAR of corporate restructuring in the automotive industry is equal to zero, is rejected in favour of the alternative hypothesis, which states that the mean CAR of corporate restructuring in the automotive industry is greater than zero.

5.2 Regional Effects

The same regression model that was used in the first hypothesis will be used to answer the second hypothesis:

There are no differences in the expectations of corporate restructuring for the automotive industry between regions.

The dummy variables relating to the different regions will be of interest when trying to answer this hypothesis (see Appendix G). The effects and significance levels of the dummy variables were discussed earlier for the first hypothesis, these same results also hold true for the second hypothesis. As was mentioned earlier, the results were not the same for divesting companies and acquirers.

The estimated CAR per region for divesting companies, when all other dummy variables are equal to zero, differs between the different regions (see Appendix H). The effect of the dummy variables for Europe and Asia-Pacific (excluding Central Asia) on divesting companies are both (marginally) significant at the 5% level and equal to around 11.40% and 9.12%, respectively. The effect of the dummy variable for the Americas on divesting companies is significant at the 10% level and equal to around 15.40%. The effect of the dummy variable for Japan on divesting companies is not significant at the 5% or 10% level and, as a result, does not differ on a statistically significant level from the region that represents the constant term. This proves that the expectations of corporate restructuring for divesting companies in the automotive industry significantly differs between regions. To be more precise it appears that especially divesting companies in Europe and Asia-Pacific (excluding Central Asia) experience CARs significantly higher than those experienced by divesting companies in the other regions.

The estimated CAR per region for acquirers, when all other dummy variables are equal to zero, differs between the different regions (see Appendix I). The effect of the dummy variable for Japan on the acquirers is significant at the 5% level and equal to around -4.34%. The effect of the dummy variable for Europe on the acquirers is significant at the 10% level and equal to around -2.80%. The effect of the dummy variable for Africa, the Middle East and Central Asia on the acquirers is equal to around -3.17% and also significant at the 10% level. The effect of the dummy variable for

the Americas on the acquirers is equal to -0.78%, however, this dummy variable is not significant at the 10% level and is therefore insignificantly different from zero. These results prove that the expectations of corporate restructuring for acquirers in the automotive industry significantly differs between regions. To be more precise it appears that especially acquirers in Japan experience a CAR which is significantly lower than those experienced by acquirers in the other regions. It also suggests that acquirers in the Asia-Pacific region (excluding Central Asia) experience the highest average CAR.

It has become apparent that the effects of the dummy variables differ between divesting companies and acquirers, however, a more important takeaway from this is that there is statistically significant evidence that proves the existence of regional effects. For both divesting companies and acquirers, there is statistically significant evidence that supports the claim that the expected CAR of similar announcements of corporate restructuring in the automotive industry is not the same for each region. This means that the expected CAR of corporate restructuring in the automotive industry differs significantly between some regions. Due to the fact that, for both divesting companies and acquirers, there is at least one region dummy variable that has a coefficient estimate with a p-value smaller than 5%, the null hypothesis is rejected in favour of the alternative hypothesis. Here the null hypothesis states that none of the region dummy variables included in the regression model have a coefficient estimate that is significantly different from zero. Meanwhile, the alternative hypothesis states that at least one of the region dummy variables included in the regression model has a coefficient estimate that is significantly different from zero.

5.3 Effects of Recessions

A combination of different regression models will be used to answer the third hypothesis:

The COVID-19 pandemic induced recession will not expedite corporate restructuring in the automotive industry.

The first regression models that will be used are similar to those found in the first hypothesis, the main difference being the inclusion of a dummy variable that identifies the presence of a recession. This recession dummy variable will be used to analyse and predict the effect the COVID-19 induced recession will have on corporate restructuring in the automotive industry. Firstly, it is necessary to test for the existence of a relationship between the CAR and the presence of a recession. This can be done by looking at the coefficient and p-value of the recession dummy variable, analysing the regression results reveals that the presence of a recession has no significant effect on the CAR for neither divesting companies nor acquirers (see Appendix J). The coefficient estimates are equal to around 10.64% and -0.49% for divesting companies and acquirers, respectively. The p-value for these coefficients is equal to around 0.540 for divesting companies and 0.791 for acquirers, this makes them insignificantly different from zero as was mentioned earlier. It can be concluded that the presence of recessions, such as the recession that was induced by the COVID-19 pandemic, will not have any

significant effects on the CAR of corporate restructuring in the automotive industry. Additionally, the inclusion of the recession dummy variable has no added benefit to the significance of the model for neither divesting companies nor acquirers. It in fact only worsens the quality of the model, as a result, the other dummy variables in this model will not be analysed further as the previous findings are expected to be more accurate.

Secondly, it is necessary to test for the existence of a relationship between the frequency of corporate restructuring and the presence of a recession. This can be done with the other regression model that looks at the frequency of corporate restructuring on a per month basis, which has been defined as 'activity' (see Appendix K). This variable will be used to test for the existence of a relationship between the activity and the presence of a recession. Further analysis of the regression results shows that the coefficient estimate for the presence of a recession is equal to around -0.05 for divesting companies, however, this coefficient has a p-value of 0.850 which means it is not significant at even the 10% level and therefore insignificantly different from zero. More importantly however is that the regression model for divesting companies has a very low F-Value, the probability that the intercept-only model fits the data as well as this regression model is equal to 0.8504. It can be concluded that this model holds no significant additional explanatory value over the intercept-only model and that recessions have no significant effect on the activity of corporate restructuring for divesting companies in the automotive industry. The results for acquirers differ strongly from those that can be seen for divesting companies, the coefficient estimate for the presence of a recession being equal to around -1.25 for acquirers. This coefficient estimate has a p-value of 0.001 making it significant at even the 0.1% level. In order to fully comprehend the importance of these results for acquirers, it is necessary to put them into perspective. The expected activity for acquirers in the automotive industry without the presence of a recession is equal to around 3.07, however, the activity decreases to around 1.82 during recessions which is equal to a decrease of around 41%. This means that acquirers in the automotive industry are far less willing to participate in corporate restructuring during recessions.

In summary, it can be seen that recessions have no significant effect on the CAR of corporate restructuring. The market does not respond significantly different to the announcement of corporate restructuring in the automotive industry in the presence of recessions compared to when recessions are not present, this applies to both divesting companies and acquirers in the automotive industry. While this proves that recessions have no effect on the market reception of corporate restructuring in the automotive industry it does not say anything about the attractiveness of corporate restructuring from the company's point of view. The results that look at the activity of companies have shown that the presence of recessions makes corporate restructuring a far less attractive activity for potential acquirers in the automotive industry. Recessions do not seem to significantly influence the attractiveness of corporate restructuring for potential divesting companies in the automotive industry.

China, as was mentioned in the theoretical framework, is a nation of interest when looking into corporate restructuring in the automotive industry. The spread of the COVID-19 virus in China seems to have been mainly contained according to the data from Worldometer (n.d. a) which describes the number of active COVID-19 cases in China. While, based on the data from Worldometer (n.d. a), China has been able to almost completely stop the spread of the virus within its own borders, the rest of the world is having more issues. The data from Worldometer (n.d. b), which describes the worldwide number of active COVID-19 cases, shows how, unlike China, the number of active COVID-19 cases has been steadily rising ever since the initial spread. The distribution of the total number of COVID-19 cases indicates that, up and till the 28th of September 2020, only around 0.26% of all reported cases were observed in mainland China (Worldometer, n.d. c). Based on the COVID-19 data by Worldometer (n.d. a, n.d. b, n.d. c) and the main findings from the paper of McKibbin & Sidorenko (2006), China is expected to see a large influx of capital as a result of having a proportionately low number of COVID-19 cases.

The presence of recessions does not seem to have an effect, that is significantly different from zero, on the expected CAR of corporate restructuring for neither divesting companies nor acquirers. Recessions neither seem to increase the amount of corporate restructuring that takes place, it in fact seems to decrease the amount of corporate restructuring where companies active in the automotive industry are the acquirer. This would mean that, under the assumption that the findings from the paper of McKibbin & Sidorenko (2006) hold true, the market does not respond to recessions the same as it does to pandemics. Surprisingly enough it can be observed that the market seems to react significantly more positive to announcements where the acquirer is based in the Asia-Pacific (excluding Central Asia) region compared to some other regions. The same cannot be said for divesting companies, this raises the suggestion that the market prefers seeing companies based in the Asia-Pacific region (excluding Central Asia) invest rather than divest, to a stronger degree than some other regions. As was reported earlier, for many years the Chinese automotive industry has had the interest of large players in the global automotive industry such as Volkswagen. Based on the findings, however, the market does not respond favourably to the announcement of companies, based in the Asia-Pacific region (excluding Central Asia), divesting. This means that, even in the presence of attractive factors, the market does not approve of corporate restructuring when the divesting company is based in the Asia-Pacific region (excluding Central Asia) compared to some other regions. Based on these findings, and the fact that the drop in vehicle sales during the COVID-19 pandemic induced recession is similar to the one that was observed during the 2008 financial crisis, it is assumed that the effects of the COVID-19 pandemic induced recession on the automotive industry are similar to those that were observed during the 2008 financial crisis. As a result, it can be concluded that the COVID-19 pandemic induced recession will not expedite corporate restructuring in the automotive industry. Firstly, there is no statistically significant evidence that the presence of a recession influences the CAR of corporate restructuring in the automotive industry. Secondly, and more importantly, there is no

statistically significant evidence that the presence of a recession increases the activity of corporate restructuring. In fact, the coefficient estimate of the recession dummy variable on the activity for acquirers is significantly negative with a p-value of 0.001. Meanwhile, this same coefficient estimate for divesting companies is not significantly different from zero. As a result, the null hypothesis is not rejected in favour of the alternative hypothesis. Here the null hypothesis states that the coefficient estimate, for the presence of a recession on the activity of corporate restructuring in the automotive industry, is equal to zero. Meanwhile, the alternative hypothesis states that the coefficient estimate, for the presence of a recession on the activity of corporate restructuring in the automotive industry, is positive.

VI. Conclusion

The answers to the three hypotheses, when combined, answer the main research question. For starters, the first hypothesis concluded that the mean CAR for automotive corporate restructuring is significantly greater than zero on the 1% level. The mean CAR for acquirers and divesting companies is equal to 3.83% and 7.32%, respectively. As a result, the null hypothesis was rejected in favour of the alternative hypothesis, which states that the mean CAR of corporate restructuring in the automotive industry is greater than zero. This means that, on average, the market reacts positively to the announcement of corporate restructuring by companies in the automotive industry. This reaction is positive for both divesting companies and acquirers in the automotive industry. In other words, the market will, on average, support the decision by companies in the automotive industry to engage in corporate restructuring. This makes corporate restructuring far more appealing than if this wasn't the case as it reduces the 'cost' of engaging in corporate restructuring. Additionally, this means that the market will react favourably to automotive companies adapting themselves to the growing industry and demand for EVs, by engaging in corporate restructuring.

The second hypothesis analysed the regional effects on the CAR of corporate restructuring in the automotive industry. This hypothesis concluded a number of things, the main finding was that some regions had a significant effect on the CAR of corporate restructuring in the automotive industry. Acquirers in Asia-Pacific (excluding Central Asia) experience a CAR that is 4.34% higher on average than acquirers in Japan for similar deals. Meanwhile, divesting companies in Europe and Asia-Pacific (excluding Central Asia) experience a CAR that is respectively 11.40% and 9.12% higher on average than divesting companies in Africa, the Middle East or Central Asia for similar deals. This is similar to the findings of Bühner et al. (1997) who found that there were significant differences in the amount of portfolio and financial restructuring between Germany and the United States. These results also show that the effect of the region on the expected CAR is dependent on whether the company is acquiring or divesting. It can be concluded that the attractiveness of engaging in corporate restructuring depends in part on where the company is based. As a result, the null hypothesis, of no effect, was rejected in favour of the alternative hypothesis, which states that regions have an effect.

The third hypothesis focuses on the effects that recessions might have on the willingness and attractiveness of engaging in corporate restructuring for companies in the automotive industry. To begin with, the presence of a recession does not seem to have a significant effect on the CAR of corporate restructuring in the automotive industry for divesting companies or acquirers. This means that there is insignificant evidence to conclude that recessions change the market's reaction to corporate restructuring. The presence of a recession does seem to influence the willingness of acquirers to engage in corporate restructuring. The expected monthly amount of corporate restructuring by acquirers in the automotive industry seems to be significantly lower in the presence of a recession. A decrease of around 1.25 announcements was observed in the monthly number of corporate restructuring announcements during recessions. This means that, in the presence of a recession, automotive companies are less likely to engage in corporate restructuring as the acquiring party. The presence of a recession does not seem to have a significant effect on the expected monthly amount of corporate restructuring for divesting companies in the automotive industry. This means that there is no significant evidence that the COVID-19 pandemic induced recession will expedite corporate restructuring in the automotive industry, therefore, the null hypothesis, of no effect, was not rejected. These findings contradict those of Domański et al. (2013) who stated that the 2008 financial crisis was a time of major corporate restructuring in the automotive industry.

As was mentioned earlier, combining the answers to the three hypotheses will answer the main research question.

How big of a role will corporate restructuring have in the automotive industry as a result of a changing market?

The results of the hypotheses suggest that the role of corporate restructuring in the automotive industry, as a result of a changing market, differs based on certain factors. On average the CAR of corporate restructuring in the automotive industry is positive, for both divesting companies and acquirers. This means that, on average, corporate restructuring can be seen as a value-creating activity. This makes engaging in corporate restructuring a very attractive venture for companies in the automotive industry as, in addition to the core reasons to engage in corporate restructuring, it also leads to wealth creation for the shareholders of said company on average. Corporate restructuring is, therefore, on average, expected to be supported by the shareholders of the company, which would make it easier for the management to gain enough support to engage in corporate restructuring. Based on these findings it can be concluded that, in order for the companies to adapt to the changing market in terms of the shift towards EVs, it will be harder for companies to resist the temptation of simply engaging in corporate restructuring rather than accomplishing their goals without it. After all, the amount of capital necessary to adapt the assets they currently own to the changing market can also be

spent on corporate restructuring which, as a matter of fact, has the added benefit of increasing the shareholders' wealth on average.

As was mentioned earlier, the results of the hypotheses suggest that the role of corporate restructuring in the automotive industry, as a result of a changing market, differs based on certain factors. One of these factors is the presence of a recession. The predicted market response, to announcements of corporate restructuring in the automotive industry, in the presence of a recession does not differ on a statistically significant level from the market response that is predicted in the absence of a recession. This means that there is not enough statistically significant evidence to conclude that the CAR of corporate restructuring is influenced by the presence of a recession. However, the same cannot be said about the activity, the results show that, in the presence of a recession, the monthly amount of corporate restructuring is lower on a statistically significant level for acquirers while insignificantly different for divesting companies. The results, therefore, suggest that there will be fewer announcements of corporate restructuring, where the acquirer is active in the automotive industry, in the presence of a recession. This means that companies in the automotive industry are less interested in acquiring companies during recessions for reasons that are unrelated to the market response.

One of the other factors that was alluded to is the regional factor. The results demonstrate that the expected CAR of an announcement differs significantly between some regions. This means that the attractiveness of corporate restructuring is also dependent on the region in which the company in question is based. The CAR for divesting companies, for example, would be significantly higher in Europe than it would be if the divesting company was based in Africa, the Middle East or Central Asia. Meanwhile, the CAR for acquirers would be significantly higher in the Asia-Pacific region (excluding Central Asia) than it would be if the acquirer was based in Europe or Japan for example. This means that the role corporate restructuring will have in the automotive industry as a result of a changing market is heavily dependent on a number of factors.

In short, the role that corporate restructuring will have in the automotive industry, as a result of a changing market, is strongly dependent on certain factors. However, the market does seem to support corporate restructuring in the automotive industry on average, for both divesting companies and acquirers. This means that, dependent on certain factors, corporate restructuring has the potential of playing a huge role in the automotive industry as a result of a changing market. This means that corporate restructuring, while partially dependent on certain factors, can be a viable way for companies to adapt to the changing market. For example, companies can choose to sell certain divisions from their company without experiencing a negative market reaction, dependent on certain factors. Another example would be the possibility for companies to drastically decrease the time spent on research and development by simply acquiring a company that has already done said research and development. Which, based on the results, would also be expected to increase the shareholders' wealth on average, dependent on certain factors. Based on the market response it is even possible for

companies to do both of these things at the same time. A company could simply sell a certain division which it deems is no longer necessary and replace this division by simply acquiring a new one that fits the changing market better, all while only increasing the shareholders' wealth on average, dependent on certain factors. However, the attractiveness of acquiring other companies through corporate restructuring seems to be severely reduced in the presence of a recession. This means that, as a result of the ongoing COVID-19 pandemic induced recession, far less corporate restructuring is expected where the acquirer is active in the automotive industry. As a result, it is expected that corporate restructuring will play a smaller role while the COVID-19 recession is still ongoing. Therefore the current role of corporate restructuring in the automotive industry, as a result of the changing market, will be reduced due to the presence of the COVID-19 recession.

Generally speaking, every study has shortcomings in one way or another, this thesis is no exception to this. One of the shortcomings of this thesis is that, while it analyses the regional effects on the expected CAR, it only does so in relation to the region incorporated in the constant term. This means that, while some region variables are significantly different from the region variable incorporated in the constant term, it is unclear whether the other region variables differ significantly from each other. This does not disprove the conclusion based on the results from the second hypothesis, however, it does require additional research if different combinations of regions are of interest. As a result, it is recommended that future studies analyse all possible combinations of regions and do not limit their research to only one combination. Another shortcoming of this thesis has to do with the data, the data was collected while the COVID-19 pandemic and recession were still ongoing. As a result, a lot of data regarding the effects of the COVID-19 pandemic and recession could not be incorporated in this thesis as they were simply not available at the time of data collection. A number of recommendations for future research are therefore appropriate. For starters, it is recommended that future studies test the robustness of the recession variable assumption, which states that the data from the 2008 financial crisis can accurately predict the effects of the COVID-19 pandemic induced recession. This is due to the fact that, as a result of the lack of data from during the COVID-19 recession, the conclusions and results regarding the recession variable are mainly based on the data from during the 2008 financial crisis. In the scenario that this assumption does not hold up in future research, it is recommended that future studies analyse why this is the case. Another recommendation for future studies is to analyse whether existing literature relating to the economic effects of pandemics can also be applied to the automotive industry. It was not possible to test this in this thesis due to the aforementioned lack of data. Another recommendation for future studies is to research why certain results have been observed, this could potentially be done by researching whether there is a difference in results between focusing and non-focusing divestitures and acquisitions.

References

Altenburg, T., Schamp, E. W., & Chaudhary, A. (2016). The emergence of electromobility: Comparing technological pathways in France, Germany, China and India. *Science and Public Policy*, *43*(4), 464-475.

Armitage, S. (1995). Event study methods and evidence on their performance. *Journal of Economic Surveys*, 9(1), 25-52.

AskAnyDifference. (n.d.). Difference Between Spin-Off, Split-Off, Split-Up and Carve-Out (With Table). Retrieved from https://askanydifference.com/difference-between-spin-off-split-off-split-up-and-carve-out/

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, *14*(1), 3-31.

Bühner, R., Rasheed, A., & Rosenstein, J. (1997). Corporate restructuring patterns in the US and Germany: A comparative empirical investigation. *MIR: Management International Review*, 319-338.

Chen, J. (2020, August 24). Divestiture. Retrieved from https://www.investopedia.com/terms/d/divestiture.asp

China's Economy Suffers Historic Slump Due to Virus Shutdown. (2020, March 16). *Bloomberg News*. Retrieved from https://www.bloomberg.com

CrispIdea. (2020, April). *Volkswagen AG (VLKAF – Q4FY19 and FY19) – Company pushes expansion of its EV plans by early FY21*. Retrieved from https://www.crispidea.com

Domański, B., Guzik, R., Gwosdz, K., & Dej, M. (2013). The crisis and beyond: the dynamics and restructuring of automotive industry in Poland. *International Journal of Automotive Technology and Management 20*, *13*(2), 151-166.

Dyckman, T., Philbrick, D., & Stephan, J. (1984). A comparison of event study methodologies using daily stock returns: A simulation approach. *Journal of Accounting Research*, 1-30.

Fama, E. F. Foundations of finance. New York: Basic Books, 1976

Fernandes, N. (2020). Economic effects of coronavirus outbreak (COVID-19) on the world economy. *Available at SSRN 3557504*.

IEA, Global electric car stock, 2010-2019, IEA, Paris https://www.iea.org/data-and-statistics/charts/global-electric-car-stock-2010-2019

Klier, T. H., & Rubenstein, J. M. (2010). The changing geography of North American motor vehicle production. *Cambridge Journal of Regions, Economy and Society*, *3*(3), 335-347.

LMC Automotive. (2020, April). *Global Light Vehicle Sales Update March 2020*. Retrieved from https://www.lmc-auto.com

LMC Automotive. (2020). Corporate website. Retrieved October 3, 2020 from https://www.lmc-auto.com

McKibbin, W. J., & Sidorenko, A. (2006). *Global macroeconomic consequences of pandemic influenza* (p. 79). Sydney, Australia: Lowy Institute for International Policy.

McWilliams, A., Siegel, D., & Teoh, S. H. (1999). Issues in the use of the event study methodology: A critical analysis of corporate social responsibility studies. *Organizational Research Methods*, *2*(4), 340-365.

Montgomery, C. A., Thomas, A. R., & Kamath, R. (1984). Divestiture, market valuation, and strategy. *Academy of Management Journal*, *27*(4), 830-840.

Meznar, M. B., Nigh, D., & Kwok, C. C. (1994). Effect of announcements of withdrawal from South Africa on stockholder wealth. *Academy of Management Journal*, *37*(6), 1633-1648.

Meznar, M. B., Nigh, D., & Kwok, C. C. (1998). Announcements of withdrawal from South Africa revisited: making sense of contradictory event study findings. *Academy of Management Journal*, *41*(6), 715-730.

Park, N. K. (2004). A guide to using event study methods in multi-country settings. Strategic Management Journal, 25(7), 655-668.

Pavlínek, P. (2015). The impact of the 2008–2009 crisis on the automotive industry: global trends and company-level effects in Central Europe. *European Urban and Regional Studies*, *22*(1), 20-40.

Picardo, E. (2020, July 29). Spin-Off vs. Split-Off vs. Carve-out: What's the difference?. Retrieved from https://www.investopedia.com/articles/investing/090715/comparing-spinoffs-splitoffs-and-carveouts.asp

Prezas, A. P., & Simonyan, K. (2015). Corporate divestitures: Spin-offs vs. sell-offs. *Journal of Corporate Finance*, *34*, 83-107.

Pynnönen, S. (2005). On regression based event study. *Acta Wasaensia*, *143*(2), 327-354.

Riley, C. (2020, January 20). The recession in global car sales shows no sign of ending. *CNN Business* Retrieved from https://edition.cnn.com/2020/01/20/business/global-auto-recession/index.html

Saberi, B. (2018). The role of the automobile industry in the economy of developed countries. *International Robotics & Automation Journal*, *4*(3), 179-180.

Schimmer, M., Levchenko, A., & Müller, S. (n.d.). Event Study Application Blueprint. Retrieved from https://www.eventstudytools.com/event-study-application-blueprint

Stanford, J. (2010). The geography of auto globalization and the politics of auto bailouts. *Cambridge Journal of Regions, Economy and Society*, *3*(3), 383-405.

Taylor, E., & Schwartz, J. (2020, March 17). Volkswagen suspends production as coronavirus hits sales. *Reuters*. Retrieved from https://www.reuters.com

Tesla. (n.d.). Number of Tesla vehicles delivered worldwide from 4th quarter 2015 to 1st quarter 2020 (in units). In Statista - The Statistics Portal. Retrieved May 9, 2020, from https://www.statista.com/statistics/502208/tesla-quarterly-vehicle-deliveries/

Thiel, C., Perujo, A., & Mercier, A. (2010). Cost and CO2 aspects of future vehicle options in Europe under new energy policy scenarios. *Energy policy*, *38*(11), 7142-7151.

Thompson, J. E. (1988). More methods that make little difference in event studies. *Journal of Business Finance & Accounting*, *15*(1), 77-86.

Wad, P. (2010). Impact of the global economic and financial crisis over the automotive industry in developing countries.

Worldometer. (n.d. a). Active cases in China. Retrieved September 28, 2020, from https://www.worldometers.info/coronavirus/country/china/

Worldometer. (n.d. b). Active cases worldwide. Retrieved September 28, 2020, from https://www.worldometers.info/coronavirus/worldwide-graphs/#active-cases

Worldometer. (n.d. c). Distribution of cases worldwide. Retrieved September 28, 2020, from https://www.worldometers.info/coronavirus/coronavirus-cases/#case-distribution

Yang, L. F., Xu, J. H., & Neuhäusler, P. (2013). Electric vehicle technology in China: An exploratory patent analysis. *World Patent Information*, *35*(4), 305-312.

Zeren, F., & Hizarci, A. (2020). The Impact of COVID-19 Coronavirus on Stock Markets: Evidence from Selected Countries. *Muhasebe ve Finans İncelemeleri Dergisi*, *3*(1), 78-84.

Appendix A. Tesla Vehicles Delivered

In Figure A the quarterly number of Tesla vehicles delivered can be found. In this figure Q1 represents the first quarter of the year, Q2 the second quarter, Q3 the third quarter and Q4 the fourth quarter. The number of vehicles delivered represents the total number of Tesla vehicles that have been delivered in that quarter. This means it does not include the Tesla vehicles that have been delivered before that quarter. In other words, if Q2 of 2020 saw 20.000 Tesla vehicle deliveries then this quarter would have a value of 20.000. In the context of this figure, the term unit represents a singular Tesla vehicle. When analysing the growth of the quarterly number of vehicles delivered over time it is important to only compare the vehicles delivered from the same quarter. It can clearly be seen in the figure that not all quarters perform evenly, an example of this is that Q3 and Q4 can be observed as outperforming Q1 and Q2 in every included year.

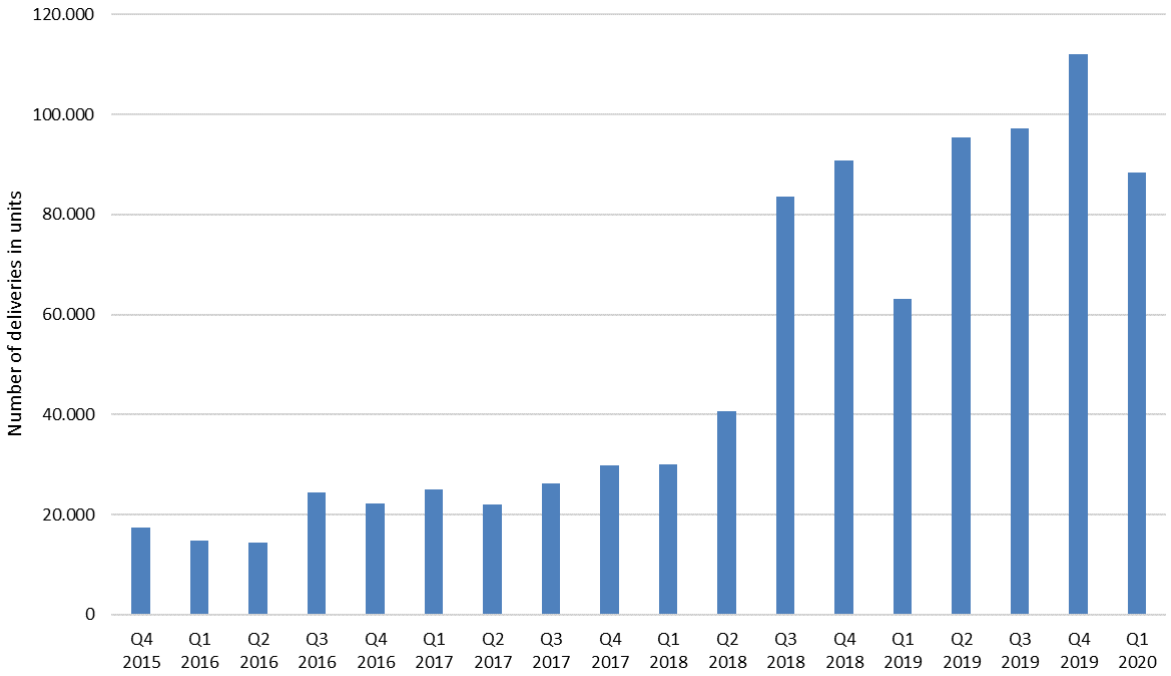

Figure A. Number of Tesla vehicles (in units) delivered worldwide from 4th quarter 2015 to 1st quarter 2020. Reprinted from 'Tesla's vehicle deliveries by quarter - YTD Q1 2020', by I. Wagner, 2020, retrieved from https://www.statista.com/. Copyright 2020 by Statista.

Appendix B. Global Electric Car Stock

In Figure B the stock of BEVs (Battery Electric Vehicles) and PHEVs (Plug-in Hybrid Electric Vehicles) has been separated to improve the depth of the data. In this figure the line representing the world BEV is of main interest. It can be observed that the world stock of BEVs has been increasing rapidly and does not show any signs of slowing down. It can also be observed that China's share of the world BEV stock has risen rapidly since 2014.

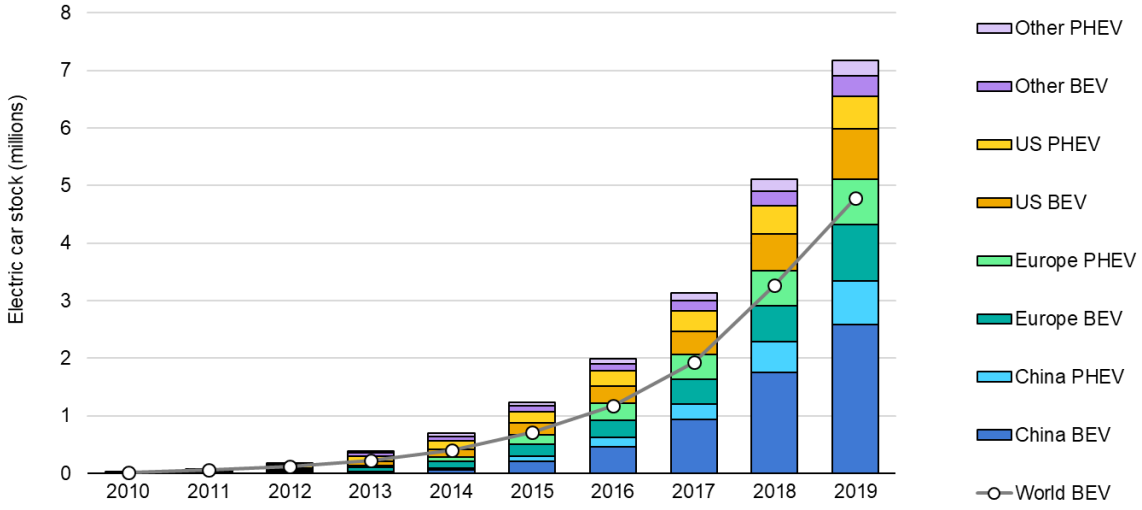

Figure B. Global electric car stock in millions over the period 2010-2019. Reprinted from IEA (2020), Global EV Outlook 2020, https://www.iea.org/reports/global-ev-outlook-2020. All rights reserved.

Appendix C. ThomsonOne Search Criteria

In Table C the search criteria on ThomsonOne can be found, this table consists out of three sections. The first section shows the universal search criteria that have been used regardless of looking at divesting companies or acquirers. The second section shows the search criteria that have only been used for the data regarding divesting companies. The third section shows the search criteria that have only been used for the data regarding acquirers. This table has directly copied the terms and wording from the ThomsonOne search engine.

Table 9. Search Criteria on ThomsonOne

Request	Operator	Description/Code
Database	Include	All Mergers & Acquisitions
Date Announced (DD/MM/YYYY)	Between	01/01/2002 to 02/06/2020
Percent of Shares Acquired in Transaction	Between	≥ 50%
Percent of Shares Owned after Transaction	Between	≥ 100%
Deal Value ($ Mil)	Between	≥ 1
Divesting company specific: Request	**Operator**	**Description/Code**
Target Ultimate Parent Mid Industry (Code)	Include	Automobiles & Components
Target Mid Industry (Code)	Include	Automobiles & Components
Target Ultimate Parent Public Status (Code)	Include	Public
Acquirer specific: Request	**Operator**	**Description/Code**
Acquirer Mid Industry (Code)	Include	Automobiles & Components
Acquirer Public Status (Code)	Include	Public

Appendix D. Region Dummy Variables

In Table D the five unique regions that are included in the data can be found in addition to the name of their respective dummy variable. The names of the respective dummy variables have been included to improve accessibility to the other tables.

Table 10. Regions and names of the region dummy variables.

Regions	Dummy variable name
Americas	America
Europe	Europe
Asia-Pacific (ex Central Asia)	AsiaPacifc
Japan	Japan
Africa/Middle East/Central Asia	AfricaMiddleEastCentralAsia

Appendix E. Descriptive Statistics for Variables

In Table E1 and Table E2 the descriptive statistics can be found for the variables that have been deemed as relevant for the linear regressions on the CAR. The Obs value represents the number of observations for which said variable has a value, however, the vast majority of these variables are dummy variables which makes this more complicated. The CAR44 variable is the only non-dummy variable in Table E1 and Table E2, this means this variable is treated differently compared to the other included variables. The Mean value for CAR44 represents the mean CAR that has been observed for the event window (-4, +4). Due to the nature of how the CAR is displayed it is important to mention that a value of .073 represents a mean CAR of 7.3%. The mean value for the dummy variables holds additional information. Multiplying the mean value of a given dummy variable by the number of observations results in the number of observations for which this dummy variable has a value of one. For example, if a dummy variable has a mean value of .5 and has 300 observations, then this dummy variable has a value of one for a 150 of those 300 observations.

Table 11. Descriptive statistics of the variables in the CAR model for divesting companies

Variable	Obs	Mean	Std. Dev.	Min	Max
CAR44	282	.073	.355	-1.196	4.325
America	282	.401	.491	0	1
Europe	282	.216	.412	0	1
Japan	282	.099	.3	0	1
AfricaMiddleEastCe~a	282	.007	.084	0	1
AsiaPacific	282	.277	.448	0	1
Recession	282	.096	.295	0	1
HighValueTransaction	282	.333	.472	0	1
Horizontal	282	.461	.499	0	1
Domestic	282	.699	.46	0	1

Table 12. Descriptive statistics of the variables in the CAR model for acquirers

Variable	Obs	Mean	Std. Dev.	Min	Max
CAR44	651	.038	.248	-1.196	4.945
America	651	.358	.48	0	1
Europe	651	.21	.408	0	1
Japan	651	.109	.312	0	1
AfricaMiddleEastCe~a	651	.014	.117	0	1
AsiaPacific	651	.309	.462	0	1
Recession	651	.061	.24	0	1
HighValueTransaction	651	.333	.472	0	1
Horizontal	651	.495	.5	0	1
Domestic	651	.631	.483	0	1

Appendix F. One-Sample T-Test Results

In Table F1 and Table F2 the results of the one-sample t-test can be found. Here the mean value represents the mean CAR that has been observed. Additionally, Std. Err. represents the standard error while Std. Dev. represents the standard deviation of the data.

Table 13. One-sample t-test on the CAR for divesting companies

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
CAR44	282	.0732346	.0211419	.3550325	.031618	.1148511

mean = mean(CAR44) t = 3.4640
Ho: mean = 0 degrees of freedom = 281

Ha: mean < 0 Ha: mean != 0 Ha: mean > 0
Pr(T < t) = 0.9997 Pr(|T| > |t|) = 0.0006 Pr(T > t) = 0.0003

Table 14. One-sample t-test on the CAR for acquirers

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
CAR44	651	.0383325	.009736	.2484106	.0192148	.0574503

mean = mean(CAR44) t = 3.9372
Ho: mean = 0 degrees of freedom = 650

Ha: mean < 0 Ha: mean != 0 Ha: mean > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0001 Pr(T > t) = 0.0000

Appendix G. Linear Regression Results on CAR

In Table G1 and Table G2 the results for the linear regression on the CAR can be found. Both these linear regression models use robust standard errors. Table G1 shows the results for divesting companies while Table G2 shows the results for acquirers. Due to the fact that the CAR is the dependent variable, the coefficient estimates should be interpreted as percentages. For example, the coefficient estimate of high-value transactions for divesting companies is equal to .049 and should be interpreted as 4.9%.

Table 15. Linear regression results on the CAR for divesting companies

CAR44	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Domestic	.078	.036	2.15	.032	.007	.149	**
Horizontal	-.029	.042	-0.69	.49	-.112	.054	
HighValueTransaction	.049	.037	1.32	.189	-.024	.123	
America	.154	.083	1.86	.064	-.009	.317	*
Europe	.114	.056	2.03	.044	.003	.225	**
Japan	.093	.06	1.56	.121	-.025	.21	
AsiaPacific	.091	.046	1.96	.051	0	.183	*
Constant	-.105	.051	-2.04	.042	-.206	-.004	**

Mean dependent var	0.073	SD dependent var	0.355
R-squared	0.021	Number of obs	282.000
F-test	2.668	Prob > F	0.011
Akaike crit. (AIC)	225.229	Bayesian crit. (BIC)	254.364

*** p<.01, ** p<.05, * p<.1*

Table 16. Linear regression results on the CAR for acquirers

CAR44	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Domestic	.034	.015	2.22	.027	.004	.064	**
Horizontal	-.028	.02	-1.38	.167	-.068	.012	
HighValueTransaction	.029	.017	1.73	.084	-.004	.063	*
America	-.008	.029	-0.27	.786	-.064	.049	
Europe	-.028	.015	-1.81	.07	-.058	.002	*
Japan	-.043	.014	-3.18	.002	-.07	-.017	***
AfricaMiddleEastCe~a	-.032	.019	-1.71	.088	-.068	.005	*
Constant	.035	.015	2.25	.025	.004	.065	**

Mean dependent var	0.038	SD dependent var	0.248
R-squared	0.015	Number of obs	651.000
F-test	4.049	Prob > F	0.000
Akaike crit. (AIC)	39.444	Bayesian crit. (BIC)	75.272

*** p<.01, ** p<.05, * p<.1*

Appendix H. Estimated CAR per Region for Divesting Companies

In Table H the CAR estimations can be found per region for divesting companies when all other dummy variables are equal to zero. It is important to mention that these estimations do not take the significance of the coefficients into account.

Table 17. Estimated CAR per region for divesting companies when all other dummy variables are equal to zero

Region	Expected CAR
The Americas	4.92%
Europe	0.91%
Japan	-1.21%
Asia-Pacific (excluding Central Asia)	-1.36%
Africa, the Middle East and Central Asia	-10.48%

Appendix I. Estimated CAR per Region for Acquirers

In Table I the CAR estimations can be found per region for acquirers when all other dummy variables are equal to zero. It is important to mention that these estimations do not take the significance of the coefficients into account.

Table 18. Estimated CAR per region for acquirers when all other dummy variables are equal to zero

Region	Expected CAR
The Americas	2.69%
Europe	0.67%
Japan	-0.86%
Asia-Pacific (excluding Central Asia)	3.47%
Africa, the Middle East and Central Asia	0.30%

Appendix J. Linear Regression Results on CAR Including Recession

In Table J1 and Table J2 the results for the linear regression on the CAR can be found, with the inclusion of the recession dummy variable. Both these linear regression models use robust standard errors. Table J1 shows the results for divesting companies while Table J2 shows the results for acquirers. Due to the fact that the CAR is the dependent variable, the coefficient estimates should be interpreted as percentages. For example, the coefficient estimate of high-value transactions for divesting companies is equal to .055 and should be interpreted as 5.5%.

Table 19. Linear regression results on the CAR for divesting companies including the recession dummy variable

CAR44	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Recession	.106	.173	0.61	.54	-.235	.448	
Domestic	.078	.037	2.12	.035	.006	.151	**
Horizontal	-.034	.047	-0.72	.47	-.127	.059	
HighValueTransaction	.055	.033	1.68	.095	-.01	.119	*
America	.143	.071	2.03	.044	.004	.282	**
Europe	.107	.051	2.11	.036	.007	.207	**
Japan	.094	.061	1.55	.122	-.026	.214	
AsiaPacific	.078	.043	1.79	.074	-.008	.163	*
Constant	-.105	.052	-2.02	.044	-.208	-.003	**

Mean dependent var	0.073	SD dependent var	0.355
R-squared	0.029	Number of obs	282.000
F-test	2.295	Prob > F	0.021
Akaike crit. (AIC)	225.047	Bayesian crit. (BIC)	257.825

*** *p<.01, ** p<.05, * p<.1*

Table 20. Linear regression results on the CAR for acquirers including the recession dummy variable

CAR44	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Recession	-.005	.019	-0.26	.791	-.041	.032	
Domestic	.034	.015	2.24	.026	.004	.064	**
Horizontal	-.028	.02	-1.38	.167	-.068	.012	
HighValueTransaction	.029	.017	1.69	.091	-.005	.063	*
America	-.008	.029	-0.27	.784	-.064	.049	
Europe	-.028	.015	-1.81	.07	-.058	.002	*
Japan	-.043	.014	-3.18	.002	-.07	-.017	***
AfricaMiddleEastCe~a	-.032	.019	-1.72	.086	-.069	.005	*
Constant	.035	.016	2.23	.026	.004	.066	**

Mean dependent var	0.038	SD dependent var	0.248
R-squared	0.015	Number of obs	651.000
F-test	3.535	Prob > F	0.001
Akaike crit. (AIC)	41.429	Bayesian crit. (BIC)	81.736

*** *p<.01, ** p<.05, * p<.1*

Appendix K. Linear Regression Results on Activity

In Table K1 and Table K2 the results for the linear regression on the activity variable can be found. Both these linear regression models use robust standard errors. The coefficient estimates in these models relate back to the monthly amount of corporate restructuring. For example, the coefficient estimate of recessions on the activity is equal to -1.252 for acquirers, this means that the number of announcements of corporate restructuring decreases with around 1.252 announcements during recessions. Table K1 shows these results for divesting companies while Table K2 shows these results for acquirers.

Table 21. Linear regression results on the activity for divesting companies

Activity	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Recession	-.054	.287	-0.19	.85	-.619	.511	
Constant	1.281	.086	14.90	0	1.112	1.451	***
Mean dependent var		1.276	SD dependent var			1.218	
R-squared		0.000	Number of obs			221.000	
F-test		0.036	Prob > F			0.850	
Akaike crit. (AIC)		717.152	Bayesian crit. (BIC)			723.949	

**** p<.01, ** p<.05, * p<.1*

Table 22. Linear regression results on the activity for acquirers

Activity	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Recession	-1.252	.363	-3.45	.001	-1.967	-.537	***
Constant	3.07	.128	23.95	0	2.818	3.323	***
Mean dependent var		2.946	SD dependent var			1.823	
R-squared		0.042	Number of obs			221.000	
F-test		11.907	Prob > F			0.001	
Akaike crit. (AIC)		886.056	Bayesian crit. (BIC)			892.853	

**** p<.01, ** p<.05, * p<.1*

Appendix L. Supporting Research and Articles

This is a list of references to supporting research and articles that were not directly referenced in the text.

Cârstea, V. (2016). The dieselgate scandal and its implications on the labor market. *Romanian Economic and Business Review*, *11*(2), 242.

DeBord, M. & Rapier, G. (2019, July 12). Ford and VW have stepped up their alliance — Ford will develop an electric vehicle using VW tech by 2023. *Business Insider* Retrieved from https://www.businessinsider.nl/ford-vw-alliance-announcement-details-2019-7/

Eckbo, B. E., & Thorburn, K. S. (2008). Corporate restructuring: breakups and LBOs. In Handbook of empirical corporate finance (pp. 431-495). Elsevier.

Kley, F., Lerch, C., & Dallinger, D. (2011). New business models for electric cars—A holistic approach. *Energy policy*, *39*(6), 3392-3403.

MacKinlay, A. C. (1997). Event studies in economics and finance. Journal of economic literature, 35(1), 13-39.

Mulherin, J. H., & Boone, A. L. (2000). Comparing acquisitions and divestitures. Journal of corporate finance, 6(2), 117-139.

Wayland, M. (2020, February 26). Coronavirus causes Moody's to slash global vehicle sales forecast for 2020. Retrieved April 30, 2020, from https://www.cnbc.com/2020/02/26/coronavirus-causes-moodys-to-slash-globalvehicle-sales-forecast.html