HOW ARE INTERNATIONAL CORPORATE INTERRELATIONS AFFECTED BY EXTREME POLITICAL CHANGES?

A STATISTICAL ANALYSIS OF THE INFLUENCE OF GOVERNMENTAL SHIFTS TO PROTECTIONISM ON THE INTERRELATION BETWEEN THE U.S. AND GERMAN AUTOMOBILE INDUSTRY

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ABSTRACT

This paper examines the influences of protectionist measures on international interrelation. The industry chosen for the research is the automobile industry within Germany and the USA. First of all, the paper gives an overview of current research regarding the influence of protectionism on trade and furthermore introduces the field of the automobile industry and protectionism itself. Consequently, exploratory research is carried out. Therefore, two data sets, stock prices and foreign direct investments, are used to perform different analyses with the programming language R. Methods used are Time Series Analysis, Network Analysis and multivariate analysis. In summary, the results show that an influence of rising protectionism on international interrelations can be proven. It is important to state that international interrelations within the German and American automobile industry are rather changed than diminished. It is noticeable that small long-term partnerships and relations migrate into bigger constantly changing networks of companies interrelated. Moreover, especially Time Series Analysis showed that in the long-term protectionism will not diminish international interrelation and investments among the countries will grow. Still, an overall fear of stronger protectionism is another important finding of the research. For the future a stronger reaction of companies regarding their internationalization strategy is more than likely.

JEL Classification: F02, F13, F15, F18, F23, L62

Keywords: International Interrelations, Protectionism, Free Trade, Globalization, Automobile industry, International Trade

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ABBREVIATIONS

BDI – Bundesverband der deutschen Industrie e.v.

BEA – Bureau of Economy Analysis

CAR – Center for Automotive Research

EPEC - European Centre for International Political Economy

EU – European Union

GDP – Gross Domestic Product

MDS – Multi-Dimensional Scaling

NAFTA – North American Free Trade Agreement

OICA – Organisation Internationale des Constructeurs D´Automobiles

U.S. – United States of America

VDA – Verband der Automobilindustrie

WTO – World Trade Organization

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1 INTRODUCTION

“Try building your cars in the United States instead of shipping them over, …”
Donald J. Trump, 2017

(Washington Post, 2017)

1.1 RESEARCH PROBLEM

During the last years the world economy has experienced a constant and strong growth of internationalization (MPRA, 2008, p.1f). Concerning international interrelation, it is hard to detect a more globally networked branch apart from the automobile industry (Zeit, 2017). This is especially true for the U.S. and German automotive sector. German imports in the automobile segment were set at 23% and exports at 34% of overall trade activities in 2016 (Außenwirtschaftsportal Bayern, 2017). From a German perspective the U.S. market is a special point of interest for the automotive industry. More than 15% of the German automotive exports are going into the United States (Kolev et. al, 2017, p.1ff.)

In contrast to those numbers the current governmental change in the U.S. signifies a switch from a trade friendly policy to protectionism (Krugman, 2016, p.1f). During his campaign Donald Trump already threatened to impose tariffs and protect domestic markets. One industry he especially focused on was the automotive industry. Several times Trump mentioned to impose high tariffs on automotive imports (Kolev et. al, 2017, p.1ff.). Recently, the Trump administration started to impose trade restrictions in form of tariffs on steel and aluminum. Several important world economies were affected, including the members of the European Union and long term trade partners[1] (White House, 2018).

In summary, it seems like Trumps desire for higher protectionism is obvious. Moreover, it is remarkably high for the automobile industry (Kolev et. al, 2017, p.1ff.).[2]

The contrast between raising protectionism and growing globalization leads to different questions: What influence do policy changes have on international interrelations? Do policy changes trigger drastic changes and movements within a highly globalized

[1] The countries affected next to countries of the European Union were Argentina, Australia, Brazil, Canada, Mexico and South Korea (White House, 2018)

[2] Other sources that support this findings are (Dullien, 2017, p.163f), (Klodt, 2017, p.167f.).

branch such as the automobile industry? Do policy changes or new promised protective policies change the setup of whole industries?

Consequently, the research question of the thesis will be the following:

"How are International Corporate Interrelations affected by Extreme Political Changes? A Statistical Analysis of the Influence of Governmental Shifts to Protectionism on the Interrelation between the U.S. and German Automobile Industry"

1.2 RELEVANCE AND OBJECTIVE

As already outlined in the prior chapter, an interesting contrast is evolving in many parts of the world today. On the one hand side the globalization proceeds and growing international interrelations and supply chains develop. On the other hand, many countries experience governmental shifts which aim to protect their country from too many external influences. Therefore, it is pertinent to detect possible international interrelations changes. As it will be outlined within the thesis, the automobile industry is one of the biggest and most interrelated industries in the world and often occurs as a pioneer industry (Nunnenkamp, 1998, p.1f). Therefore, potential findings of changes within international interrelations due to governmental shifts are interesting for other industries. Moreover, it is possible to transfer findings to other branches which develop slower or later. Furthermore, it is especially interesting to investigate the topic of political influences on international trade setups of industries within one of the most important, interlinked and biggest industries of today's economy.

At a time were many governments and countries experience to drift to higher protectionist measures and many countries turning more skeptical towards foreign influences politically, it is more than relevant to investigate the reaction of and on important industries. Especially, if they as highly globalized as the automobile industry.

Another aspect which underpins the relevance of the thesis is the current extent of other research regarding the topic. Present research describes political influences as a key driver for international interrelations. Still, all research misses to scale or describe those influences of political changes. Moreover, especially the influences on the automobile industry are named by many researchers but are not described in detail. This paper will try to extend the research within this area.

Consequently, the objective of the thesis will be to analyze possible changes within and among industries due to governmental shifts and give recommendations on how international trade and interrelation will develop in the future.

1.3 COURSE OF INVESTIGATION

In order to draw a conclusion, the thesis will first of all give an overview over current and important literature regarding the topic of the thesis. Furthermore, the global automobile industry and the globalization of the automobile industry is characterized. In addition to that, a setup of the German and U.S. American automobile industry will be pictured and its international branching will be drawn. Also, the special importance of the German and U.S. automobile industry will be presented. Moreover, the term protectionism will be defined in detail. In addition to that, an insight into the current standings towards protectionism will be given.

The research part will examine the influence of radical governmental changes on the interrelation of U.S. and German automobile businesses from a statistical point of view by using the software R. Thereby, it focuses on the current political change within the USA and the economic crisis of 2009 during which protectionist measures tented to be particularly high. Finally, the findings will be summarized and interpreted.

1.4 METHODOLOGY

As already outlined, the statistical program R will be used for the research part of the thesis. Different code was compiled by the author in order to draw conclusions regarding the research question.

For the research, three statistical methods will be used to investigate two different data sets. The first data set consist of stock prices of all companies of the producing and supplying automotive sector within the U.S. and Germany. The second data set consists of annual foreign direct investment[3] values for the U.S. and Germany.

The statistical methods used are Time Series Analysis, Multivariate Analysis and Network Analysis. A detailed overview of the specific techniques used for the research will be given within the research part of the thesis.

[3] Foreign Direct Investments describe capital expenditures of a domestic investor into a foreign market. They are often used as an indicator for globalization and international interrelation (Moon, 2009, p.1ff.).

2 LITERATURE REVIEW AND TOPICAL BACKGROUND

2.1 LITERATURE REVIEW

Different research regarding the influence of policy changes on international corporate interrelations can be found. The following chapter will outline the most important and recent research on the influence of protectionism on international interrelations in general and in case of many sources in particular, all within the automobile industry.

Sources sustain that massive political changes such as the turning towards protectionism will diminish international interrelations. In a recent statement the World Trade Organization argued that concerning protectionism it is important (World Trade Organization 2015, p. 104) “to remind the world of the dangers of economic isolationism – politically attractive in the short term, but globally harmful in the long term.“ Bhagwati describes rising protectionism as a dangerous hazard economies and companies have to be protected of (Bhagwati, 1988, p.48f.). Many other researchers and multiple studies come to the same conclusion concerning the influence of protectionism on international interrelations.

Gereffi, professor of sociology at Duke University, argues that raising protectionism has severe negative effects on international relations among countries. In detail, Gereffi establishes his findings on the actual political change in the USA. He implies that not only countries exporting to the U.S. would be hurt by increasing protectionism and for example higher tariffs. He also sees a threat for the country performing protectionism itself. Regarding Gereffi, that can be explained by higher production costs due to weaker supply chains within the U.S. (Gereffi, 2017, p.1ff). Interestingly, in an earlier article of 2005, during a time of trade liberalization, Gereffi and two other researchers found a rising level of international corporate ties and a network of vertically connected corporations (Gereffi et. Al 2005 p. 78ff). As described, after the governmental change within the U.S. in 2017, Gereffi describes and warns of the opposite development (Gereffi, 2017, p.1ff).

Furthermore, Gereffi claims that especially strongly interrelated industries, such as the automobile industry, will be affected strongly by rising protectionism. This is mainly due to their large amount of components which are used to produce final products and which are gathered from many different spots around the world. According to his findings, protectionism will damage those needed international ties and interrelations (Gereffi, 2017, p.1ff).

Finally, Gereffi points out another interesting consequence of a country rising protectionist measures. He is confident about the fact that establishing protectionism will lead to changes of international interrelations. Regarding this, he once again outlines consequences of the possible changes within the USA. Gereffi predicts that international relations, for example in the automobile industry, will change and moreover international ties to the U.S. will be reduced and replaced by other countries. This can for example be true for gathering parts for the automobile production. It is obvious that – concerning the research question of this paper – many corporations interacting internationally will be affected negatively by protectionism (Gereffi, 2017, p.1ff).

In line with the findings of Gereffi, a recent study of the U.S. American bank Morgan Stanley also points out possible consequences of rising protectionism within the USA. In line with Gereffi, the study found that in the short run mainly trade partners will be negatively affected by U.S. protectionism. On the other hand, Morgan Stanley predicts better economic results within the USA in the short term. However, in the long term not only international partners will be affected, but especially the U.S. itself.[4] Morgan Stanley therefore created a model for GDP growth with different levels of protectionist tariffs. Interestingly, all outcomes after fifty years showed a negative long-term impact on GDP-growth (Morgan Stanley, 2017).

In general, Morgan Stanley sees a big threat in shrinking international interrelation and predicts a stagnating growth in all countries participating in world trade. Additionally, an even bigger threat to international interrelated economies can be the counter reactions of other countries to the introduction of protectionism of one country. In consonance with the study of Morgan Stanley it is most likely that other countries will also introduce protective measures for their countries. In total, this would lead to less interlinked and more encapsulated economies (Morgan Stanley, 2017). Along with the conclusions of Morgan Stanley, Krishna mentions the dangerous effects on durably needed corporate interrelations by only small trade restrictions (Krishna, 1985, p.1).

A recent study of the Center for Automotive Research points into the same direction as the research listed earlier. The non-profit automotive research organization named above expects a change and realignment of the global trade setup in case of a drastic

[4] This valuation of short- and long term consequences of rising protectionism also finds support by other researchers of the World Trade Organization (World Trade Organization, 2015, p.104f.)

political change (CAR, 2017, p. 12ff). Though the study focuses on the potential termination of the NAFTA-Agreement, conclusions can be drawn in regard to all international interrelations within the automobile industry. The study suggests that in case of the termination of NAFTA as an U.S. American act of protectionism the other involved countries (Mexico, Canada) would turn away from the U.S. and seek other international partners for gathering parts and products for their automobile production. In conclusion, this will lead to a whole new set-up of international interrelations within the automobile industry. In addition to that, the study points out that also many other industries will be affected by international interrelation changes (CAR, 2017, p. 12ff).

This theory is also supported by other researchers such as Erixon and Razeen from the EPEC, the European Centre for International Political Economy. Within their studies of 2010, they encountered a strong worldwide rise in protectionism since the major crisis of 2008 and suppose that this fact will hardly damage the worlds trading system and many domestic economies. Moreover, the researchers see a huge threat by restricting open and globally interrelated economies and corporations (Erixon et. al., 2010, p.18).

Paul Krugman, professor of economics at Princeton University, also lays an emphasis on the possible changes of international interrelations among corporations due to rising protectionism. In line with the findings of the CAR, Krugman believes that international ties would not only be changed but also be shortened. In other words, under a possible strong protectionism by the USA, globalized networks, especially in strongly interlinked branches such as the automobile industry, are more likely to collapse or fall apart (Krugman, 2016).

Helpman, adds up to those findings, that under trade barriers and protectionism it is more likely that multinational corporation arise than corporations knot international interrelations with other companies (Helpman, 1984, p.451ff.).

In another article, Krugman who recently and multiple times criticized the efforts of raising protectionism within the USA, draws a scenario in which protectionism could have also positive effects. First, it is still important to state that protectionism, also under the following scenario of Krugman, would change and partially destroy international interlinked branches. But under the premise of every country adopting protectionist actions, Krugman predicts on the one hand side torn international trade but also overall higher employment within the world’s economies. Finally, it is important to state that Krugman only sees this as a theoretical scenario and states that such a

scenario would not be worth the achievements of international interrelations and trade collaboration (Krugman, 2009).

Another source which supports the statements of Gereffi and the Center for Automotive Research is Milner. Moreover, relating to the research question of this thesis, Milner makes a very interesting point by stating (Milner, 1958, p.3): "...domestic politics and international relations are inextricably interrelated. A country´s international position exerts an important impact on its internal politics and economics. Conversely, its domestic situation shapes its behavior in foreign relations." In other words, Milner argues that political orientations determine a country's interrelation with other countries in every aspect (Milner, 1958, p.3 ff).

While all the researchers named before primarily focused on bad influences of protectionism, it is also important to consider another point of view and list researchers who researched within the field of benefits or disadvantages of the opposite of protectionism, free trade or even found positive aspects of protectionism on international interrelations. In the following, current and important research of this kind will be outlined.

Gilpin argues that under liberalization of international trade interrelations among corporations and countries greatly expanded (Gilpin, 1987, p. 228ff.). Remarkably, Gilpin argues that protectionism must not be harmful to international interrelations in every matter. Therefore, he introduces the term of "cooperative protectionism" which describes trade agreements between certain groups and partners which close out others. Gilpin finds that this kind of protectionism applies certain rules in a strongly opening and interlinked world (Gilpin, 1987, p. 224ff.).

Krishna explores similar findings within her research in which she focused on voluntary trade restrictions[5] in certain markets. She argues that those restrictions are in the interest of the domestic market but can be favorable for the exporting country as well. Furthermore, she argues that trade cannot be restricted by certain protectionist measures. This argument would create the impression that protectionism is not always harmful to international interrelations. However, it is important to mention that Krishna only focuses on special market situations and on a rather soft measure of

[5] VER or Voluntary Trade Restrictions can be described as voluntary measures of protectionism. VER´s limit the amount of exported products to a certain country in order to protect the domestic market. Usually they are set voluntarily by the exporting country, in accordance with the importing country (Ethier, W., 1991, p.3f).

protectionism, namely VER. Her findings can therefore not be seen as generally true (Krishna, 1985, p.20).

Moreover, as already mentioned earlier, Krishna sees an in total negative effect of corporate interrelations by only small trade restrictions (Krishna, 1985, p.1).

Finally, Moon, researcher at the University of California, discovered that Free Trade Agreements or in other words agreements against protectionism which promote trade between countries, favor international interrelations. He bases his findings on Foreign Direct Investments (FDI), which describe capital expenditures of a domestic investor into a foreign market. They are often used as an indicator for globalization and international interrelation. Moon discovered that in case of existing Free Trade Agreements, Foreign Direct Investments were noticeably higher (Moon, 2009, p.1ff.).

Finally, it is important to state that no actual research could be discovered that describes rising protectionism as an overall advantage for international interrelations. Once again, it can be outlined that positive effects of protectionism are only described by research as a short-term effect and cannot be interpreted as positive overall (Morgan Stanley, 2017).

In summary, one can conclude that the majority of the research sees a big threat in rising protectionism to international interrelations. Many researchers focus on short-term benefits for countries raising protectionism but in the long-term see serious threats and disadvantages for all countries participating in global trade and to international interrelations in general. Moreover, it has been outlined multiple times that especially massively internationally interlinked industries such as the automobile industry face huge changes concerning their international ties and supply chains. Some researchers do not vilify protectionism completely and show scenarios in which protectionism cannot cause any of the effects named above. However, it is important to state again that most of these conclusions were based on very specific scenarios.

Since benefits of free trade and disadvantages of protectionism regarding international interrelations are obviously the main findings of all researchers named above, it is important to state that clearly there are different reasons for governments and countries to introduce protectionist measures. Since the thesis only focuses on the influence of protectionism on international interrelations, those reasons and discussions will not be covered by this thesis. As almost all research on the one hand side sees a threat in protectionism to international interrelations and on the other hand a benefit by free trade, the necessity of own research within this work becomes even more evidently.

Current research assures influence of political changes on international interrelations but misses to scale those influences. Furthermore, the automobile industry is often named as one of the main affected branches, but potential shifts in interrelations within the industry are not completely described. The research part of this paper will try to fill those gaps.

2.2 THE GLOBAL AUTOMOBILE INDUSTRY

“If the automobile industry were a country it would be the sixth largest economy”

(OICA 2018)

The global automobile industry is growing steadily. While global car sales declined during the economic crisis for a short period, overall worldwide car sales raised from about 58 million car sales in 2000 to around 95 million car sales in 2016 (Statista, 2018). In order to reach those huge numbers, more than nine million people are employed in business making or supplying parts for automotives. In addition to that, even more people are employed in industries producing supplements used for producing cars. Therefore, the automotive industry is one of the key economic sectors for almost every economy worldwide. Moreover, in many countries of the world the automotive industry is the major driver of economic growth (OICA, 2018). Even if the profit margins dropped from 20 % in the 1920s (IndustryWeek, 2007) to less than 8% today (Price Waterhouse Coopers, 2017, p.5), the industry is still a mayor economic driver.

In addition to that, the social and political role – together with the fact that it is one of the biggest employers worldwide – make the automotive industry an even more important and special industry (IndustryWeek, 2007). Due to its high social meaning in the general public and the huge reliance of many economies and people, the automobile industry has developed not only to a major economic player, but also to an important political influencer (Sturgeon et. al., 2009, p. 21ff).

In summary, one can say that the automotive industry with its huge economic, social and political influence is a very special and interesting industry. Especially because of its size and its importance it is interesting to investigate the industry’s reaction to political changes.

2.3 THE INTERNATIONALIZATION OF THE AUTOMOBILE INDUSTRY

For many years, globalization has been one of the most important factors changing and shaping the world's economy and trade. Almost every industry has been globalized more and more, especially the automotive industry. As already outlined earlier, the automobile industry was acting as a pioneer industry concerning globalization. Already in times of the industrial revolution, in the early 20th century, international production was introduced to the automotive sector. Ford and GM started producing in different countries in 1928 (Sturgeon et. al. 2000, p.1ff.).

The credit insurer Euler Hermes ranks the automotive industry as one of the most globalized industries of the world. This is true for car producers and also suppliers to the industry (Euler Hermes, 2017). For suppliers Euler Hermes states that (Euler Hermes, 2017) "global presence is a must". For producers it is specified that today it is crucial to be active in every market around the world in order to be successful (Euler Hermes, 2017).

Consequently, today and in the past years international and global interrelations and connections within the industry are usual. Commonly today, huge parts of production have been shifted to countries with low labor costs but comparably high quality such as China, India or Brazil. Furthermore, another very important globalization aspect of many industries and the automotive industry is the outsourcing of whole production steps. This leads to a two sided development within the industry. On the one hand side, big automobile producers invest into foreign developing countries in order to set up production lines and benefit from the low costs in those countries. On the other side, developing countries and its firms invest into their own infrastructure and enforce their ability to supply better quality. Since many big corporations are active within the automotive industry, mergers and acquisition of comparably small firms are a common procedure. Overall, the consequence is big automotive businesses on the production, but also on the supplier side. The result of this development is obvious. A globally interlinked industry with large corporations. Consequently, not too many companies are active on the production and supplier side of the automotive industry (Sturgeon et. al., 2009, p.1ff).

Another interesting part of the globalization within the automotive sector is the country specific assembling of the cars by their producers. As outlined earlier, car producers invested in many countries in order to produce cars there. A common feature of the

automotive sector of today is to assemble the final product within the country it gets sold (Sturgeon et. al., 2009, p.1ff).

Still, it is astonishing that in a highly globalized industry such as the automotive industry regional patterns still play a very important role. Compared to other highly globalized industries such as the textile industry, the automotive industry still acknowledges many different regional habits within their production. This is due to huge differences for the demand of the final product in different parts of the world. Consequently, this is once again one of the main reasons for the opening of many local assembly and production lines (Sturgeon et. al., 2009, p.14ff). Another reason for the relatively strong regional aspect of the automotive production is its political influence. The automotive industry around the world has developed to the industry with one of the biggest political clout. Even if no tariffs or import restrictions exist, foreign producers and suppliers tend to produce locally in order to prevent and bypass political pressure or countermeasures (Sturgeon et. al., 2009, p. 21ff).

In summary, this makes the automotive industry a very special industry in the globalized world today. Like many other globalized industries, the automotive industry has huge globally connected supply chains for its productions. Still, it has a national or even regional touch which makes it different to other highly globalized industries such as the textile industry. Reasons for this were outlined earlier, but can mainly be named as special demands of different regions and also the strong political influence and radiance of the industry itself (Sturgeon et. al., 2009, p. 19ff).

2.4 THE U.S. AND GERMAN AUTOMOBILE INDUSTRY

In order to understand possible changes and reactions of the interrelations between the U.S. and German automobile industry, it is inevitable to look at the current situation of the industry within both countries. The following chapter will therefore provide an overview of the US and German automobile industry.

The German automobile industry is the biggest industrial segment of Germany with a turnover of 404 billion euro in 2016. Moreover, the german automobile industry takes up almost 20% of the overall german industry revenues (GTAI, 2017). Currently, more than 800.000 people are employed within corporations of the automotive industry (Statistisches Bundesamt, 2016). In conclusion, the german automobile industry can be seen as the key branch of the German economy which is well situated in its domestic, but also in foreign markets. Next to the final products, German suppliers to

industry are also an important factor within the international automotive industry (Diez, 2012, p.1ff).

The USA is currently the second biggest car producer of the world. More than 940.000 people worked within the U.S. automotive industry in 2016. Almost 4 % of the U.S. gross domestic product was generated by the automotive industry (Select USA, 2017). Furthermore, U.S. American car producers sold almost 17,5 million cars in 2016. In line with the German automobile industry, the automotive sector within the USA, with production and suppliers to industry, can be described as one of the major backbones of the U.S. economy (Auto Alliance, 2017).

German imports in the automobile sector from the U.S. were set at 23 % and exports to the U.S. at 34 % of overall trade activities in 2016 (Außenwirtschaftsportal Bayern, 2017). These numbers already show not only the huge importance of the industries for their own economies, but also for each other.

Recently, the VDA, Union of German Car Producers, stated that the U.S. and German automotive industry are strongly dependent on each other and at best, connections will become even stronger. In line with the statement, German car producers strengthened their fabrication within the U.S. and raised their production from 214.000 units in 2009 up to 850.000 units in 2016 (VDA, 2017). This does also show the huge importance of the German automotive sector for the U.S. economy and the U.S. automotive sector. Since Germany raised its production strongly, the U.S. automotive sector relies on future investments and the protection of a lot of jobs (EY, 2017 p. 2ff). Current numbers present at least 110.000 jobs created by investments of companies from the German automotive sector into the U.S. (Politico, 2017). Additionally, Germany is also an important market and production site for U.S. American companies of the automotive sector. Companies such as Ford have own production lines within Germany and the market share of U.S. automobiles is clearly in double-digits (Handelsblatt, 2017).

To outline the importance of Germany and the U.S. for the global automotive industry, one can introduce current figures of the credit insurer Euler Hermes. In its global automotive report, Euler Hermes outlines that Germany and the U.S. are the key players of the whole industry concerning international trade. While Germany is number one importer and number two exporter of the world’s automotive industry, the U.S. is number one importer and number two exporter.

This means that Germany and the U.S. lead both categories of international trade of the automotive sector. Concerning the third big pillar of the industry, production, China

outranked the U.S. and Germany and is the biggest producer of the automotive industry. Still, one can say that concerning international trade and international interrelations Germany and the U.S. are one or the most important countries for the whole automotive industry (Euler Hermes, 2017).

COUNTRY	ROLE
	#1 Importer #2 Exporter
	#1 Exporter #2 Importer

Figure 1 - Key players automotive industry (Euler Hermes, 2017)

Finally, it is important to remark why the automobile industry was chosen as the sample industry for the research. One of the main reason for the focus on the automobile industry can be seen in the pioneer role of the automobile industry when it comes to the topic of globalization (Nunnenkamp, 1998, p. 294f.). Furthermore, concerning international interrelation, it is hard to detect a more globally networked branch other than the automobile industry (Zeit, 2017). As outlined before, this is especially true for the U.S. and German automobile industry (Außenwirtschaftsportal Bayern, 2017).

On the one hand side, the pioneer role and the strong interrelations between the two countries within the industry serve well to investigate possible changes by certain events. On the other hand, it might be possible to transfer possible findings to other industries which tend to develop slower or later.

2.5 DEFINITION PROTECTIONISM

For the following research and composition of this thesis the terms protectionism and free trade will be defined. As outlined within the introduction, protectionism will serve as the key case of governmental changes which are subject of the research of this thesis. Since especially the term of protectionism can be interpreted in a lot of different ways, it is important to narrow the term which underlies this research.

First of all, since the field of research is majorly about international interrelations between corporations, the definition of protectionism of this paper will focus on

protectionism in the field of trade. Common protectionist measures disturbing trade can be described as policy implements that are supposed to protect domestic companies against firms from other countries. Such policies can for example be tariffs, trade quotas (Sykes, 1999, p.1) or any other practices of governed defense of the domestic market. Usually, protectionist measures raise the price of foreign goods in a domestic market or otherwise restrict the amount of a certain foreign good that can be sold in one particular domestic market (Nollen et. al., p.494f). Moreover, such polices aim at obstructing free trade between different countries (Aggarwal, 1994, p.3f). Current examples of protectionist measures are trade restrictions by the U.S. and the European Union against the import of certain irons from mainly China and Canada (WTO II, 2017, p. 79ff.).

The opposite of protectionism concerning trade is “free trade”. In a market under free trade, policies aim to inhibit market limitations so that markets can regulate and work on their own. Policies that remove tariffs or measures regulating prices or quantities of a product being sold are common with free trade. Moreover, the main goal of free trade is to give all countries participating in trade the possibility to reach maximum production and consumption (Nollen et. al., p.494f).

3 TOPICAL STATUS QUO

3.1 PROTECTIONISM AS A GLOBAL TREND

As already outlined earlier, the current governmental change in the U.S. signifies a switch from a trade-friendly policy to protectionism within the USA (Krugman, 2016, p.1f). In order to further understand possible changes in international interrelations within the German and U.S. American automotive sector, the following chapter will give an overview of the current trade and interrelation status of the two countries. Furthermore, an overview over the global economy will be given in order to detect potential extraordinariness for the two countries which are the main subject of the research.

Interestingly, rising protectionism did not emerge in line with the last governmental change of the USA. More likely, the worldwide major economic crisis in 2009 brought an over thirty-year long period of trade liberalization to an end. In 2009, international trade experienced the strongest decline since the 1930s which led to a trend from trade liberalization to protectionism (Erixon et.al, 2010, p. 1f.). It is important to state, however, that the introduced measures of protectionism were not very trade persuasive. Still, the World Trade Organization explicitly warned of the danger of raising protectionism (World Trade Organization, 2009, p.160).

Since 2009 marked a possible start of a new era of protectionism, and consequently the restriction of international interrelations and trade, it is important to look at the development after the crisis in 2009.

Before looking at the USA and Germany in particular, it is legitimate to look at the current situation within global trade. Consequently, a recent report of the World Trade Organization points out that between 2016 and 2017 the lowest monthly implementation of trade restrictions was recorded (World Trade Organization, 2017, p.4). Figure 2 shows the average monthly trade restrictive measures which have been introduced within the WTO member countries.

Even if the restrictive measures are at an all-time low since the crisis in 2009, the current trend has to be confirmed in the near future. In addition to that, the same study of the World Trade Organization points out that also the trade facilitating measures are situated at the lowest level since 2009 (World Trade Organization, 2017, p.5).

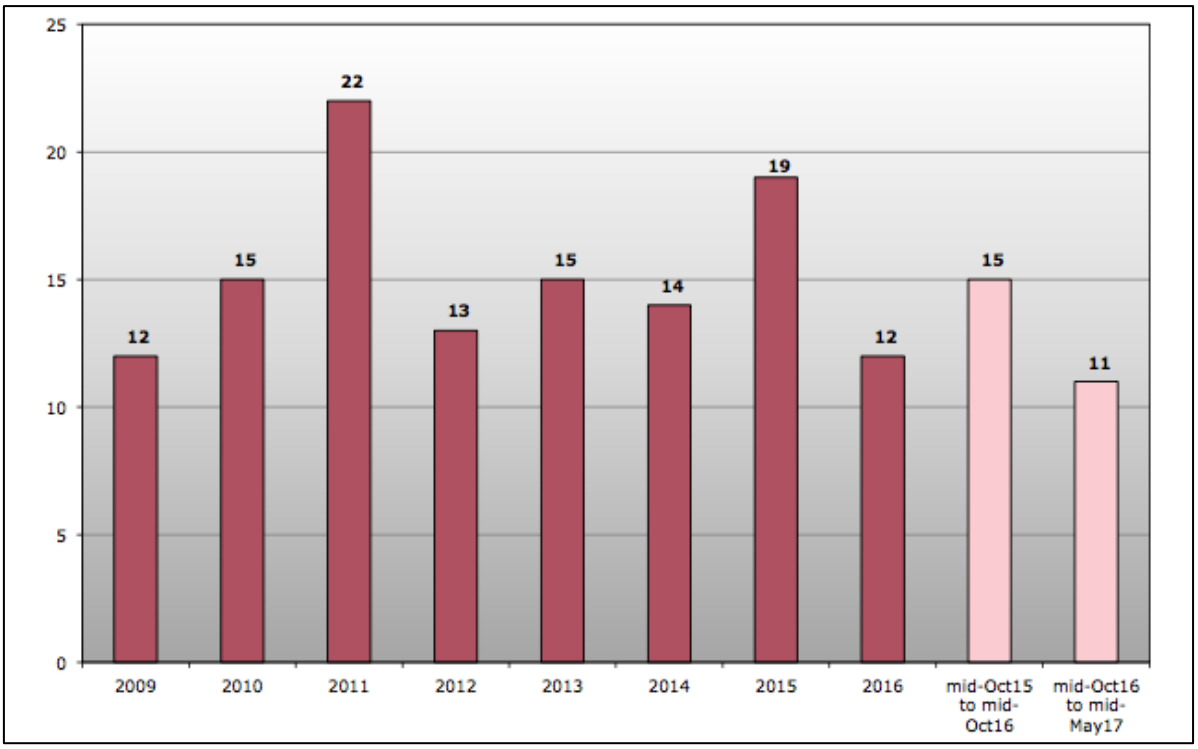

Figure 2 - Trade restrictive measures – Average per month (World Trade Organization, 2017, p.4)

Nevertheless, the present numbers and the current trend point to the tendency of the WTO members to oppose restrictive trade measures as tools of protectionism in the eyes of the World Trade Organization (World Trade Organization, 2017, p.28). Still other studies show, that the fear of emerging protectionism is very present. The Worldbank named protectionism within their global economic prospect (Worldbank, 2017, p.3) a “risk to the global outlook.” However, the Worldbank also argues in the same context that so far protectionist measure cannot be seen as a reason for weaker trade (Worldbank, 2017, p.11). Still, it becomes obvious that protectionism and its possible rise is a current topic and threat in the eyes of major economic institutions.

As outlined before, it is also important to look at the two countries which are the main subject of the research of this thesis, namely the USA and Germany. Since the election of Donald Trump as president of the United States of America, a stronger expectation for trade restrictive measures and protectionism can be identified. This is mainly due

to various threats of the president to implement stronger trade restrictions before, during and after the election of the new U.S. president (Epstein, 2017).[6]

If one once again looks at recent figures of the world trade organization from October 2016 till May 2017, the U.S. implemented one new trade facilitating measure and 22 trade restricting measures (World Trade Organization II, 2017, p. 68ff). First of all, in line with the evidence of figure 2, it already becomes obvious that compared to eleven restrictions on average per month for the whole WTO, 22 new measures in a time-span of eight months seem comparatively high. Compared to the period from May 2016 to October 2016, the newest figures are also higher. From May 2016 to October 2016, only 16 new trade restricting measures were implemented by the USA (World Trade Organization, 2016, p. 70ff.). It is important to state that this uprising trend of protectionist measures cannot be confirmed by earlier measurement periods. More likely, the amount of U.S. trade restricting measures was higher than those of other WTO members, even before the governmental shift within the USA (World Trade Organization II, 2016, p. 84.)

In conclusion, one can say that protectionist measures within the U.S. are comparably high. Besides, it is still questionable if and to what extent advertised trade restrictions and measures of protectionism will be enrolled by the new U.S. government. First enrollments of tariffs on certain countries and certain goods such as aluminum and steel strengthen the impression that the threats of higher protectionist measures are not only to be taken seriously, but will most likely be implemented further and further under the administration of President Donald Trump (White House, 2018).

Concerning Germany, one can once again look at the current figures of the World Trade Organization. The aforesaid WTO study only raises data for the whole European union. Since Germany is a member of the European Union, trade measures of the EU can already serve as a first good indicator for the present situation in Germany.

The recent figures of the World Trade Organization from October 2016 until May 2017 show that the EU implemented no new trade facilitating measures, but eight new trade restricting measures (World Trade Organization II, 2017, p. 68ff). In the time frame before, from May 2016 to October 2016, the European Union implemented eight new trade facilitating measures and seven new trade restricting measures (World Trade

[6] Many other sources can be named such as (The Economist, 2017), (Zeit, 2017), (Financial Times, 2017)

Organization, 2016, p. 70ff.) Compared to the recent U.S. numbers of the WTO one can get the impression that the European Union is less protective concerning trade. By introducing a recent statement of the German government this conclusion can be reaffirmed for Germany only. In the statement of the German government, free global trade is described as a major key for growth and jobs. Furthermore, free trade agreements can be seen as necessary guidelines in a growing globalized world (Bundesregierung, 2017).

Summing up, one can come to the conclusion that from the figures presented above, protectionist measures within the U.S. are stronger than within Germany. As outlined earlier, it is noticeable that in the past year trade restricting measures of the U.S. were higher than the average of the WTO members in total.

Finally, it is important to state that it is not deniable that since the crisis of 2009 protectionist measures on international trade were and still are a current threat to international trade (Erixon et.al, 2010, p. 1f.). Furthermore, since the election of Donald Trump and the accompanied governmental change, the fear of partner countries such as Germany, of protectionist measures by the U.S. and of restricting trade is growing stronger (Reuters, 2017).

4 EMPIRICAL RESEARCH AND DATA ANALYSIS

4.1 RESEARCH OBJECTIVE

In order to point out the objective of the empirical part of the thesis, the research question will once again be outlined:

"How are International Corporate Interrelations affected by Extreme Political Changes? A Statistical Analysis of the Influence of Governmental Shifts to Protectionism on the Interrelation between the U.S. and German Automobile Industry"

The aim of the empirical part of the research is to analyze the effect of raising protectionism in the area of trade on international interrelations within the U.S. and German automobile industry. In other words, the research will try to detect possible changes within international interrelations and international trade due to the threat or the introduction of protectionist measures as defined in the definition of chapter 3.1.

The main questions to be answered within the scope of the research are the following:

1. What influence do policy changes into the direction of protectionism have on international interrelations?
2. Do such policy changes trigger drastic changes and movements within a highly globalized branch such as the automobile industry?
3. Do policy changes or advertised policy changes influence the international trade setup of whole industries?

4.2 RELEVANCE

As already outlined, an interesting contrast is evolving in many parts of the world today. On the one hand side, the globalization proceeds and growing international interrelations and supply chains develop. On the other hand, many countries experience governmental shifts which aim at protecting their country from too many external influences. Countries such as the U.S. recently experienced such governmental shifts and fear of rising protectionism got bigger (Reuters, 2017).

In chapter two it became obvious that many researchers fear the consequences of protectionism on international trade and international interrelations among firms. Therefore, it is pertinent to detect possible international interrelations changes. Since the automobile industry is one of the biggest and most interrelated industries in the world, it often occurs as a pioneer industry (Nunnenkamp, 1998, p.1f). Accordingly,

potential findings of changes within international interrelations due to governmental shifts towards protectionism are instructive for other industries. In other words, it might be possible to transfer findings to other branches which develop slower or later. Consequently, the objective of the research of this thesis will be to analyze possible changes and give recommendations on how international trade and interrelation will develop.

This is especially true for my field of studies “International Business”. Understanding the influence of political changes on international interrelation is an important part to many different parties.

4.3 DATA DESCRIPTION

For the research two data sets will be used: Stock prices and Foreign Direct Investments. The following two chapters will introduce the two different datasets.

4.3.1 DATA DESCRIPTION – STOCK PRICES AUTOMOTIVE INDUSTRY

The first data set which will be analyzed within the thesis includes stock prices of German and U.S. companies of the automotive sector. For the research the closing rates of the stocks will be used. The data will be collected by R-Code from Yahoo-Finance. The time frame of the data collection is initially set from 2008 until today, a total timeframe of almost nine years. Stock prices from 57 companies are part of the data set. 27 of them are German, 29 are U.S. American companies. Those 57 companies represent all U.S. or German companies listed in an international stock exchange and are part of the automotive sector. In other words, the data set represents the most important companies of the automotive sector of both countries. In addition to that, the companies can be divided into car producers and suppliers, who provide parts for the automobile production. Table one gives an overview of the datasets arrangement.

	Car producer	**Supplier**	**TOTAL**
USA	8	21	**29**
Germany	5	23	**28**

Table 1 - Overview dataset – Stock prices

The type of variable is numeric, continuous. The unit of the variable is numerical. A disadvantage of the dataset is that it contains data for a limited number of companies.

This is due to the very specific field of research. In order to promote significant research results, a second data set is introduced and will be analyzed. It will be introduced in the following chapter.

In terms of data issues, the data is tested concerning missing values and other inconsistencies. Missing values occur for certain parts of the data. This is mostly due to companies which converted to a public limited and public traded company within the set time-frame or also for the occurrence and differences of national holidays within the U.S. and Germany. Before an analysis is carried out, missing values have to be replaced. Possible R-Functions to replace or remove missing values are na.omit() or na.approx().

Finally, na.omit was not used for the replacement of missing values within the data set. The function na.omit() returns the object with list wise deletion of missing values. Therefore, na.omit() cannot be seen as the best option for missing value replacement since already a whole row is removed from the data set if only one observation of the data set contains a missing value (Quick-R, 2017). This would reduce the data set dramatically. Instead, na.approx() is used for the replacement of missing values. The method replaces missing values by linear interpolation (r.documentation, 2017).

Furthermore, some companies included in the original data set which clearly belong to the U.S. and German automotive industry had so many missing values that they were dismissed from the data set completely before the analysis. Those companies were: BBS (automobile supplier, Germany), Lythia Motors Inc. (automobile supplier, USA), Tenneco Inc. (automobile supplier, USA), Spartan Motors Inc. (automobile producer, USA). In addition to that, two companies had to be replaced for the evaluation of the second event. The companies removed for the second event (before and after the election of Donald Trump) were Winnebargo Industries, due to too many missing values, and Wanderer Werke AG which became insolvent in 2010.

After the replacement of missing values and the exclusion of the companies named before, the data can be used for the analysis.

4.3.2 DATA DESCRIPTION – FOREIGN DIRECT INVESTMENTS

The second data set which will be part of the research consists of data regarding FDI – Foreign Direct Investment. Aforementioned, Foreign Direct Investments describe capital expenditures of a domestic investor into a foreign market. They are often used

as an indicator for globalization and international interrelation (Moon, 2009, p.1ff.). Besides, the OECD depicts FDI as a (OECD, 2008, p.3.) “key driver of international economic integration.” FDI postulates a resource for deeper and permanent interrelations between economies. Therefore, FDI can be understood as a positive driver for international trade.

The data set consists of the FDI values from Germany into the U.S. (BEA I, 2017) and of the FDI values from the U.S. into Germany (BEA II, 2017). The time frame of the data collection is set from 2000 until 2016. The type of variable is numeric, continuous. The unit of the variable is numerical. Regarding data issues, the data set does not contain any missing values. The data is also tested to be free of other inconsistencies.

The second part of the FDI data set contains information especially on the automotive industry. It contains data from 2003 until 2012. The data contains outward foreign direct investment flows from Germany and the U.S. just for the automotive sector. The type of variable is numeric, continuous. The unit of the variable is numerical. No data issues were found within the data set. Furthermore, the data set does not have any missing values and is tested to be free of other inconsistencies. The data is gathered from the OECD data base (OECD, 2018). The original data contained data for all industries listed by the OECD. Unnecessary data of other industries was removed prior to the analysis.

Finally, both parts of the FDI data set can therefore be used for the intended analysis.

4.4 HYPOTHESES

In conjunction with the findings within the literature review in chapter two, this chapter is going to state hypotheses which will be examined within the empirical research. Furthermore, the accuracy of the stated hypotheses will be checked within the summary of the empirical research.

Hypothesis 1 – Protectionism diminishes international interrelations

Protectionism in the area of trade can be seen as an economic isolation of the country introducing protectionist measures (World Trade Organization 2015, p. 104). As presented within the literature review, many researchers draw the conclusion that protectionism destroys or shrinks international interrelation. It is therefore expected that after the introduction or advertisement of protectionist measures existing international interrelations are destructed.

Hypothesis 2 – Protectionism changes existing international interrelations

Next to the eradication of international interrelations by the introduction of protectionist measures, research also named interrelations changes as possible consequences. Within the literature review, recent studies are presented which argue that in case of one country introducing protectionism other trade-wise related countries will turn away from this particular country. In conclusion, those countries would seek other international partners or cooperations they will interrelate with (CAR, 2017, p. 12ff). It is presumable that shortly after the introduction or advertisement of protectionist measures international interrelations are changing and usual patterns are reformed.

Hypothesis 3 – Protectionism influences the international setup of whole industries

As described within the literature review, researchers stated that protectionism does not only diminish or change international interrelations of single cooperation but can also possibly change the setup of whole industries (Krugman, 2016). It is likely that shortly after the introduction or advertisement of protectionist measures international interrelations setups of whole industries change as a major consequence.

Hypothesis 4 – Free Trade promotes international interrelations

In order to introduce another view to the empirical research, also the opposite of protectionism, free trade or free trade agreements will be investigated on their influence on international interrelations. Current research, outlined within the literature review explored that in times of trade liberalization or with the issuance of free trade agreements international interrelations and global ties between cooperation experience growth (Moon, 2009, p.1ff.). It is therefore expected that in times of trade liberalization international interrelations will grow in line with free trade agreements.

4.5 ANALYTICAL RESEARCH

The following chapter is going to introduce the methodology, methods used and the course of investigation of the research part of the thesis. First of all, the methodology in general is going to be outlined. Following, the explicit methods used within the research are introduced and described in detail. Finally, the course of investigation is presented.

4.5.1 EVENTS

In order to be capable to analyze the research question of this paper and to examine the hypotheses stated in chapter 4.4, it is necessary to inspect the connection to the events identified to signal changes to trade protectionism or trade liberalization with the relation and reaction of the two different data sets. In case of the first data set, those reactions will be drawn to the companies directly which are represented by their stock prices. In case of the second data set, connections will be drawn from the event to the actual value of the Foreign Direct Investment. In order to detect possible changes, the data sets will be examined within a time frame before and after the chosen events.

The events selected for the research are the following:

Event 1 – Global economic crisis 2008

As already outlined earlier, the global financial crisis ended a long lasting era of trade liberalization. Many countries introduced protective trade measures to protect their domestic economy of even more damage (Erixon et.al, 2010, p. 1f.). To examine possible changes, parts of the data sets before and after the crisis will be examined. Within the global economic crisis, the collapse of the Lehmann Brothers bank marked one of the biggest financial and economic break downs in history. Therefore, the collapse of the Lehman brothers bank can be interpreted as the peak of the economic crisis. Consequently, the time frames investigated within this event, will be situated around the date of the collapse of Lehmann Brothers, the 15th of September 2008 (Mawutor, 2014, p. 84ff.).

Event 2 – Election of new U.S. president Donald Trump 2016

When Donald Trump got elected president on the 8th of November 2016, fear of rising U.S. protectionism around the world emerged. This is due to the fact that during his campaign the candidate often threatened to raise protectionist measures in order to protect the U.S. market (Reuters, 2017). Newly, it can be explored that the threats during the campaign are already transformed into policies which are restricting free trade. One can name the aforementioned introduced tariffs on steel and aluminum (White House, 2018). Therefore, one of the events which will be subject to investigation is the election of Donald Trump. Consequently, the thesis will examine the time before Donald Trump became president and a timeframe shortly after today. This is due to the fact that while writing this thesis Donald Trump carried out his threats

and raised protectionist measures such as tariffs during the last months. In other words, the time frame before Donald Trump will be set to January 2016. As figure 2 and the outlines of chapter 3.1 show the WTO marked the beginning of 2016 as a year of low protectionist measures. It seemed that the aftermath of the economic crisis and its protectionist upraise stopped. As also mentioned in chapter 3.1 U.S. protectionist measures were higher than the WTO average but still comparably lower. The time frame is therefore valid to be named a low protectionist time. The time frame within the era of Donald Trump will be May 2018.

Concerning the inspection of the events named above, it is from special importance for the research to filter and consider any other possible events or incidents that could have caused potential changes within the datasets. In other words, can it be rejected that other events and information released during the analyzed time frame influenced the data sets.

Due to the huge number of companies in the first data set, stock prices, only the most conspicuous changes will be investigated. This will be the most promising way to detect valuable information regarding the research question and the stated hypotheses.

To analyze the huge amount of data, the statistics program “R” was used as it offers an environment for statistical computing and visualization. Furthermore, R makes it possible to compile a wide range of data in a lot of different ways. (Stowell, 2014). R is therefore most suitable to identify answers to the research question of this thesis.

With regard to the two different data sets and the two different events which are subject to the research, the research will be split up into four different chapters. For each event and each data set one chapter will be outlined for the course of investigation, which in turn is outline in a later sub-chapter. The findings of all four chapters will be summarized and connected to the research question and to the hypotheses within the end of the research chapter of this thesis.

4.5.2 METHODOLOGY

In the following three sub-chapters the three statistical methods used for the empirical research will be introduced. Since all the methods will be performed by R, the code for every method will be tacked to this thesis in the appendix. Finally, it is important to state that not all methods will be used in all cases and for all data sets. Only methods applicable and useful for the purpose of the research questions will be used.

4.5.2.1 MULTIVARIATE ANALYSIS

Principle Component Analysis (PCA)

Principal component analysis is a method to reduce variables of a data set to fewer principal components. This will help to overview the data of the data sets easier. By running a principle component analysis correlated variables are transformed into a new arrangement of uncorrelated variables. Those new variables are also called principal components. The newly created principle components are ordered by their importance regarding the explanation of the data set. The goal of a successful principle component analysis is to reduce the number of variables explaining the core of the data set. Consequently, another low-dimensional model can be used to interpret the data (Everitt et. al., 2011, p. 60ff.).

Within the principle component analysis, next to the principle components in general also the biplot is used for the analysis.

The biplot is a graphical model that represents the contribution of each variable to the first two and therefore most important principle components. The x- and y-axes of the biplot each represent one of the most important principle components. The shown data is a composition of the eigenvalues and eigenvectors of the covariance matrix. Therefore, the biplot is attractive to identify certain patterns within the data set (Everitt et. al., 2011, p.92ff).

Cluster Analysis

Cluster Analysis is a common method to detect potential groups our patterns within a data set. Usual methods within a Cluster Analysis are k-means Clustering, and model-based Clustering (Everitt et. al., 2011, p. 166f.).

Multi-Dimensional Scaling

Distance matrices are used to plot a map in order to show how similar or different observations are, based on the data (Kruskal, 1964, p.1ff.). Inside the research of the thesis Multi-Dimensional Scaling will be used to identify potential changes within the data sets prior and past the isolated events of protectionism.

4.5.2.2 TIME SERIES ANALYSIS

Time Series Analysis displays a certain sequence of time with the progress of certain values of a variable. Regarding the final stock prices, Time Series Analysis can help to

detect possible connections between certain events regarding protectionism (as outlined in the prior chapter) and stock price movements. Concerning international interrelations, it will be interesting to identify possible development patterns between two different companies. For the second data set, including values of the foreign direct investment, Time Series Analysis will help to identify changes in form of drops or rises of foreign direct investment values. Consequently, conclusions may be drawn from those changes to events regarding the introduction of protectionist measures (Shumway & Stoffer, 2011, p.1ff.).

4.5.2.3 NETWORK ANALYSIS

In order to run the Network Analysis, both data sets are normalized and afterwards complemented by logarithmic calculations. Successively, the data is prepared to analyze the influence of it to certain events outlined before. To do so, the Network Analysis will for every case be performed for two similar timeframes. For this thesis, the time frame used will be one month before and one month after the chosen protectionism event. This approach makes it possible to compare situations pre and post of the event and to derive possible conclusions. Furthermore, it will be possible to detect changes of relations and structures within the networks and drastic changes among specific companies or branches of the automotive industry. For this thesis, the Network Analysis will consist of two stages. A Degree Distribution Analysis and a Minimum Spanning Tree Analysis are carried out. Both stages will be introduced in the following.

Degree Distribution Analysis

By running a “Degree Distribution Analysis”, connections of every node of the data set are calculated. A node represents one element of the data set. In case of the stock price data set, one node will represent one company. The “Degree Distribution Analysis” allows to detect how many contacts one node has to other nodes in one network. Therefore, the degree distribution creates a probability scattering of all degrees of one network (Dalgaard, 2008, p.1ff.). In conclusion, the “Degree Distribution Analysis” gives a first overview of a network. Furthermore, drastic degree changes of one node help to identify parts of the dataset which should be investigated in more detail.

Consequently, within the following research, nodes with the highest negative and highest positive degree or betweenness changes will be examined especially.

Minimum Spanning Tree Analysis

Within the “Minimum Spanning Tree Analysis” networks are illustrated. By running the analysis in R, all vertices of the data set are connected by using the lowest achievable total edge weight (Cormen et.al , 2009, p.1ff). The visualizations created help to identify connections and interrelations within the data set which can then be used to draw a conclusion and analyze market behavior in connection to a certain event (Luke, 2015). Again, analyses are conducted one month prior and one month after the examined protectionist event.

Once again, it is important to outline that pre- and post-event analysis can draw conclusions in the direction of the selected events and its impact on the data. Still, it is possible that changes are triggered by other factors or events that happened within the evaluated time frames. Therefore, it is essential to analyze possible other events which happened within this time frame. Still, it possible that unknown effects will influence the results of the research.

4.5.3 RESEARCH DESIGN

Since many different methods are used for the research, it is important to follow a certain pattern for the use of the different methods. This is especially important in order to draw targeted conclusions regarding the research question and hypotheses stated within the thesis.

For the FDI data set only the Time Series Analysis will be used. Different methods of Time Series Analysis will be applied in order to draw conclusions regarding the research question and the hypotheses stated within this thesis. Since the FDI data set is relatively small and the data set is fairly uncluttered, the use of multivariate analysis methods, especially principle component analysis and classification methods, are not completely applicable. This is especially true since the FDI data for the U.S. and Germany will be investigated separately. Consequently, the data is not multivariate and multivariate analysis is not applicable.

In addition to that, Network Analysis is also not appropriate for the FDI data set since it only consists of annual FDI values for two different countries over a short time frame. Network Analysis would not clarify the data any further in the case of the FDI data set. However, different methods of Time Series Analysis will be applied to the FDI data set and is applicable to allow drawing conclusions regarding the research question.

Regarding the stockprices data set, it was decided not to use Time Series Analysis as a method for this data set. With the stock price data set, Time Series Analysis could be used to model different developments of stock prices related to the events chosen for this research. Also, Time Series Analysis could be used to create forecasts on the development of the stock prices or its volatility (Tsay, 2013, p.1ff). This would in no matter help to investigate possible patterns or indications regarding the research question of this paper or the hypotheses stated for the analytical research course of this investigation. Since the thesis tries to explore patterns on international interrelations changes due to the raise of protectionist measures, an analysis of the development of stock prices, as performed by a Time Series Analysis will not help. In other words, Time Series Analysis with stock prices can generate information regarding the reaction of stock prices to a certain event but cannot spawn evidence of possible changes in interrelations between certain companies. Therefore, time series was not used for the data set stock prices.

However, all the other methods introduced in earlier chapters are applied to the stockprices data set. Therefore, the course of investigation for the stock price data set of this paper will be the following.

Overview of data set and identification of patterns

Methods of principle component analysis, correlation analysis, biplot and Clustering are used to identify first patterns within the data set regarding the research of the thesis.

Confirm findings

For the second part of the research classification methods are used as a first tool for confirmatory analysis. In the case of this thesis, Multi-Dimensional-Scaling is used for the research. The method is used in order to approve findings of the methods used for the first part of the analytical research.

Verify findings within in-depth analysis

Finally, Network Analysis is performed. Network Analysis will be executed as the second part of confirmatory analysis and the final part of the research. Network Analysis is well suited for looking at certain findings within the data set in detail. Therefore, within the Network Analysis specific findings of the before applied methods will be inspected within the Network Analysis in order to strengthen and verify findings.

4.5.4 RESULT OF ANALYTICAL RESEARCH

4.5.4.1 STOCK PRICE DATA SET

The stock data set contains stock prices of companies of the U.S. and German automotive producers and suppliers listed at a stock exchange (excluding companies with too many missing values).

4.5.4.1.1 EVENT 1 – GLOBAL ECONOMIC CRISIS

Overview of data set and identification of patterns

By running a principle component analysis, a first hint for a change within the data can be explored. While looking at the data before the economic crisis, three principal components account for almost 80 % of the variation of the variables. When looking at the data after the event, one principal component already accounts for more than 85% of the variation of the variables.

Also, the investigation of the biplot plots (attached to the appendix / Appendix 1) signals a change within the data before and after the event. The biplot generated before event one shows that 64,3 % of the variance can be explained by the first principle component. Another 27,3 % is explained by the second principle component. One company, the German Audi AG, points directly into the direction of principle component two, while other companies are either pointing to principle component one and two or into the direction of none of the first two principle components. When looking at the biplot generated after event one, already 90,6 % of the variance can be explained by principle component one. Again, the Audi AG points directly into the direction of principle component one. Another 4,4 % of the total variance are explained by principle component two. Companies which are pointing directly to principle component two are the German companies Siemens AG, Continental AG and Volkswagen AG. Consequently, those companies and the aforementioned company Audi AG could be of special interest in the following analysis.

The principle component analysis, including the biplot, provides a first hint that changes inside the data can be explored within the timeframe before and after the event of the economic crisis. To lead the research into the right direction, a correlation analysis was performed. Therefore, correlation among all companies was compared before and after the event. Points of interest of the correlation analysis were correlation changes in between U.S. and German companies of the data set. Correlation changes from a

positive or negative high linear correlation to no linear relationship or counter-wise are of special interest. For the purpose of the thesis such a correlation change could be a first indicator for interrelation changes due to a protectionist event. Several correlation changes similar to the ones explained above could be explored within the data set for event one. The companies attached to appendix two are therefore of special interest for the following steps of the research (attached to the appendix / Appendix 2). Furthermore, the correlation data is provided within the Cloud Appendix.

As a last step of getting an overview of the data for event one, a Clustering analysis was performed. First, the distance measures of the data set before and after the event were examined. Distance measures describe the similarity or dissimilarity between observations. The blue color within the graph shows a high similarity, while the red color describes a low similarity. Companies belonging to the same Cluster are shown in serial order (STHDA, 2017). The distance measures for the data set (attached to appendix / appendix three) also display a change within the data before and after the event.

The distance measures before the event suggest several different clusters within the data. The white or light blue / light red breaks between the deep blue / deep red “clusters” can be interpreted as dissimilarities between different groups within the data. For the distance measures calculated before the event the result looks very uneven. This can be interpreted as huge dissimilarities among the data before the event. No real big clusters can be explored.

The distance measure result for the data after the event looks much more tidied up. One can explore two big clusters which are displayed in deep red and in deep blue. At this point of the research, the findings of the distance measures are only a pre-step of the following performed cluster analysis. Since the distance measures already imply a change within the data, the findings shall be reviewed with the optimal number of clusters calculated by R. The optimal number of clusters will then be used to perform a cluster analysis using the K-Means method.

The calculation of the optimal number of clusters suggests that for the data set in both cases, before and after the event, three clusters are the optimal number of clusters (attached to the appendix / appendix four). This suggestion will be used for the calculation of the K-Means clustering which will be the final part of the data overview for event one.

Figure three shows the K-Means cluster before the event of the financial crisis. First of all, it is important to state that only the companies of special interest were used for the K-Means clustering. Those were in total 26 companies, including all companies named in the table attached to the appendix two and in addition the company Audi AG identified in the principle component analysis.

The lastly named Audi AG forms the first cluster marked in yellow. No other company was grouped into this cluster.

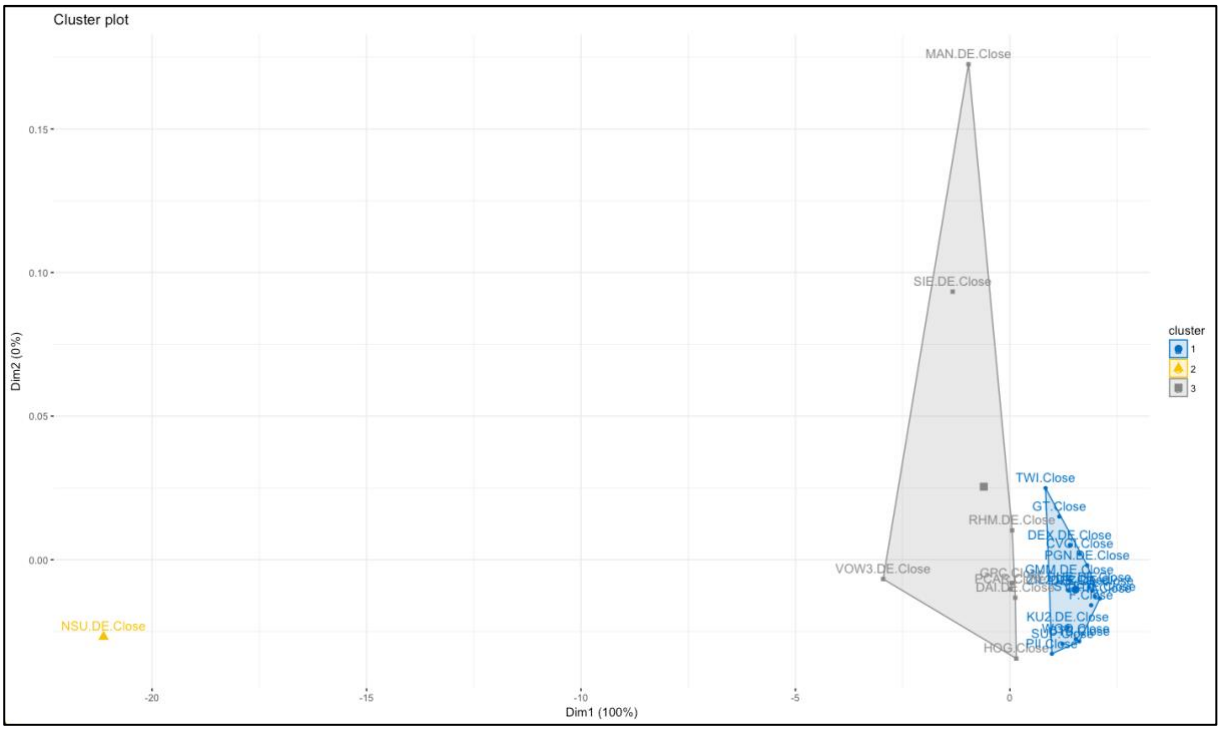

Figure 3 - K-Means Clustering before event (Own research – Cloud Appendix A)

A second larger cluster is shown in grey. It mainly consists of German companies. From the supplier side, the cluster includes the German companies Siemens AG, Rheinmetall AG, Continental AG and from the U.S. side the Genuine Parts Company. Moreover, the following German car producers are included into the grey cluster: MAN SE, Volkswagen AG, Daimler AG and from the U.S. side the Paccar Inc. and Harley Davidson Inc. The cluster can therefore be seen as a cluster of big producers and major distributors of supplies needed for automobile production.

The third and last cluster is the blue cluster. Interestingly, it consists only of U.S. producers and suppliers and of a few German suppliers. The companies included are the following U.S. suppliers: Titan Tire Corporation, Commercial Vehicle Group, Cooper Tire & Rubber Company, Gentex Corporation, Superior Industries International. U.S. producers included within the blue cluster are Winnebargo

Industries, Polaris Industries and the Ford Motor Company. German suppliers included in the cluster are Deutz AG, Delticon AG, Dürr AG, Erlringklinger AG, Grammer AG, KuKa AG, Softinger AG and the Paragon AG.

To identify changes among the clusters, figure four is introduced. It shows the K-Means cluster after the event of the financial crisis. Again, only the companies of special interest were used for the K-Means clustering. Those were in total 26 companies, including all companies named in the table attached to the appendix two and the aforementioned Audi AG.

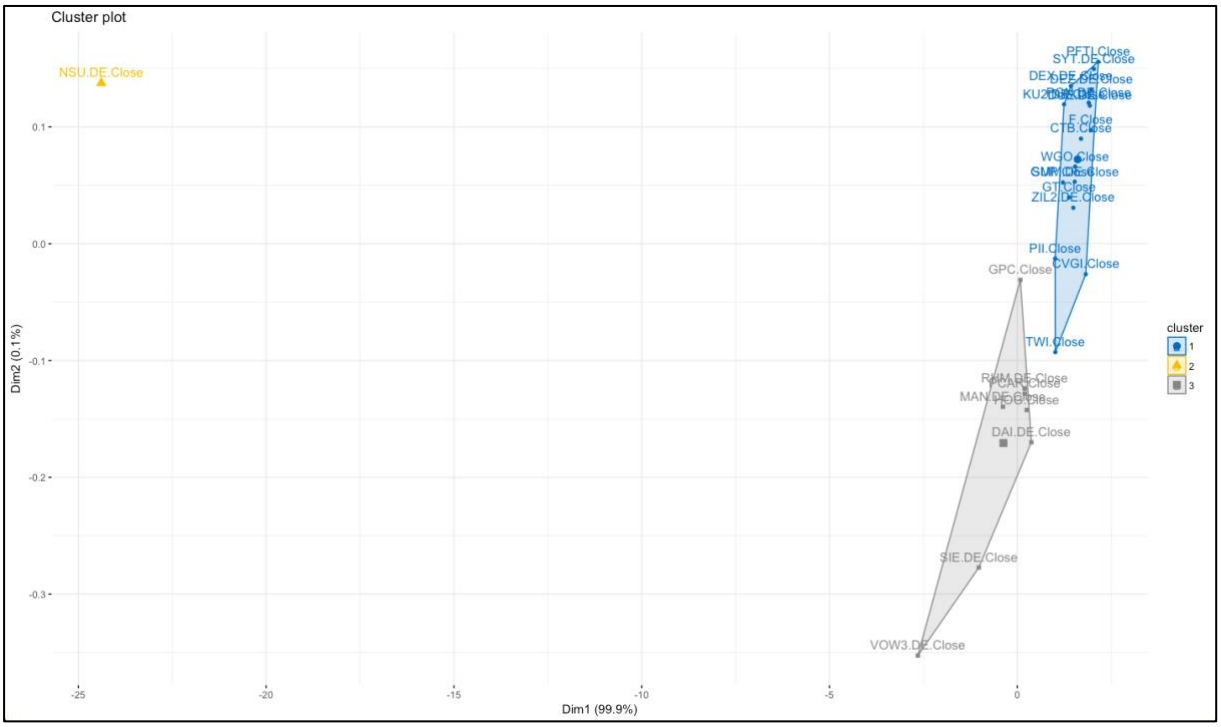

Figure 4 - K-Means Clustering after event (Own research – Cloud Appendix B)

Once again, as already discovered within the analysis before the event, the Audi AG forms a cluster by itself in yellow.

Furthermore, it can also be discovered that the grey and the blue cluster have not changed their setup. The distribution of companies among the clusters has stayed exactly the same. In total, it is striking that the Audi AG forms its own cluster far out from both other clusters. In addition to that, it is noticeable that the blue cluster is in both cases, before and after the event, significantly more compact than the grey cluster. This signifies that the observations within the grey cluster lie farther apart from the clusters centroid and are in total further apart from each other than the observations within the blue cluster. Regarding this, it is interesting that the companies which are most far away from the clusters centroid, changed from before to after the event.

Furthermore, it is also noticeable that the clusters centroid has moved strongly in case of the blue and yellow cluster, but almost stayed alike for the grey cluster. Since the centroid marks the overall average of all observations within one cluster, a move from the clusters centroid before and after the event makes the companies within the cluster especially interesting for the further research.

In summary, the first part of the analysis gives an interesting first overview of the data for event one. The principle component analysis and the analysis of the biplot provide first indications that a change before and after the event occurred. By comparing correlation changes among the different companies before and after the event, conclusions regarding more important parts of the data set could be drawn. Companies could be identified which had significant correlation changes from prior to after the event. The companies identified and charted in table attached to the appendix two above are of special interest for the in-depth analysis of the following chapters.

Also, the distance measures calculated within the cluster analyses indicate data changes prior and after event one.

Contrary are the findings of the cluster analysis itself. Within the clusters no changes of the setup of companies occurred before and after the event. Only remarkable changes that could be explored within the cluster analysis were shifts of the clusters centroids. Still and especially because cluster analysis was only used to get a first overview and impression of the data, the findings are very helpful. The clusters calculated with R form a good basis for the upcoming analysis in the following chapters. Since only companies identified and charted in the table attached to the appendix two were used for the cluster analysis, the clusters indicate companies which are connected in a certain way. For the following step of the research, illustrated by the next chapter, mainly the companies identified by the correlation changes will be used. Furthermore, analyses only within the identified clusters will be performed. The main goal of the first step of the research to overview and identify first patterns of the data was therefore successful.

Confirm findings

As already mentioned in the aforementioned chapter, only the companies identified with significant changes shown by the table attached to the appendix two will be used for the analysis with multi-dimensional scaling. In addition, the special situation of the company Audi AG identified within the cluster analysis will be part of the analysis, too. In total, 26 companies are included in the analysis with the method multi-dimensional

scaling in order to display how similar or different observations are, grounded on the data (Kruskal, 1964, p.1ff.).

Before examining the companies themselves, it is already interesting to look at the results of the method only from a country and industry perspective. The calculation of the MDS before and after the event labeled with industries (attached to the appendix / appendix five) and countries (attached to the appendix / appendix six) shows an interesting picture.

The industry perspective (attached to the appendix / appendix five) shows a shift within the data. A lot of the observations are standing on their own, but three dimensions can be explored. The dimension in blue marks a dimension with a mix of suppliers and producers. The dimension marked in green shows a single supplier dimension while the dimension marked in red displays a production only dimension. When looking at the data after event one, one can discover a change within the before identified dimensions. The production dimension marked in red is not present anymore. Therefore, the mixed dimension of suppliers and producers marked in blue got significantly larger. Also the supplier dimension in green shows an influx of more suppliers than before the event.

Only by presenting the dimensions' countries (attached to the appendix / appendix six) first hints regarding the hypothesis stated within this thesis can be made. As one can see, not many dimensions can be created. The observations are widely mixed regarding the origin of the company observed. This can already be interpreted as a hint for hypothesis one and hypothesis four. After event one, no changes within the setup of dimensions could be explored. The dimensions are mixed nationally before and after the event. That would hint to the conclusion that protectionist events do not diminish international interrelation. Also this could implement that counter wise free trade encourages international interrelations.

Furthermore, it can be discovered that before event three, dimensions of one U.S. and one German company exist (marked in red). In the aftermath of the event those connections are once again not existent and the involved companies mainly integrated into bigger dimensions. That would be a hint into the direction of protectionism not diminishing international interrelations but rather changing the setup of whole industries and consequently a change of international interrelations.

In the following paragraphs of these chapters those first findings shall be examined further with the result of the analysis with the companies itself. Figure five shows the

results for the multi-dimensional scaling before event one. Two dimensions are identified. The green dimension consists of the German suppliers KUKA AG, Rheinmetall, Siemens AG and on the German production site of MAN AG.

On the U.S. side, the suppliers Puradyn Filter Technologies and Superior Industries International Inc. The blue dimension consists of the German suppliers Deutz AG, Delticom AG, Elringklinger AG, Paragon AG and the Derr AG. Furthermore, the U.S. suppliers Cooper Tire & Rubber Company, Goodyear Tire & Rubber Company, the Genuine Parts Company and the Commercial Vehicle Group are included in the dimension. In addition to that, the U.S. producer Polaris Industries is included in the blue dimension.

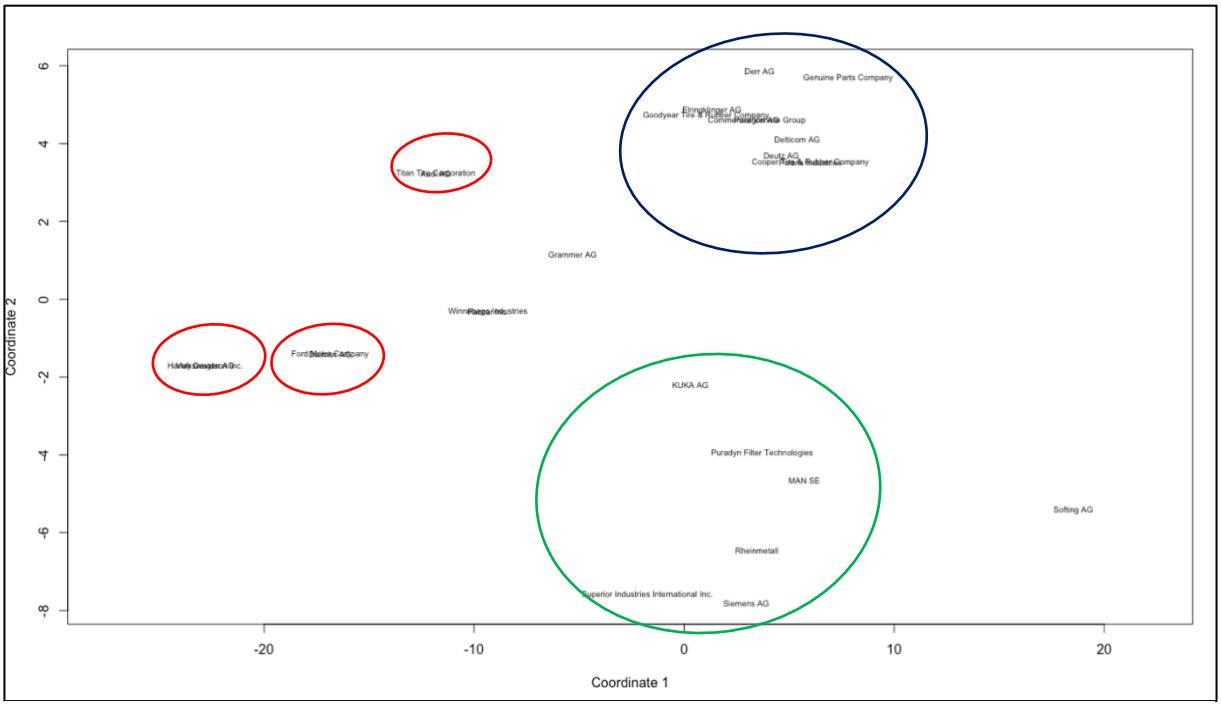

Figure 5 - Multidimensional Scaling before event (Own research / Cloud Appendix A)

Another interesting finding are the close connections between three U.S. and German companies marked in red. The pairs are the following. Ford Motor Company and Daimler AG, Harley Davidson Inc. and Volkswagen AG and Titan Tire Corporation and Audi AG.

Before analyzing changes within the dimensions' figure six is introduced, which shows the multidimensional scaling results after event one. As already outlined again two real dimensions can be identified in the aftermath of the event. Interestingly, core parts of the dimensions stay put, but changes occur. Exemplary switches in between dimensions are the switch of KUKA AG from the green to the blue dimension. Furthermore, changes among countries and industries occur. This again shows that

setups within the data are constantly changing by influences that have to be identified within the in-depth analysis.

In addition to that, it is interesting to notice that the U.S. and German connections marked in red before are gone in the aftermath of the protectionist event. This would imply a diminution of international interrelations (hypothesis one) at first sight. To find further prove this finding will be entered into the in-depth excel file and treated within the next chapter.

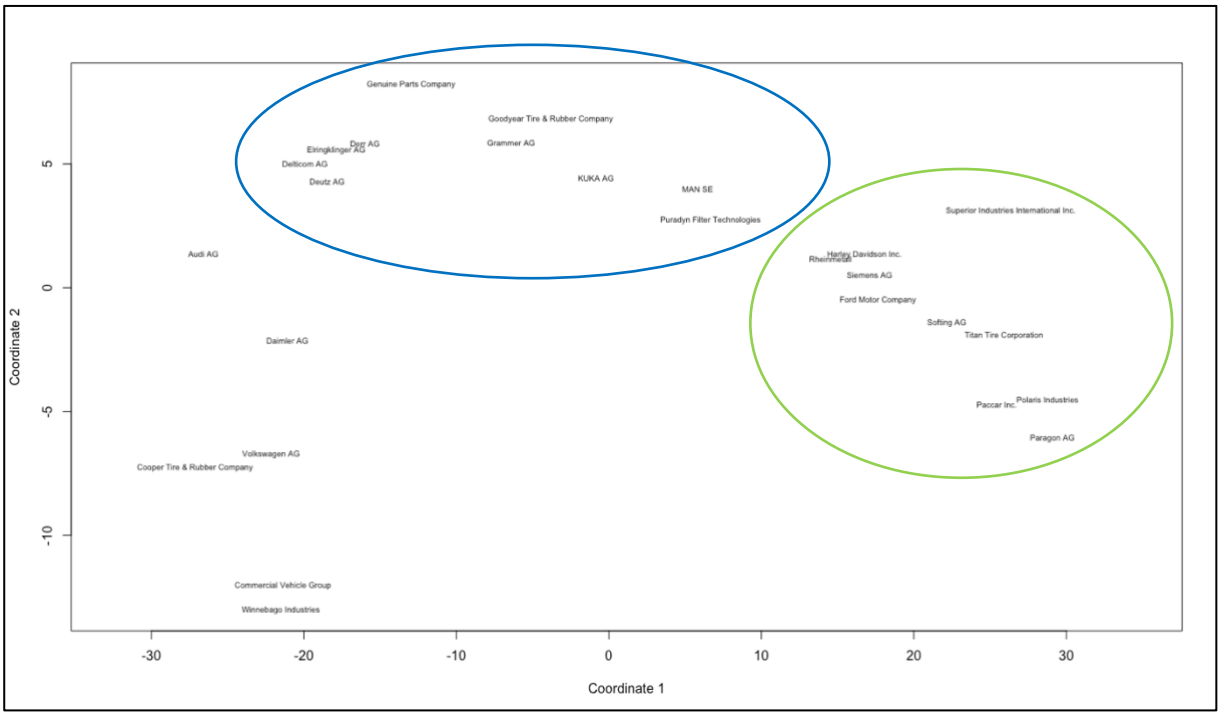

Figure 6 - Multidimensional Scaling after event (Own research / Cloud Appendix B)

In summary, the second part of the research showed that the findings of the first part, that changes within the data occurred, can be confirmed. Furthermore, first clues regarding the research questions and hypothesis stated within the thesis could be made. As one can see from the analysis with the multi-dimensional scaling method dimensions changed in the aftermath of the event. It is important to state that both before and in the aftermath international dimensions exist.

Interestingly, and maybe most importantly, the results imply that after a protectionist small dimensions which only include one company of every country dissolve and integrate into big multinational dimensions. Regarding the research of the thesis this would mean that protectionism does not diminish international interrelations (hypothesis one) and protectionism can change international interrelations and its setup (hypothesis two and hypothesis three).

Especially the unexpected fact, that international interrelation becomes stronger in the aftermath of a protectionist event has to be proven again and especially be explained in the end of the thesis.

Summarizing, this part of the research turned the research in one direction. Protectionism does not diminish international interrelation but more likely enhances interrelations among international companies. These findings have to be checked in detail by the third part of the research – the network analysis.

Verify findings within in-depth analysis

The last chapter identified first findings regarding the research of the thesis. The last part of the research should examine those findings within an in-depth analysis. Therefore, a network analysis is performed. Only the companies identified within the first part of the research are subject of the network analysis. The main goal of this last chapter of research for event one is to clarify and deepen findings explored within the foregone chapters by different methods and identify possible prove that earlier hints can be interpreted as definite prove for research questions of the thesis. The chapter will therefore first of all collect and identify relevant companies and occasions and list all of them in the excel-data “Indepth_company_analysis_event_1” (attached to the cloud appendix). The results of the in-depth analysis will be presented at the end of this chapter.

In the beginning, results of a degree distribution analysis will be discussed. Within the analysis one node represents one company. The degree distribution analysis looks at the connections of every node and therefore gives a good first overlook of the network itself. Appendix seven (attached to the appendix / appendix seven) shows the degree distribution before and after the event. Before the event the majority of the nodes has no connection at all or one or two. Only two nodes have more than two connections. In the aftermath of the event the setup has changed slightly but not significantly. Still the majority of the nodes has none or some connections. Only three nodes have more than two connections. In terms of connection between the different nodes no real change can be explored within the data. This is also supported by the number of nodes, in other words connections among the nodes, which has only fallen by one from before to after the event.

Companies which have many edges can be of particular interest for the in-depth analysis and are so called hubs. Appendix eight (attached to the appendix / appendix eight) displays the individual degree distribution. Companies with more than one

connection are marked in yellow. Special interest should be paid to those companies with strong node changes before and after the event. Those are Grammer AG (+2 connections after event), Harley Davidson Inc. (+2 connections after event), Winnebargo Industries (-3 connections after event), Cooper Tire & Rubber Company (-2 connections after event), Deutz AG (-2 connections after event), Ford Motor Company (-2 connections after event). Those companies will be integrated into the in-depth-analysis excel-file.

In addition to the individual node degree distribution the nodes closeness centrality and the nodes betweenness centrality will be examined.

The closeness centrality compares the “closeness” of one node to all other nodes within one network. Therefore, it gives an impression which node influences the whole network the most (Cambridge Intelligence, 2014). Appendix nine (attached to the appendix / appendix nine) shows the most influencing nodes before and after the event as marked in yellow. Once again companies with high changes within their node closeness centrality will be added to the excel-data “Indepth_company_analysis_event_1”. Results will be presented in the end of this chapter. Those companies are Volkswagen AG, Genuine Parts Company, Grammer AG, MAN SE, Harley Davidson Inc., Deutz AG, KUKA AG.

Furthermore, the betweenness centrality processes the amount of one nodes position on the shortest path to other nodes. Therefore, the betweenness centrality is another identifier of strong influencers within a whole network (Cambridge Intelligence, 2014). The most influencing nodes before and after the event are marked in yellow within appendix ten (attached to the appendix / appendix ten). Once again companies with strong changes within their node betweenness are added to the in-depth analysis. Those are Genuine Parts Company, Grammer AG, MAN SE, Harley Davidson Inc., Winnebargo Industries, Deutz AG, Ford Motor Company, Polaris Industries.

In order to finalize the collection of input for the in-depth analysis, the minimum spanning tree before the event is introduced by figure seven. From a first view, one can discover that no international connections exist within the network before the event. Many nodes are not connected to any other nodes. Most of them, except for the German car producer Audi AG are suppliers.

Furthermore, it can be noticed, that different country-based groups are formed with connections between suppliers and producers. One of those groups consist of the U.S.

producers Polaris Industries and Paccar Inc. in connection with the U.S. suppliers Genuine Parts Company and Commercial Vehicle Group.

Another U.S. group consist of the producers Ford Motor Company, Harley Davidson Inc. and Winnebago Industries. Connected suppliers are Goodyear Tire & Rubber Company, Cooper Tire & Rubber Company and Superior Industries International. Winnebago Industries is situated within the center of the group.

In addition to that, one German group exists. It contains the German producers Daimler AG and Volkswagen AG and is connected to the suppliers Rheinmetall, Siemens AG, MAN SE, Deutz AG and KUKA AG.

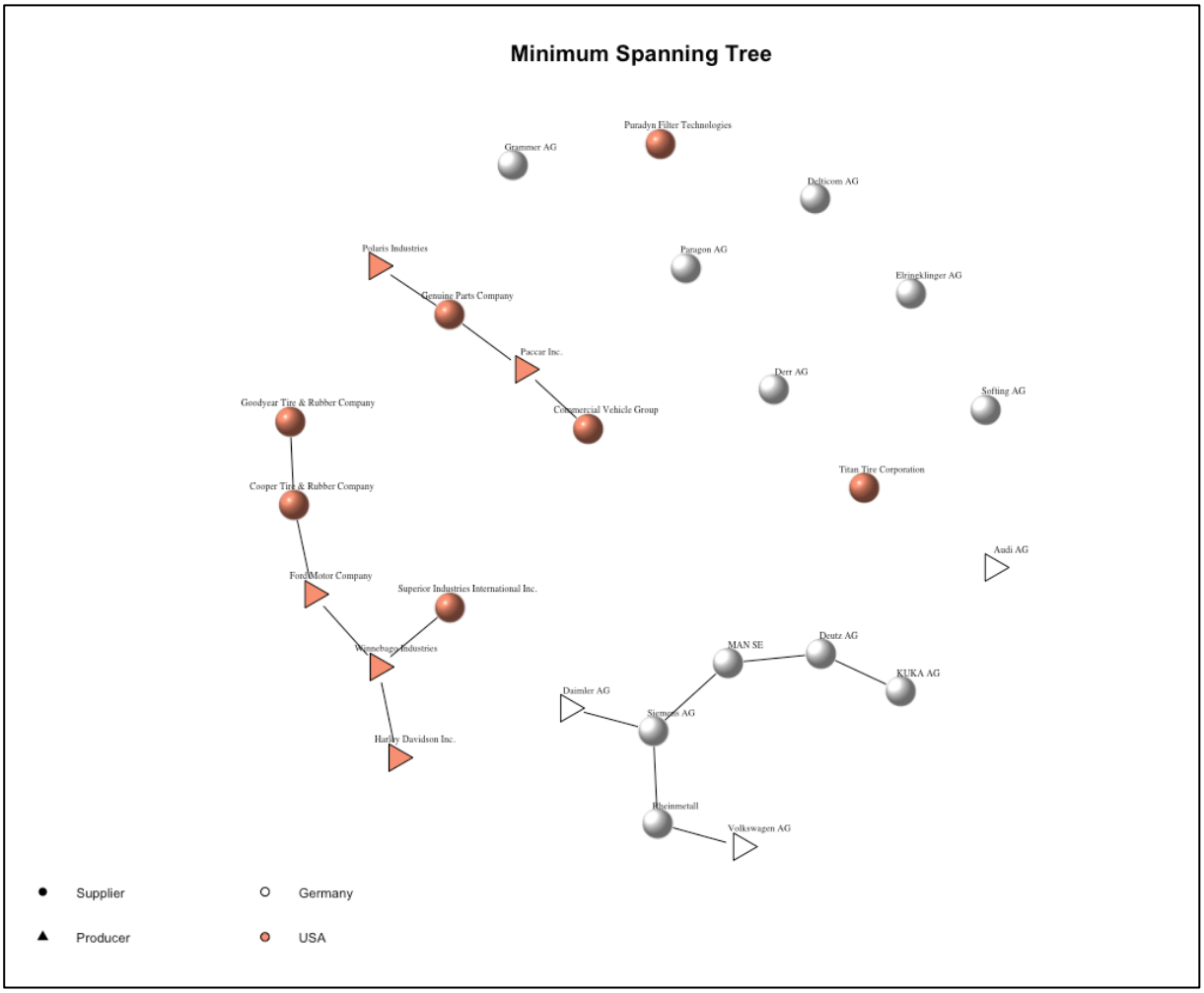

Figure 7 - Minimum Spanning Tree before event (Own research / Cloud Appendix C)

From a first point of view, one can say that the nodes are not connected internationally but have a strong national focus. By introducing figure eight changes can be explored. Figure eight shows the minimum spanning tree after the event. Only two noticeable groups can be discovered. Still, an only American group exist, with a slight change

within the setup. As an example the Ford Motor Company is now a stand-alone node and was replaced by the U.S. producer Polaris Industries.

Of special interest for the research of this thesis, is only one development within the minimum spanning tree though. The setup of the before all-German group internationalized by the U.S. producer Commercial Vehicle Group. Consequently, this movement has to be reviewed in detail, since it could be of major importance for the research of this thesis. It is therefore added to the in-depth excel-file.

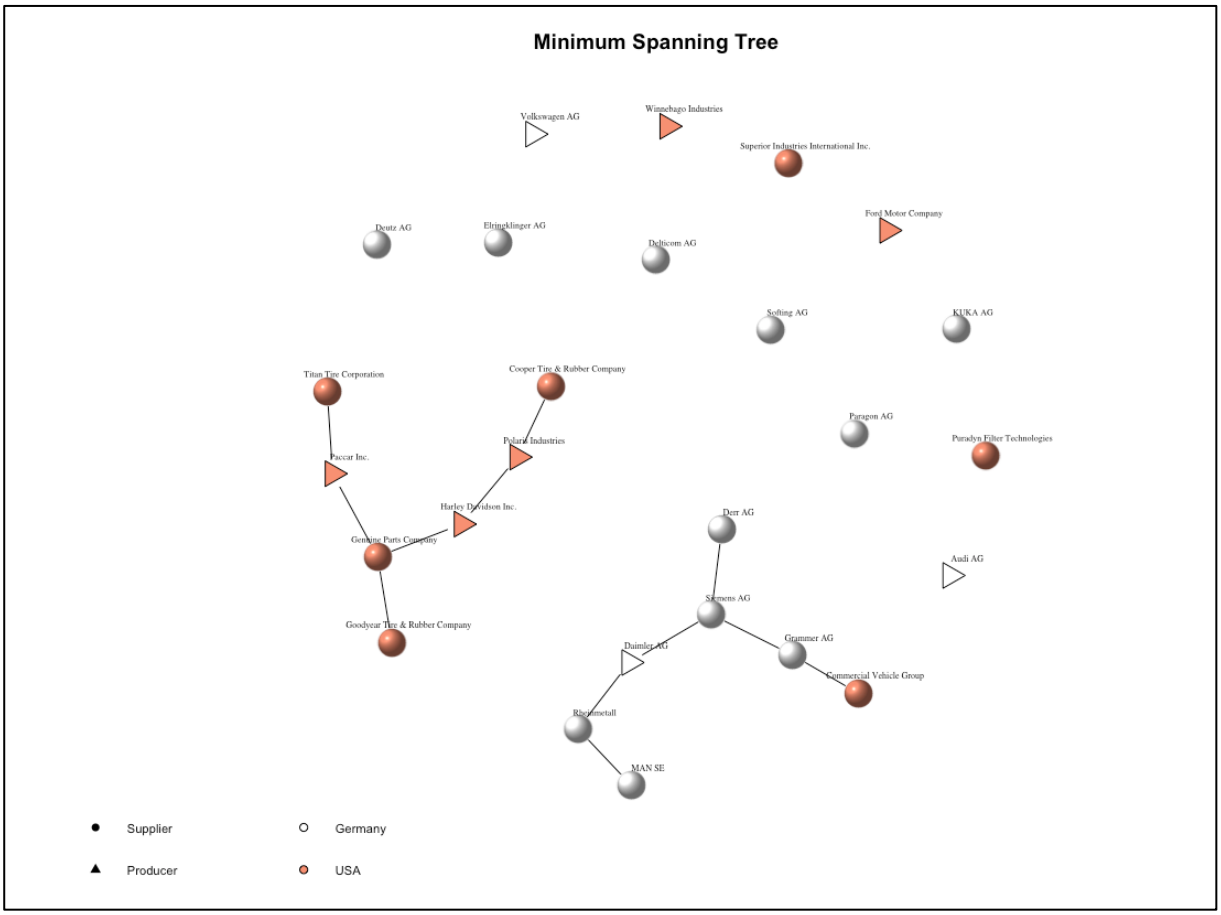

Figure 8 - Minimum Spanning Tree after event (Own research / Cloud Appendix D)

Before discussing the results of the in-depth-analysis one can already explore first hints regarding the research of the thesis. Even if it is so far just a small finding or hint one can say that in the aftermath of a protectionist event multinational connections arose. Therefore, this would be in direct confrontation with hypothesis one.

The in-depth-analysis of the conspicuous findings listed in the excel-data “Indepth_company_analysis_event_1” (attached to the Cloud Appendix) and named in the research chapters show noteworthy results regarding the research of this thesis. In many listed cases different explanations and / or no protectionist measures can be

understood as the change within the data. In some cases, evidence supplies stronger prove for the research questions of this thesis.

Before presenting those cases, it is important to state that within the forerun and aftermath of the event, the global economic crisis, many changes within the economy occurred. Especially, in strongly interrelated industries such as the automobile industry (Worldbank, 2009, p. 12ff). Therefore, even if the findings shown below give ideas regarding answers to the research questions of this paper, it is hard to isolate one reason explicitly. Furthermore, many findings could not be related to protectionist events and can rather be explained by many different changes triggered by the economic crisis.

Cases and findings which can be connected to protectionism or supply information regarding the research of this thesis are listed in the following. The first company at which changes can be linked to protectionism is the Grammer AG. The German supplier had a strong distribution change, a node closeness change and a node betweenness change from before to after the event. Concerning potential threats by higher protectionist events, Grammer announced a strategical turning point. Due to the economic crisis and potential market changes, for example tariffs, Grammer promised to control market changes more alert and adapt production and capacities in its different locations (Grammer AG, 2009, p. 11/18 ff.). Concerning the research of this thesis this would prove, that protectionism, triggered by an economic crisis, changes international interrelations and changes the setup of whole industries (hypothesis two and hypothesis three). Hypothesis one cannot be interpreted as true, since international interrelations would not be diminished but rather be changed.

Another interesting finding could be made in connection to the changes within the data for the German supplier Deutz AG. Before and after the event the Deutz AG had a strong individual distribution change, a strong node closeness change and a strong node betweenness change. Concerning the research of this thesis it could be explored, that the Deutz AG internationalized in the peak of the financial crisis and longtime peak of protectionist measures. The Deutz AG started to open a factory in the U.S. right after the event of the Lehmann Brothers Collapse (Deutz AG, 2008, 12ff.). The factory is still open today (Deutz AG, 2016, p. 10ff.). Even if an opening of a factory is a longtime planned decision, the opening shows interesting hints regarding the internationalization strategy in protectionist times. Regarding hypothesis one, the actions of Deutz AG show that protectionism does not diminish international

interrelations. Counter wise the Deutz AG invested into a country with high protectionist measures at that time and enlarged those investments later on (Deutz AG, 2016, p. 10ff.).

Lastly, the node connection of the Commercial Vehicle Group to German producers and suppliers in the aftermath of the event was analyzed. Also, sufficient results regarding the change could be explored. The U.S. supplier Commercial Vehicle Group also internationalized and released new products in Germany in the aftermath of the crisis (Commercial Vehicle Group, 2009, p.13ff.). Concerning hypothesis one, this expresses remarkable results. Since a launch of a new product could be stopped easier than the opening of a new factory, the decision to release a new product to Germany in a time of economic crisis and high protectionist measures implies that protectionism does not diminish international interrelations. The trade and connection with Germany was more important to the Commercial Vehicle Group than the possible bad launch of new products (due to higher prices by tariffs) in a foreign market.

In summary, one can say that the in-depth-analysis supplied first sufficient prove on the influence of protectionism on international interrelation in the case of event one. Especially hypothesis two and hypothesis three can be proven in some cases of the data. Protectionism, in the cases mentioned above, influences and changes existing international interrelations. Companies tend to react faster to market- and trade changes and are willing to adapt their strategy.

Regarding hypothesis one, surprising findings could be made. The case of the Commercial Vehicle Group shows that in times of high protectionist measures international interrelations are not diminished but more likely in some cases even strengthened. One of the explanation can be the long-term hope and believe in low protectionist times and the rely on important (trade-) relations with foreign countries.

4.5.4.1.2 EVENT 2 – ELECTION OF DONALD TRUMP

As already mentioned earlier, the second event to be analyzed is the era and election of Donald Trump. Aforementioned, the campaign and election of Donald Trump threatened a strong raise of protectionist measures. Today, after more than one year in office it is unmissable that Donald Trump intimidations become true. Recently the U.S. raised protectionist measures strongly and even more important especially threatened tariffs directly into the direction of the foreign automobile industry (New York Times, 2018). Therefore, the following research event will consist of the same methods

and analysis as event one. This time one timeframe before the era of Donald Trump and one timeframe shortly after today will be compared. As already mentioned in chapter 4.5.1 those timeframes are in detail January 2016, which has proven to be a low protectionist time and may 2018, which symbolizes the recent peak of Donald Trump's presidency concerning protectionism.

Overview of data set and identification of patterns

First of all, a principle component analysis is performed. The principle component analysis indicates a change within the data. The data in a less protectionist environment in January 2016, before Trump, shows that two principle components account for more than 80 % of the variation of the variables. After the event of the election of Donald Trump two principle components only account for 65 % of the variation within the data. To explain more than 80 % of the data at least four principle component are necessary.

The calculated biplots (attached to the appendix / appendix eleven) underline this impression. The biplot generated before the event shows that mainly two principle components are explaining a high percentage of the variance of the data. It is interesting to explore that two directions are generally to be found in the biplot before the event. Companies pointing into the direction of principle component one are mainly suppliers, with the exception of MAN SE and Paccar Inc. The companies pointing into the other direction are fairly mixed concerning industries and countries. When then looking at the biplot after the event changes within the data become even more obvious than by just looking at the principle components of the data. As one can see from the biplot generated for the data after the event (attached to the appendix / appendix eleven), the directions within the biplot are far more spread than before.

The principle component analysis and the analysis of the biplot show that massive changes within the data occurred before and after the event. As already conducted for event one, a correlation analysis will follow. Again, correlation before and after the event will be compared. Correlation changes from a positive / negative high linear correlation to no linear relationship or counter wise are of special interest. For the purpose of the thesis such a correlation change could be a first indicator for interrelation changes due to a protectionist event. The correlation data is provided within the cloud appendix.

The table (attached to the appendix / appendix 12) shows the results of the correlation analysis. Several different companies could be identified with a strong correlation

change before and after the event. In order to only analyze relevant data, the companies displayed in the table attached to the appendix are going to be used for all further analysis of event two. The relevant data is therefore reduced to 24 companies.

To retain the same procedure within the analysis as for event one a Clustering analysis was performed as a last step of gathering an overview of the data for event two.

First of all, distance measures for before and after the event were calculated (attached to the appendix / appendix 13). The distance measures before the event imply that no real clusters within the data exist, but also that the observations of the parts of the data set are not very different to each other or in other words that there is no big distance between the single observations. As one can see from the attached figure, many color-breaks are within the distance measures which can be interpreted as dissimilarities between groups within the data. Still, the colors are mainly light and consequently imply low distance measures in-between the observations. However, one can get the impression that two deeper colored clusters, one in red and on in blue, have developed in the aftermath of the event. This would imply that some parts of the data would differ strongly from other parts of the data. The explored changes have to be reviewed by the cluster analysis itself.

Once again, the optimal number of clusters was calculated for the data before and after the event (attached to the appendix / appendix 14). Interestingly, the impression that the observations are quite similar is also proven by this calculation. As the figures attached to the appendix show, the optimal number of clusters for both before and after the event is one. This result implies very close observations for the data or in other words that there are no groups within the clusters. Consequently, the K-Means clustering was performed with one cluster, but also with two clusters to still explore first groups within the data.

Figure nine shows the K-Means clustering before the event. As already outlined earlier, the different observations of the data set are quite close and therefore form one cluster. Consequently, no conclusions regarding the setup of the clusters can be made since all companies belong to one cluster.

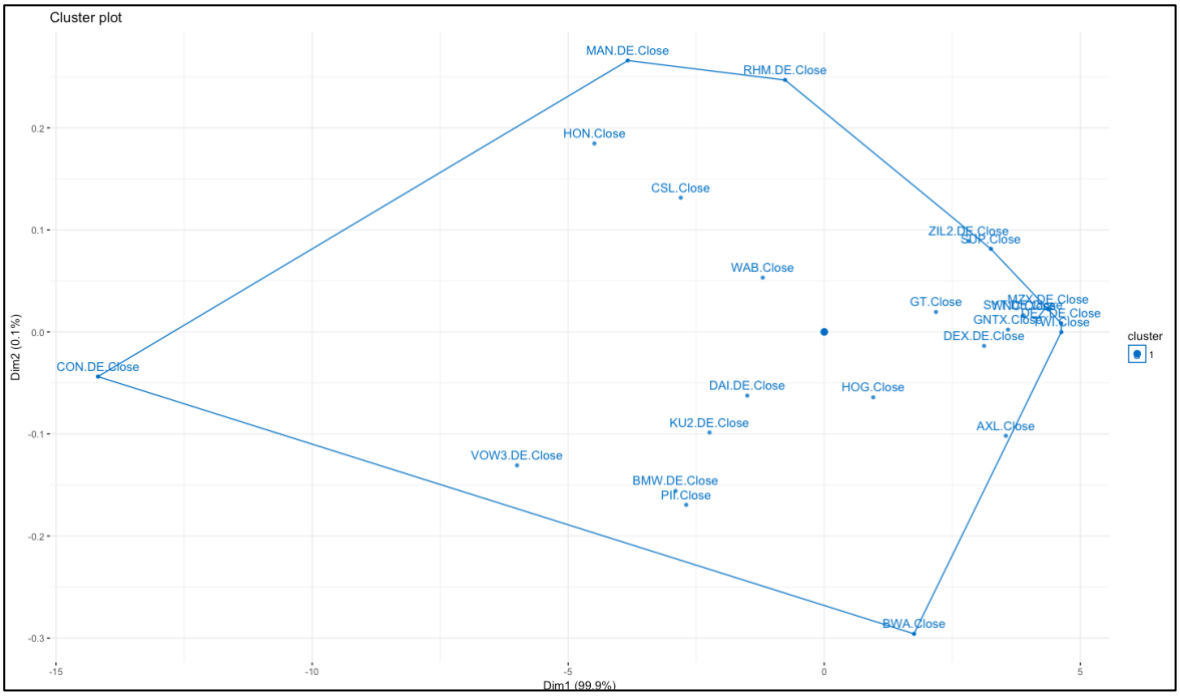

Figure 9 - K-Means Clustering with one cluster before event (Own research – Cloud Appendix E)

Therefore, figure ten shows the K-Means clustering before the second event with two clusters. Still, no conclusions regarding the research questions of the paper could be drawn. The clusters are mixed widely country- and industry-wise.

The K-Means clustering for after the event was at first also generated with only one cluster, as the calculation of the optimal number of clusters suggests.

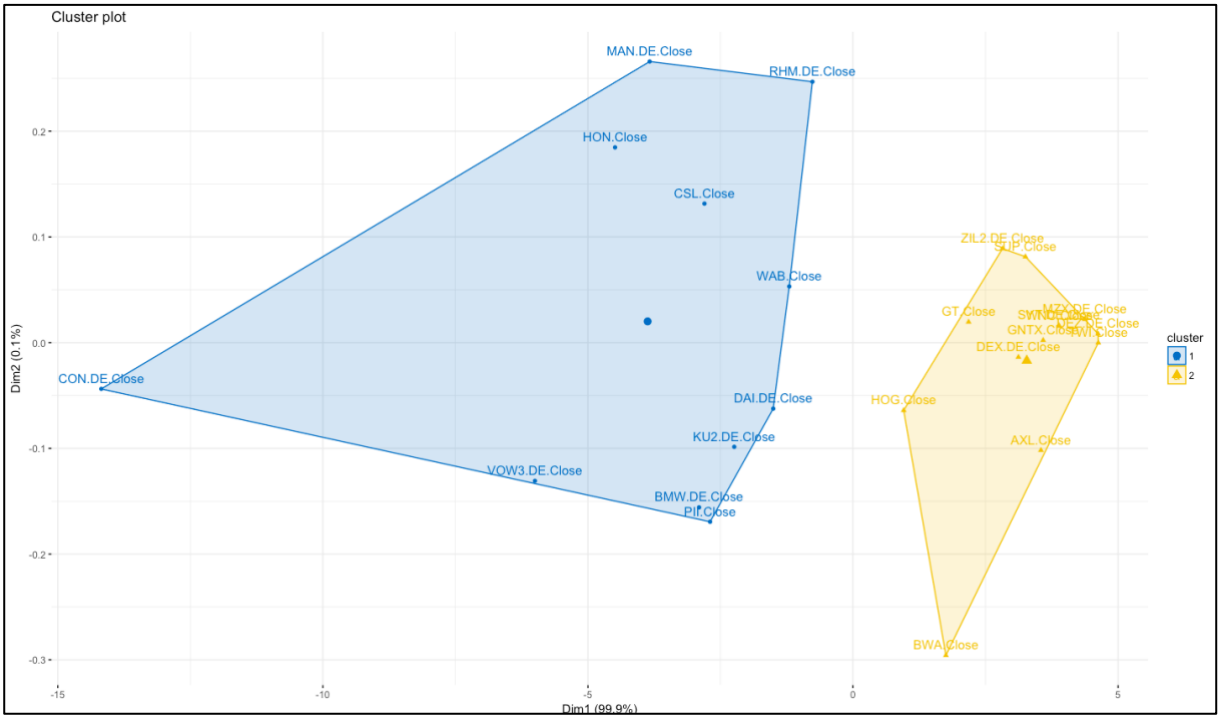

Figure 10 - K-Means Clustering with two clusters before event (Own research – Cloud Appendix F)

Figure eleven shows this K-Means clustering. Once again, it is obvious that the different observations are very close since all are combined in one clusters.

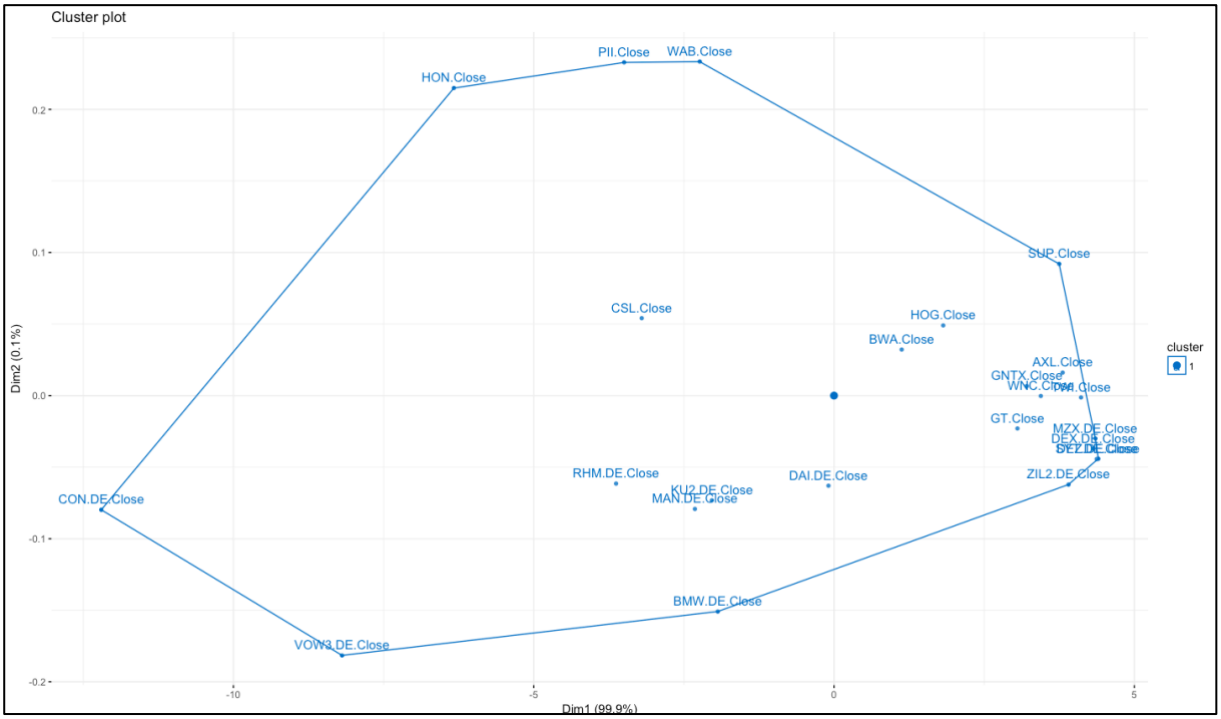

Figure 11 - K-Means Clustering with one cluster after event (Own research – Cloud Appendix G)

Still, some findings can be made regarding potential further research in the following chapters. As one can see from figure nine, figure ten and figure eleven, the German supplier Continental AG is always situated at the far left of the cluster.

When looking at the K-Means clustering after the event with two clusters, shown by figure twelve, again no obvious changes can be discovered before and after the event. Still, the setup within the clusters changed. Obviously, this can be explained by the large timeframe which lies between the timeframe before and after the event. More interestingly, the data did not change regarding the setup of the cluster country- or industry-wise. This phenomenon could have been a hint regarding the research questions of this paper. In conclusion, no hints regarding the research questions of the thesis can be found by performing a cluster analysis. This is mainly due to the fact that the optimal number of clusters is one and consequently the data has no real groups and observations are generally very close. Due to the extent limitation of the thesis and the use of different other methods such as network analysis, different clustering methods were excluded from the research.

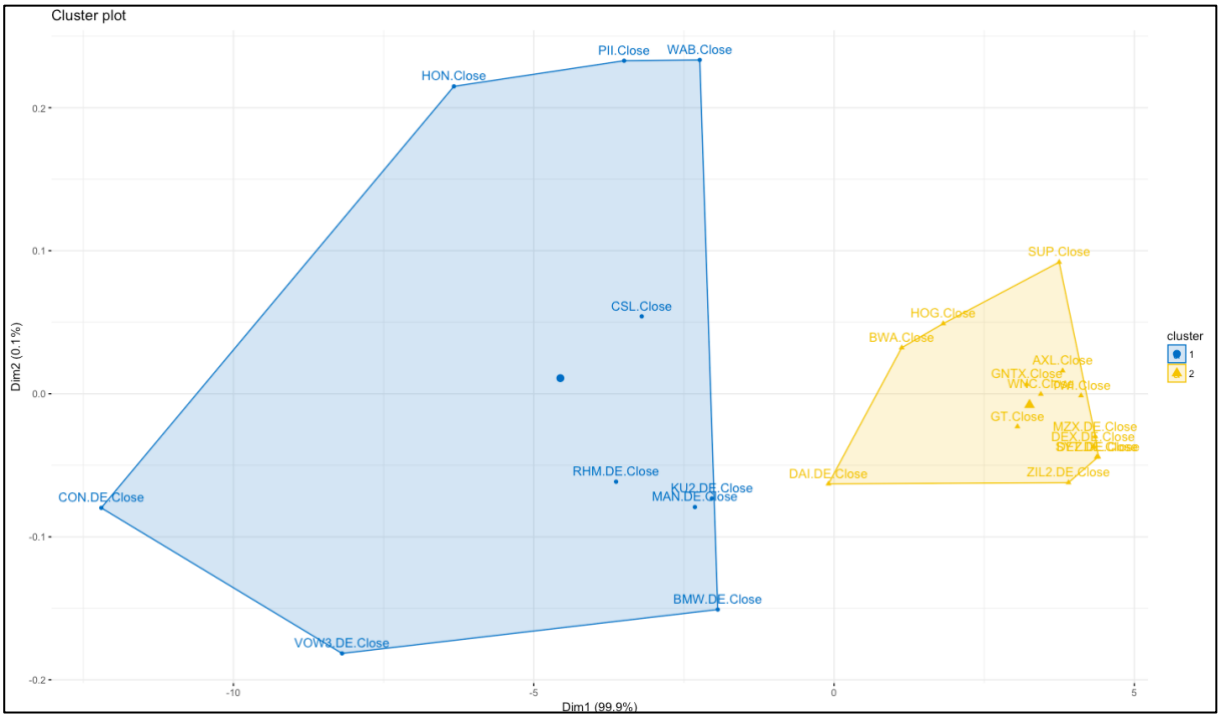

Figure 12 - K-Means Clustering with two clusters after event (Own research – Cloud Appendix H)

Finally, the overview of the data for event two had two mayor learnings regarding the research questions of this paper. First of all, it could be explored that there is a huge change within the data before and after the event. Furthermore, companies could be identified which have a significant change within their relationship before and after the

event displayed by a strong correlation switch. Still, no directions or conclusions concerning the hypothesis could be drawn. Consequently, more research has to be conducted. In the case of this paper, the following analysis will be, such as for the first event, multi-dimensional scaling.

Confirm findings

The foregone chapter gave a first overview of the data set and showed that a change within the data occurred, especially for certain companies. Those identified companies will again be used for the further analysis. Subject of this chapter will be multi-dimensional scaling.

A first remarkable sight to the data can already be made by just looking at the industries of the result of the multi-dimensional scaling analysis before the event. The results are attached to the appendix (attached to the appendix / appendix 15). Before the event many industry-separated dimensions could be explored. Those dimensions marked in green are “supplier only” dimensions, while the dimension marked in blue shows a “producer only” dimension. Still, a very small mixed dimension marked in red exists. When looking at the result for the analysis after the event important changes regarding the research of the thesis can be explored. As one can see from the attached appendix, large dimensions of suppliers exist. Still, it occurs that the dimension of producers, marked in blue, moved closer to the suppliers. It is even possible to form dimensions including suppliers and producers. Regarding hypothesis three, this could be a hint that protectionism influences the setup of whole industries. Nevertheless, it is important to state that the results do not imply towards which direction setups are affected.

Therefore, the multi-dimensional scaling results from a country perspective are introduced. As on can see from the results (attached to the appendix / appendix 16), the dimensions mentioned before are mixed country-wise. Consequently, no conclusions can be drawn regarding the research of this paper. Nevertheless, another finding can be discovered which is catching, concerning potential international interrelation changes due to protectionism.

Before the event, during a time of the Obama administration with comparably low protectionist measures, many direct “dimensions” between one U.S. and German company can be discovered. Those are marked in red within the aforementioned appendix. After the event some of those obviously close connections are gone. This would be a hint especially regarding hypothesis one and in addition to that, hypothesis

two and three. Protectionism seems to destroy strong interrelations within the automobile industry between the U.S. and Germany.

In order to deepen those findings and perhaps identify relevant companies for the last step of the analysis the multi-dimensional scaling results with company names are introduced.

Figure thirteen shows the results for the analysis with the method multi-dimensional scaling before event two. Particular interest was paid to the aforementioned strong interrelated U.S. and German companies. Those companies are Continental AG (German supplier) and Polaris Industries (U.S. producer) marked in green. BMW AG (German producer) and Wabash National Corp. (U.S. supplier) marked in blue. Volkswagen AG (German producer) and Harley Davidson Inc. (U.S. producer) marked in yellow. Daimler AG (German producer) and Wabtec Corp. (U.S. supplier) marked in red. Elkringer AG (German supplier) and Gentex Corporation (U.S. supplier) marked in purple.

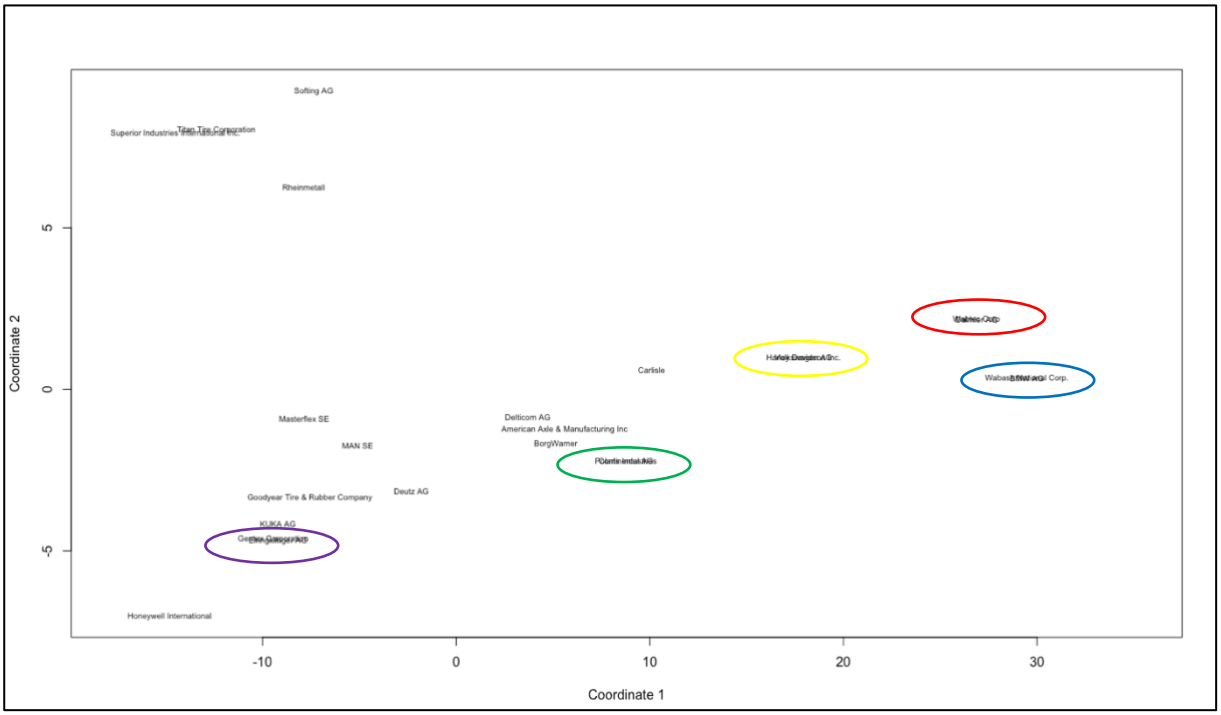

Figure 13 - Multidimensional Scaling before event (Own research / Cloud Appendix E)

Another pair can be explored on the top left of figure thirteen. The pair consist of two U.S. American suppliers Superior Industries International Inc. and Titan Tire Corporation. Therefore, this pair is not as important as the other pairs. In addition to that, the country mixed pairs are most important for the research questions of the thesis, so that the rest of the results shown by figure thirteen are rather unimportant.

The close interrelation of the companies named above is from big importance for the research though. The closeness of the U.S. and German companies can be interpreted as a close relationship which has to be examined in detail.

In order to do so, figure fourteen is introduced. It shows the multi-dimensional scaling results after event two.

From a first glance, one can explore that some of the close pairs have disappeared. When looking closer, it gets obvious that all aforementioned pairs have disappeared. None of them exist anymore. Three new pairs have developed. Those are the following: Volkswagen AG (German producer) and Polaris Industries (German producer) marked in yellow. Daimler AG (German producer) and Harley Davidson Inc. (U.S. producer) marked in red, BMW AG (German producer) and Wabtec Corp. (U.S. supplier). In addition to the new pairs, is can be discovered that many of the companies are, compared to the results before the event, wide-spread and not close.

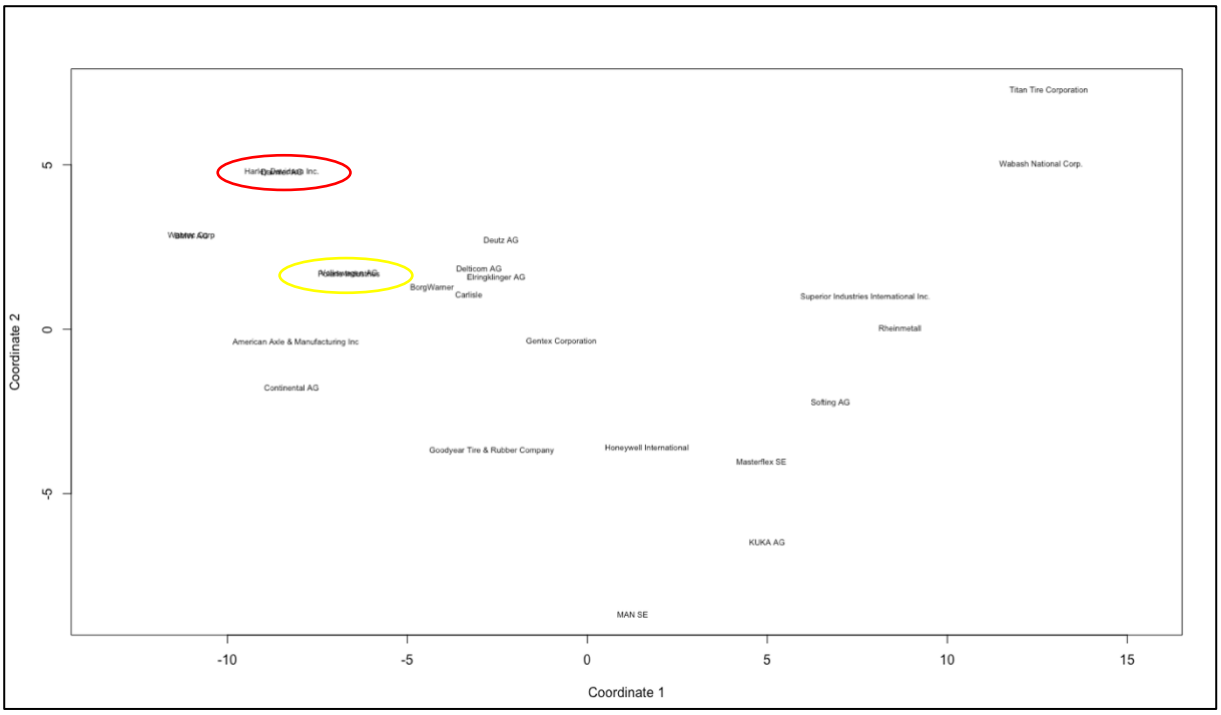

Figure 14 - Multidimensional Scaling after event (Own research / Cloud Appendix G)

Regarding the research of the thesis, that would be a sign that protectionism diminishes international interrelations (hypothesis one), protectionism changes existing interrelations (hypothesis two) and protectionism influences the international setup of whole industries. Even if a first look already provides an idea of how and if protectionism influences international interrelations the analysis has to be deeper in order to draw justifiable conclusions. Therefore, the relevant companies named above

are examined according to their business strategies, business relations or other company related news. All these draw an individual picture per company and lead to the conclusion whether a reasonable causation or relation is proven, or whether any effects or changes are without a reliable linkage. The excel-data "Indepth_company_analysis_event_2" lists all the information gathered and interpreted, along with the conclusion (attached to the Cloud Appendix).

As the results show, almost no information could be found regarding potential events or changes which can explain the turn within the data. Only one connection between Volkswagen AG and Harley Davidson Inc. could be explained by ongoing sales-talks over Volkswagens motorcycle division Ducati to Harley Davidson.

While no information could be found to refute the possibility that protectionism might change international interrelation, it also has to be stated that no prove could be explored so far that raising protectionism is responsible for the change within the data presented above. Another significant reason which has to be kept in mind for the conclusion especially is the constant change within the automobile industry. As one can learn from different sources the automobile industry switched from long-term partnerships between producers and suppliers to constantly changing, model-attached, contracts. A reason behind that is in most of the times cost reduction (Wirtschaftswoche, 2015).[7] Therefore, constant switches of close relations between cooperation's of the automobile industry are possible.

This also shows the data one or two months before the chosen timeframe for after event two. When looking at the data for April 2018 and March 2018 it becomes obvious that different close relationships between corporations exist (attached to the appendix / appendix 17). In April four very close relations exist[8] and in March three close relations exist.[9] Those findings show that the automobile industry is a fast changing business. Interestingly, it is noticeable that some producers like Daimler AG, BMW AG, Volkswagen AG, Harley Davidson Inc., Polaris Industries and suppliers such as

[7] Other sources: Zeit II (2017),

[8] Those are: Volkswagen AG (German producer and Wabtec Corp. (U.S. supplier) red, Continental AG (German supplier) and Harley Davidson Inc. (U.S. producer) yellow, Polaris Industries (U.S. producer) and American Axle & Manufacturing Inc. (U.S. supplier) green, Daimler AG (German producer), BMW AG (German producer), Titan Tire Corporation (U.S. supplier) and Wabash National Corp. (U.S. supplier) blue

[9] Those are: Volkswagen AG (German producer) and Polaris Industries (U.S. producer) yellow, BMW AG (German producer) and Wabtec Corp. (U.S. supplier) green and Daimler AG (German producer) and Harley Davidson Inc. (U.S. producer) red

Wabash National Corp. and Wabtec Corp. are more than once in close relation to other companies of the industry. Those and other findings, prove that the automobile industry is a constantly changing industry.

If those changes are related in any way to raising protectionism cannot be proven so far.

In summary, this part of the research turned the research into the direction, that changes before and after protectionist events occur. The research of this chapter showed that the automobile industry is a constantly changing business. These findings and in addition if the changes within the data have anything to do with stronger protectionist measures have to be checked in detail by the third part of the research – the network analysis.

Verify findings within in-depth analysis

The goal of this chapter is to clarify and deepen findings explored within the foregone chapters by different methods. So far only hints could be found regarding the hypothesis of this paper. Therefore, the goal of this chapter is to prove that the change that obviously occurred within the data can be explained by raising protectionism. Elsewise, another goal would be to isolate other valuable reasons for the data change. The chapter will therefore first of all collect and identify relevant companies and occasions and list all of them in the excel-data “Indepth_company_analysis_event_2” (attached to the Cloud Appendix). The results of the in-depth analysis will be presented at the end of this chapter.

First of all, a degree distribution analysis will be performed. As mentioned before, one node represents one company. Within the analysis it is shown which nodes have which and how many connections. Consequently, the degree distribution analysis gives a probability spreading of all degrees within the network and also a good first overlook of the network itself.

Appendix 18 (attached to the appendix / appendix 18) shows the degree distribution before and after the event. Before the event, the majority of the nodes has no connection at all or only just one connection. Only six companies have more than one connection to another node. In the aftermath of the event, the nodes are connected stronger. Now, more than ten companies have at least one connection to another node, while five companies have more than one connection. The group of nodes with no connection at all has shrunk to eight nodes. At first sight, this implies that the nodes

are more interrelated and connected after the event than before. This is strengthened by the fact that the number of edges, in other words connections between the nodes, has risen from eleven before the event to twelve after the event.

Companies with many edges, can be interpreted as hubs. Appendix 19 shows the degree distribution individually for every company. Accordingly, the hubs with more than one connection are marked in yellow. Those companies can be of particular interest for the in-depth analysis. In addition to that, even more special interest should be paid to those companies with strong node changes before and after the event. Those are BMW AG (-2 connections after event), Carlisle (-2 connections after event), Superior Industries International Inc. (-3 connections after event), Wabash National Corp. (-2 connections after event and Rheinmetall (+2 connections after event), Daimler AG (+3 connections after the event). Those companies will be integrated into the in-depth-analysis excel-file.

In order to get a closer look at the setup of the nodes of the network and to identify further companies for the in-depth analysis one can also take a look at the node closeness centrality and the nodes betweenness centrality.

The closeness centrality compares the “closeness” of one node to all other nodes within one network. Therefore, it gives an impression which node influences the whole network the most (Cambridge Intelligence, 2014). The most influencing nodes before and after the event are marked in yellow within appendix 20. From particular interest for the in-depth analysis are companies with a change from high to low or counter-wise influence on the whole network. The identified companies are Superior Industries International Inc., Deutz AG, Rheinmetall, Titan Tire Corporation and Harley Davidson. They are listed within the excel-data “Indepth_company_analysis_event_2”. Results will be presented in the end of this chapter.

In addition to that, the betweenness centrality processes the amount of one nodes position on the shortest path to other nodes. Therefore, the betweenness centrality is another identifier of strong influencers within a whole network (Cambridge Intelligence, 2014). The most influencing nodes before and after the event are marked in yellow within appendix 21. From particular interest for the in-depth analysis are companies with a change from high to low or counter wise betweenness change. The identified companies are BMW AG, Superior Industries International Inc., American Axle & Manufacturing Inc., Rheinmetall, Daimler AG and Continental AG. They are listed

within the excel-data “Indepth_company_analysis_event_2”. Results will be presented in the end of this chapter.

In order to get a closer look at the changes that occurred, the Minimum Spanning Tree before the event is introduced by figure 15.

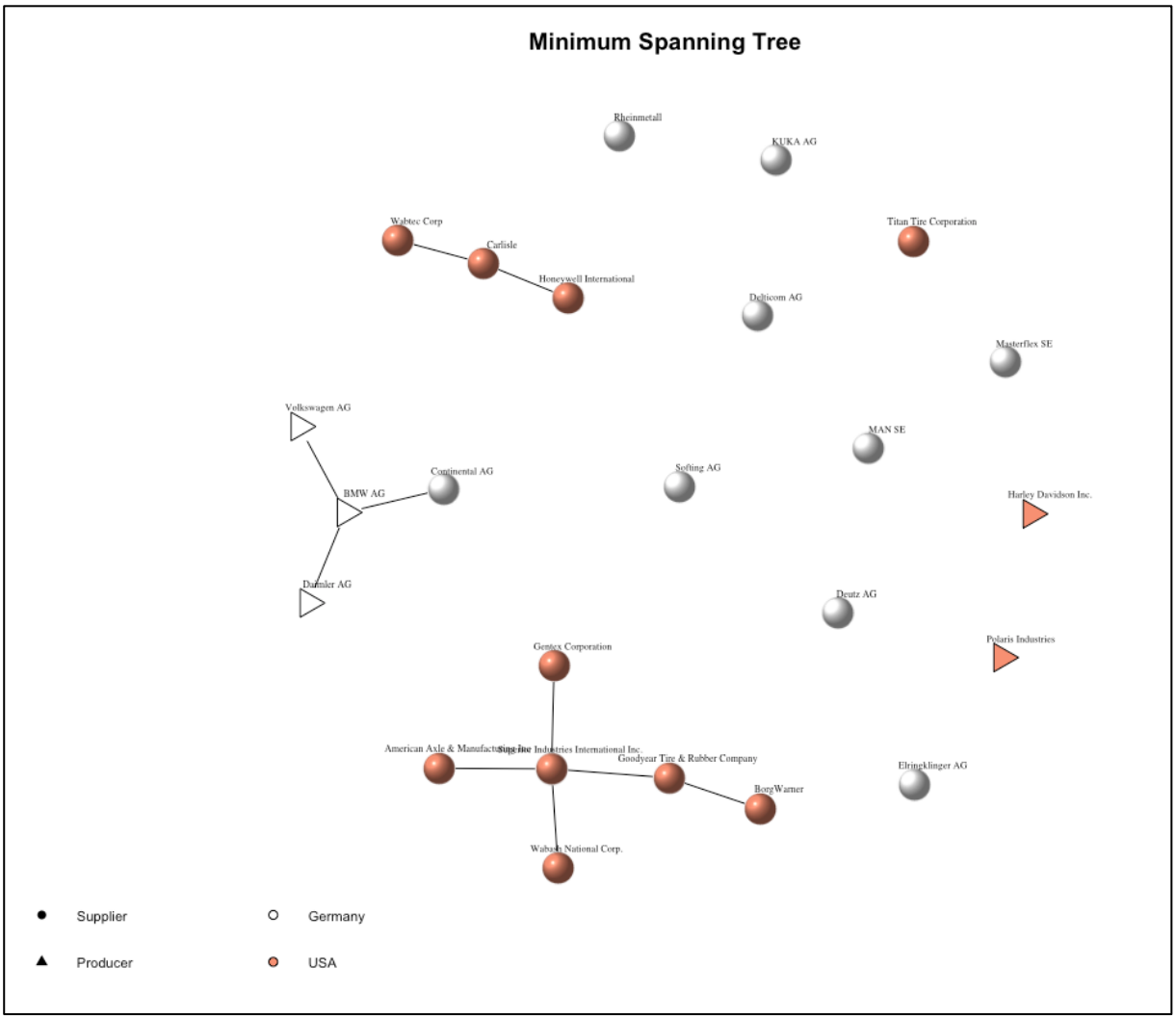

Figure 15 - Minimum Spanning Tree before event (Own research / Cloud Appendix J)

From a first view, one can discover that no international connections exist within the network before the event. Within the countries, there is also only one “supplier producer relation” between three of the biggest german car producers and one of the huge German automobile suppliers Continental AG. Otherwise only two other groups of U.S. suppliers exist.

When looking at figure 16 and the minimum spanning tree after the event, the data has changed. As already shown by the degree distribution analysis, the nodes are more connected. Still, some of the nodes are not connected at all, but overall the data and companies are more interlinked.

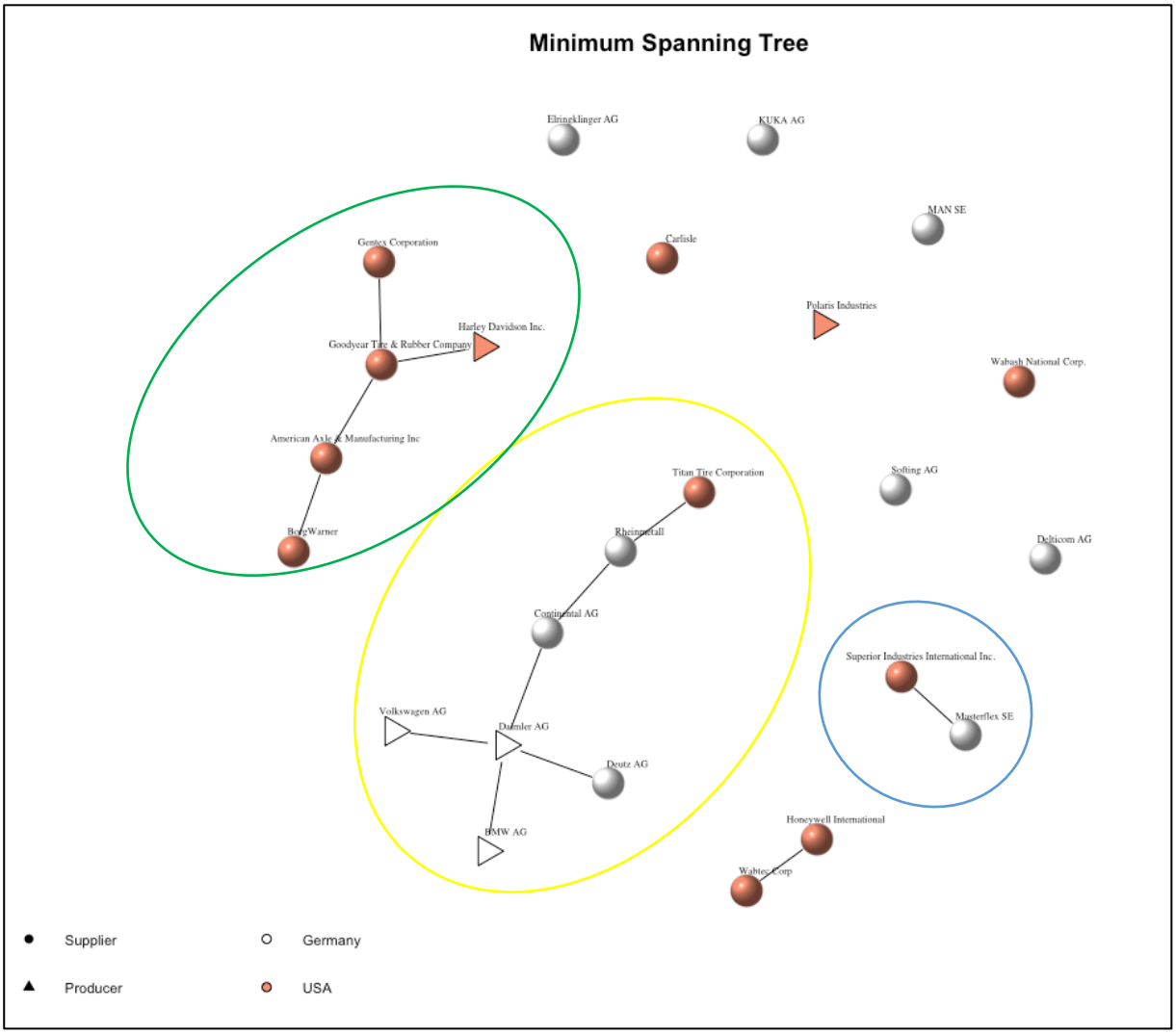

Figure 16 - Minimum Spanning Tree after event (Own research / Cloud Appendix K)

In addition to that, international connections have developed. The already before the event existent connection of German producers and suppliers was enlarged by more German suppliers and furthermore, the U.S. supplier Titan Tire Corporation. This connection is marked in yellow and will be part of the in-depth analysis. Another connection evolved between a German and U.S. supplier marked in blue and will also be analyzed in-depth.

Another evolving connection of U.S. American suppliers and producers is marked in green. Since the topic of the thesis is more likely to focus on international interrelation changes, it will not be part of the in-depth-analysis.

Before discussing the results of the in-depth-analysis one can already explore first hints regarding the research of the thesis. Surprisingly, it seems like in the aftermath of the protectionist events the international interrelations have rather been enhanced than diminished. Therefore, this would be in direct confrontation with hypothesis one. In addition to that, one can say that regarding hypothesis three in the aftermath of a protectionist event, the setup of whole industries is changed. Still those findings need deeper prove.

The in-depth-analysis of the conspicuous findings listed in the excel-data “Indepth_company_analysis_event_2” and named in the research chapters show interesting results regarding the research of this thesis. In many listed cases many different reasons and / or no protectionist measures can be interpreted as the switch within the data. In some cases, evidence exists that protectionist events are responsible for the data change.

In the case of the node and individual betweenness changes of the BMW AG it can be seen that BMW sees an ongoing and actual threat of protectionism. BMW especially invested into the U.S. American markets mainly into production facilities. Local politicians consequently fear the stop or downsize of BMWs investments into the U.S. due to protectionism (Forbes, 2018). Consequently, this would be evidence for hypothesis two and three. Protectionism changes existing international interrelations and changes the setup of whole industries. In this case, this would imply the stop of BMW investments into the U.S. Accordingly, investments would move to other countries of the world.

Another finding of the in-depth analysis is the node connection and betweenness change of the German car producer Daimler AG. Daimler currently also sees a strong threat of protectionism. This recently lead the company to release a profit warning for the upcoming year, in which protectionism is one actual key driver for the bad development of the company. Regarding protectionism Daimler mentions, that the reallocation of vehicles and business will not compensate the loss due to protectionism and other factors (Daimler AG, 2018). Therefore, once again this statement has to be interpreted as prove for hypothesis two and three, since Daimler threatens to reallocate business to other locations.

Finally, another remarkable result was retrieved from the node betweenness change of the German supplier Continental AG. Recently the CEO of Continental released a statement, that rising protectionism on the U.S. side threatens and increases the price

of business and products. Furthermore, he claims that changing markets have to become a matter of everyday business and that his company takes every necessary steps to adapt and change company's activity more flexible and faster in the future (Continental AG, 2018). Again, this has to be interpreted as a prove for hypothesis two and three stated earlier within the thesis.

In summary, one can say that the in-depth-analysis supplied first sufficient prove on the influence of protectionism on international interrelation in the case of event two. Especially hypothesis two and three can be proven in some cases of the data. Protectionism, in the cases mentioned above, influences and changes existing international interrelations. Regarding hypothesis one and four, no direct prove could be found. Still, it is important to state, that activities covered by hypothesis two and three can imply changes described by hypothesis one. Furthermore, by implication one could then argue that also hypothesis four could be implied counter-wise.

4.5.4.2 FOREIGN DIRECT INVESTMENT DATA SET

As outlined before, Foreign Direct Investments describe capital outflows of a domestic investor into a foreign market. Therefore, the data set suits well as a gauge for globalization and international interrelation (Moon, 2009, p.1ff.).

4.5.4.2.1 EVENT 1 – GLOBAL ECONOMIC CRISIS

Figure 17 shows a timeline of the Foreign Direct Investments from the U.S. to Germany and from Germany to the U.S. from 2000 to 2016. The red line within the figure marks the year of the peak of the economic crisis in 2008, which as outlined earlier marked the new rise of protectionist measures within many countries (World Trade Organization, 2009, p.2ff).

As one can see evidently from the graphic, the U.S. had a lower FDI before, during and in the aftermath of the crisis compared to Germany. Almost two years after the crisis the U.S. foreign direct investments to Germany experienced a growth again.

Interestingly, the German Foreign Direct Investments into the U.S. even rose during the economic crisis. Still, a drop occurred within two years after the crisis. While the recent drop of the U.S. Foreign Direct Investments to Germany can be explained by the economic crisis, the delayed drop of Germany foreign direct investments to the U.S. cannot be explained by the crisis. The reasons will be outlined hereafter.

Since no other events or market movements could be found within the U.S. during the time frame, it is most likely that the U.S. shortened its foreign direct investments due to the major hits of the economy by the financial and following economic crisis. From an U.S. point of view this can be seen as a hint regarding hypothesis one. A shortage of Foreign Direct Investments to strengthen the domestic economy can be interpreted as a protective measure. This would also strengthen findings of researchers named within the literature review which name short-term economic benefits of countries introducing protectionist measures.

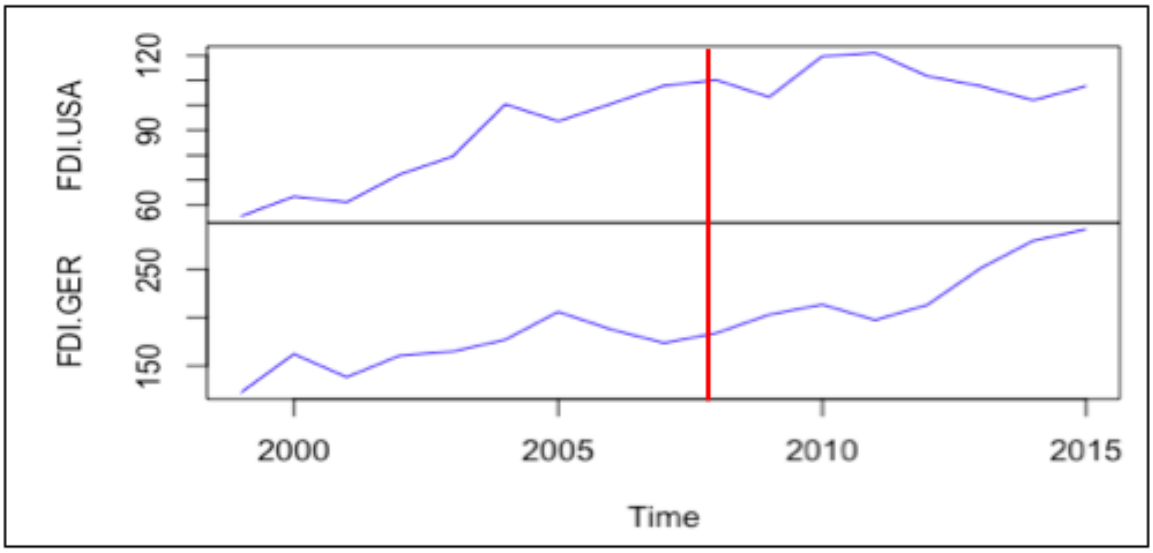

Figure 17 - Annual Foreign Direct Investments US to Germany / Germany to US (Own Research – Cloud Appendix L)

Regarding hypothesis one, one can say that in conclusion protectionist measures are set up in order to protect domestic markets and strengthen the domestic economy, therefore diminish international interrelations.

Still, it is important to state that the drop of U.S. Foreign Direct Investments to Germany only occurred in the peak year of the financial crisis, 2008. Already one year later Foreign Direct Investments from the U.S. to Germany were rising again. Those findings show that even in tough economic phases interrelation and investments still seem to be important. This is especially interesting when knowing that the U.S. raised protectionist measures right at the peak of the financial crisis (World Trade Organization, 2009, p.2ff).

By introducing a statement of the U.S. president at that time, hypothesis four can be confirmed in connection with the finding named above. Right in the middle of the financial crisis, president George W. Bush stated that free trade and less protectionism is needed in order to enforce international trade and international interrelations. From

the standpoint of the president at that time, international interrelations were the future solutions for the economic problems within the world (CNN Money, 2008). Since the president is the major adjusting screw regarding U.S. Foreign Direct Investments, one can say that the detected raise of foreign direct investments in figure 17 right after the peak of the crisis show that free trade promotes international interrelations. Consequently, in the case of this data, hypotheses four can be marked as true.

In addition to that, one of the findings of researchers named in the literature review can be confirmed. As outlined earlier, countries believe in the short term help of protectionist measures. Still, in the long-term protectionist measures seem to ruin trade in general and especially also in the domestic market. This opinion can be confirmed by the actual data. During the peak of the financial crisis, protectionist measures were rising and Foreign Direct Investments were cut back. Right after the peak in 2009, free trade was promoted and consequently Foreign Direct Investments have been raised again.

On the other hand, Germany's Foreign Direct Investments to the U.S. dropped two years after the economic crisis. In contrast to the American Foreign Direct Investments, the drop cannot be explained by event one and the rise of protectionist measures. Still, the findings reveal interesting information regarding hypothesis two and hypothesis three. As a researcher from the German Institute of Economic Research pointed out, it was rather a strategy shift of German companies, than the crisis itself that led to the changed amount of Foreign Direct Investments to the U.S. The researcher argues that Germany diversified its trade in the aftermath of the crisis and for example invested and traded more into emerging countries than into countries like the U.S. (Spiegel, 2011). On the one hand, this fact explains the drop of less German Foreign Direct Investments to the U.S., on the other hand the circumstances also reveal interesting facts concerning hypothesis two. Since it was outlined earlier that protective measures rose especially in the U.S. in the aftermath of the financial and economic crisis, it is interesting to see that international interrelations change in the aftermath. Germany and German companies shifted a huge amount of Foreign Direct Investments from the U.S. to emerging economies. This is especially true when displaying that overall German foreign direct investments were in total rising during the described period (BDI, 2013, p. 6ff.).

In summary, the examination of the FDI data set for event one shows that indeed corporate interrelations are affected by political changes, especially by the introduction

of protectionist measures or in this case the decrease of FDI investments. Just from the inspection of event one, one can say that it seems to be a common method to raise protectionist measures. Still, in the long-term case of the U.S., free trade is seen as an important economic driver. Furthermore, it is also shown by the data that political changes trigger modifications in the setup of international interrelations, as proven by the findings for Germany presented above.

4.5.4.2.2 EVENT 2 – ELECTION OF DONALD TRUMP

Overview of data set and identification of patterns

In order to investigate event two, the election of Donald Trump and a threatened strong growth of protectionism, figure 18 is introduced. It shows a forecast of U.S. and German Foreign Direct Investments combined. The HoltWinters method was used to create this forecast with R. Holt Winters uses historical data – the data provided by the data set – to forecast time series developments (R-Bloggers, 2017). At this point it is important to say that also the historical data was averaged for the forecast.

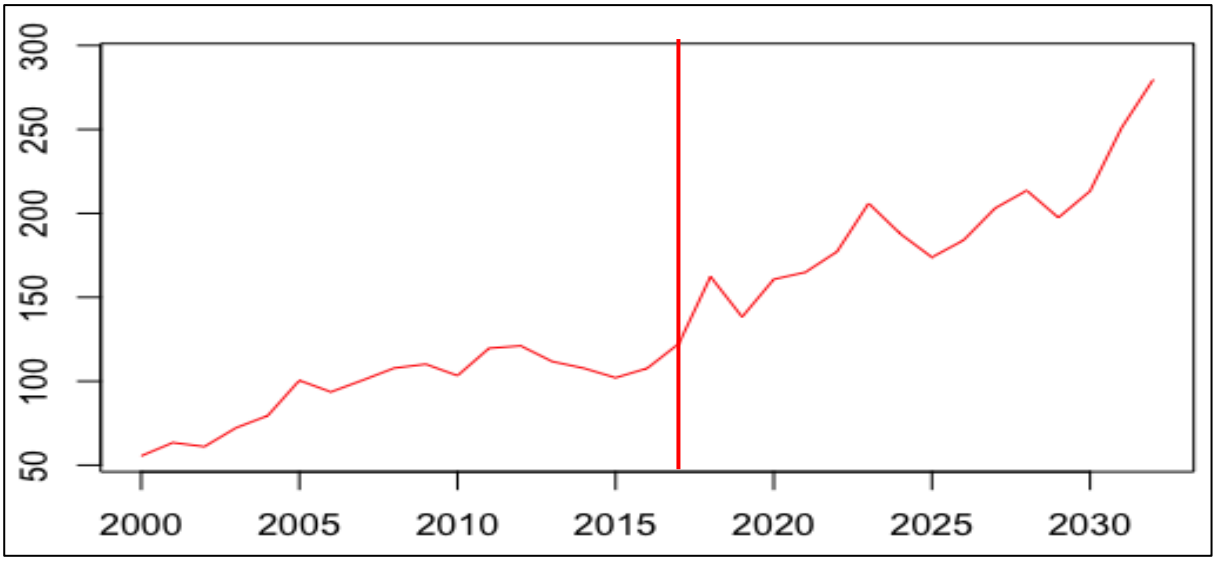

Figure 18 - Annual Foreign Direct Investments U.S. / Germany Forecast (Own Research – Cloud Appendix L)

The forecast predicts a growth of foreign direct investments within the first years after the election of Donald Trump. In the following years until 2030, different periods of falls and growth can be noticed within the forecast. Although the most important information revealed by the forecast is the long-term FDI growth which is predicted. Since it was outlined within the theoretical part that protectionist measures are currently on the raise and the threat of protectionism is at a very high level, it is remarkable that a strong FDI growth is predicted by the Holt Winters forecast. This is especially true since another

strong protectionist time after the economic crisis of 2009 is included in the data set used to make the prediction.

Another interesting approach that can be made in order to predict future FDI growth, is the fanchart method. Fanchart diagrams combine historical data, shown by a line graph, with a range zone graph created by predicted values. Values that are predicted further in the future have a stronger spread shown by the range due to harder predictability. The middle of the range always shows the most probable prediction (Mathworks, 2017). Figure 19 and 20 show the fanchart predictions for the US and German FDI until 2035.

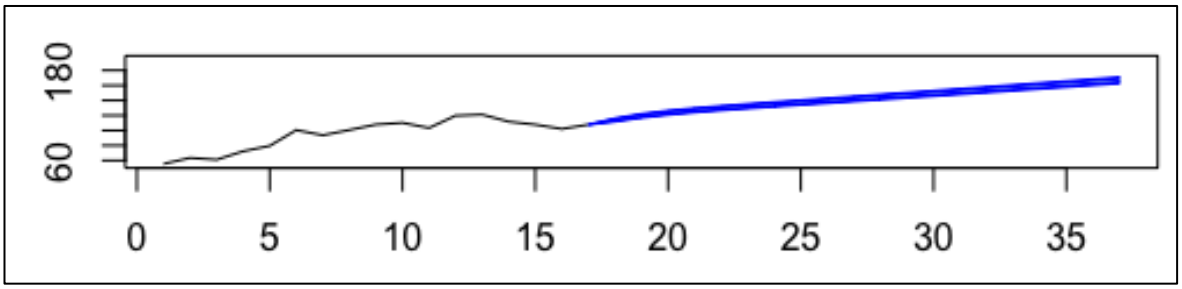

Figure 19 - Fan Chart FDI USA (Own Research – Cloud Appendix L)

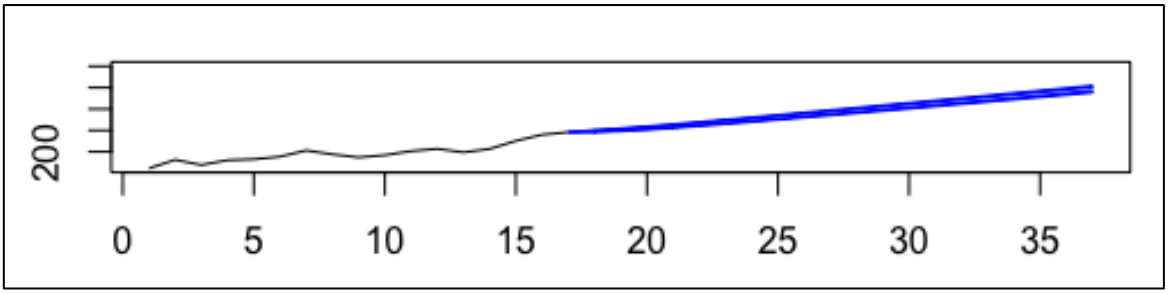

Figure 20 - Fan Chart FDI Germany (Own Research – Cloud Appendix L)

As one can see, the fanchart predictions for the U.S. and Germany point into the same direction as the Holt Winters forecast, which, as outline earlier, displays a combined prediction for the U.S. and Germany. It is noticeable that both fan charts only show a small range graph for the prediction. This can be interpreted as a relatively accurate prediction relying on the historical data. Although the range widens towards the end of the prediction, the range of the predicted values is not very wide. In addition to that, in both fancharts a clear tendency can be discovered: Both fancharts predict overall increasing Foreign Direct Investments from the U.S. to Germany and from Germany to the U.S.

Concerning hypothesis one, future predictions by Holt Winters and fancharts lead to the conclusion that, if FDI is interpreted as a measure for international interrelations and globalization, threat and growth of protectionist measure do not diminish international interrelations. One can conclude that political intervention through protectionism into trade is not considered as an obstacle for cooperation investing into international interrelations.

4.5.5 SUMMARY OF ANALYTICAL RESEARCH

The following chapter will summarize and merge the different findings of the diverse methods applied to the two different data sets. Since the four hypotheses were created on the basis of the findings of the literature review, the summary will primarily focus on proving or disproving the stated hypothesis.

Hypothesis 1 – Protectionism diminishes international interrelations

One of the mayor findings of the literature review was that protectionism diminishes international interrelations. In the case of the country, raising protectionism researchers named economic isolation as the major consequences. Furthermore, due to protectionist measures other countries would avert trade with protectionist countries and therefore international interrelations would be diminished.

Different research of this thesis showed results regarding hypothesis one that basically point into another direction. Concerning the stock price data set, it could be explored that international interrelations, especially in this case of the research between the U.S. and German automobile industry are not diminished. Interestingly, they are becoming even stronger. The MDS analysis shows that international interrelations change but are internationalized before and after the different events. Furthermore, the research showed that even if close relations between U.S. and German companies are gone after protectionist events, they are ongoing, but integrated in connections with other companies.

Within the network analysis deeper prove could be found. The in-depth analysis showed that in case of the Deutz AG and the Commercial Vehicle Group companies invest into the other market even if high protectionist times are present.

Furthermore, the analysis of the FDI-data set showed that protectionism does not diminish international interrelation. Counter-wise, different prediction methods show a strong rise of FDI-investments in the future and also after high times of protectionism.

In conclusion, one can say that hypothesis one, in the case of this research, has to be proven as false. International interrelations are rather strengthened or at least still existing than being diminished.

Hypothesis 2 – Protectionism changes existing international interrelations

Next to the destruction of international interrelations, many researchers named the change of international interrelations as one of the major consequences of rising protectionism. Within the literature review recent studies are presented that argue that in case of one country introducing protectionism other countries, so far trade related, will turn away from this particular country. In conclusion, those countries would seek other international partners or cooperations they will interrelate with (CAR, 2017, p. 12ff).

Within the research, prove could be found that supports hypothesis two. Within the stock price data set the cases and findings in connection with the Grammer AG, the BMW AG, the Daimler AG and Continental AG provide this prove. As identified within the research, the Grammer AG announced after the economic crisis and strong protectionism that reactions to market changes have to be done and have to be done faster. Furthermore, within the stock prices data set it was shown that small dimensions which existed before the first event integrated into big dimensions. Strong prove for a change of international interrelations.

Within the stock price data set and event two further prove for hypothesis two could be found. Both, the Daimler AG and the Continental AG threatened and promised to adapt their strategy, especially concerning company locations, in case of even higher protectionism. Since those announcements were especially named in connection to rising protectionism by Donald Trump, the announcement of the German companies can be seen as another strong prove for hypothesis two.

Finally, also the FDI data set provides prove for the hypothesis stated above. Within the analysis it was shown that Germany diversified its FDI investments after the financial crisis and at times of high protectionism. Deeper research showed that Germany diversified their investments away from countries like the U.S. to emerging markets. This is a strong prove, especially if knowing that German FDI investments were growing during that time.

Hypothesis 3 – Protectionism influences the international setup of whole industries

Many researchers, such as Krugman, argued that raising protectionism can change the setup of whole industries and not only some international interrelations (Krugman, 2016).

Regarding the research and in case of some of the findings named in connection with the summary of hypothesis two, it can be said that the research of this thesis also provides prove for hypothesis three. Especially the findings within the stock price dataset, that small dimensions before the event dissolve and integrate into big international dimension after the event, support hypothesis three. In addition to that, the findings of the FDI data set show that countries such as Germany change their international investment and in conclusion international relation strategy in the aftermath or in times of high protectionist measures. As mentioned before, Germany rose their Foreign Direct Investments in the aftermath of the economic crisis, but invested more in emerging countries and lowered investing into high protectionist countries such as the U.S.

Hypothesis 4 – Free Trade promotes international interrelations

Counter-wise to the findings of many researchers that protectionism harms international interrelations a lot of researchers also argued that free trade promotes international interrelations. It was therefore expected for the own research that in times of trade liberalization in line with free trade agreements international interrelations will grow.

Regarding the research of this thesis, no prove or disprove for hypothesis four could be found within the data used for the research. Only within the FDI data set and an in-depth analysis it could be explored that within the economic crisis one of the mayor U.S. strategies was to improve free trade in the aftermath of the economic crisis in order to enrich international interrelations. This can be interpreted as a hint regarding the influence of free trade on international interrelations. Once again, it is important to state that no prove could be identified within the two data sets used for the research of this thesis.

5 CONCLUSION

5.1 SUMMARY

The main purpose of the thesis was to identify possible changes within international interrelations due to protectionism. Especially in times of strong globalization growth on the one hand side and significantly growing measures of protectionism on the other side, it becomes obvious that the reaction of international trade is a strong concern in today's time.

Concerning the general influence of protectionism, it can be said that the research of the thesis definitely provided enough prove to show that protectionism influences international interrelation within the automobile industry of Germany and the USA.

Regarding the question of "how" international interrelations are influenced, findings showed different directions. In summary, one can say that international interrelations are not diminished by protectionism so far. As already mentioned earlier, it can be explored that today a long-time high level of protectionism by the U.S. exists (Reuters, 2018). Consequently, first companies of the automobile industry are starting to adapt their international interrelations strategy. Interestingly, on the side of U.S. (Financial Times, 2018) and German companies (Continental AG, 2018) of the automobile industry. It has to be expected that in the future reactions are going to be stronger and more often, if the U.S. continues its protectionist policies which are often met by counter-reactions by international partners. Once again, until today research did not provide prove for a destruction of international interrelations.

More likely, research showed that international interrelations within the U.S. and German automobile industry change and setup of whole industries change. The automobile industry seems to have adapted to higher protectionism by allowing wider and more interrelated networks of suppliers and producers. As already mentioned, long-term partnerships in the automobile industry are an old term today and are more likely to change constantly within greater networks of possible international partners.

Finally, it is important to state that with no doubt the German and U.S. automobile industry is facing strong changes, if the U.S. continues to raise protectionist measures. As Milner stated (Milner, 1958, p.3): "...domestic politics and international relations are inextricably interrelated. A country´s international position exerts an important impact on its internal politics and economics. Conversely, its domestic situation shapes its behavior in foreign relations." Concerning the research of the thesis, it is possible that

the U.S. is losing a key player role within international interrelations, not only in the automobile industry. Furthermore, it is most likely possible that more companies such as the Harley Davidson Inc. and Continental AG turn their back on them. This goes in line with many researchers listed within the literature review, that the U.S. will face the biggest harm in the long-term.

Finally, it has to be said that protectionist policies are only one of many influencers of international interrelations. Especially, for the international automobile industry, U.S. customers are an important factor for their income and success. Concerning international connections to the U.S. this is especially important. Since it was found within the theoretical part, that the automobile industry has also strong regional patterns and cars are often finalized where they are sold (Sturgeon et. al., 2009, p.1ff), a complete downturn of investments of international automotive companies into the U.S. is more than unlikely. This is also shown by an overall rising number of German automotive facilities within the U.S. (VDA, 2017).

Therefore, it is most likely that the U.S. remains a factor within the international automobile industry and furthermore, due to their worldwide market presence international interrelations within the automobile industry might change but will never be diminished completely. The research of the thesis showed that the international and highly globalized automobile industry heavily relies on international markets and international interrelations.

Still, in the end it has to be warned that the ongoing protectionism of the U.S. government has already forced companies of the sector to react. Emerging countries, with improving infrastructure seem to get more and more into the focus of international automotive companies (Sturgeon et. al., 2009, p.1ff), to the detriment of the U.S. with uprising protectionism.

5.2 CRITICAL ACCLAIM

Regarding the research of the thesis it is important to establish that this paper is not providing a full analysis of all relevant developments in connection with the research question and the data provided within the event.

Especially since the automobile industry is a fast moving and dynamic industry, it is hard to isolate protectionism as the only reason for change within the data. Furthermore, the automobile industry, particularly within Germany and the U.S. has suffered strong influencing events, such as the economic downfall of U.S. American

producers General Motors or the diesel scandal in Germany which shook and influenced the whole industry during the time frame of the research.

In addition to that, the research could not provide a full examination regarding the use of methods and time frames. This is mainly due to the extent restrictions of the thesis itself. A full analysis of the data and the connected events could have included different time frames before and after the event and deeper and more use of different methods.

Moreover, it would of course be thinkable to include different events than the two events chosen for this research. Furthermore, the amount of data is also restricted by the industry and availability of complete data itself.

Finally and consequently, the hypotheses and research presented within this thesis can only be confirmed or not be confirmed in the framework of the chosen data, the chosen methods and the chosen events. It cannot be applied generally and has different restrictions named above.

5.3 OUTLOOK

As already mentioned in the previous chapter, the research of the thesis has different limitations. Therefore, different possible directions for further research can be identified.

For the current data set it would be interesting to integrate further methods and time frames and even other events than the economic crisis and the election of Donald Trump. Moreover, it would even be thinkable to investigate other industries than the automobile industry. Furthermore, it would be possible and beneficial for further findings to extend and deepen the research concerning every event analyzed. Since international trade, especially in the automobile industry, is very complex and fast changing intensive and deep research is necessary.

In addition to that, the actual development within the German and U.S. automobile industry shows interesting promises regarding the research topic of this paper. As already mentioned earlier within the thesis, U.S. president Donald Trump is currently and continuously carrying out his threats of higher protectionist measures by the USA. By the end of June 2018 those restrictions are currently at a new and unprecedented level of protectionism. Many trade barriers were raised and especially had the purpose of protecting the U.S. automobile industry. Strong reactions and a trade war with Europe is currently within the realms of possibility (Reuters, 2018).

As another counter-reaction, cases of the Continental AG (Continental AG, 2018) and other German companies presented within the research shows that the current level of U.S. protectionism forces companies to react.

In addition to that, U.S. companies such as Harley Davidson Inc. recently announced to move production facilities out of the U.S. market due to problems with international suppliers and sales due to U.S. protectionism and counter measures by the European Union (Financial Times, 2018).

Consequently, the upcoming time will be more than perfect to analyze the influences of protectionism on international interrelations. The actual level of protectionism within the U.S. provides an outstanding possibility in a considerable period of time.

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APPENDIX

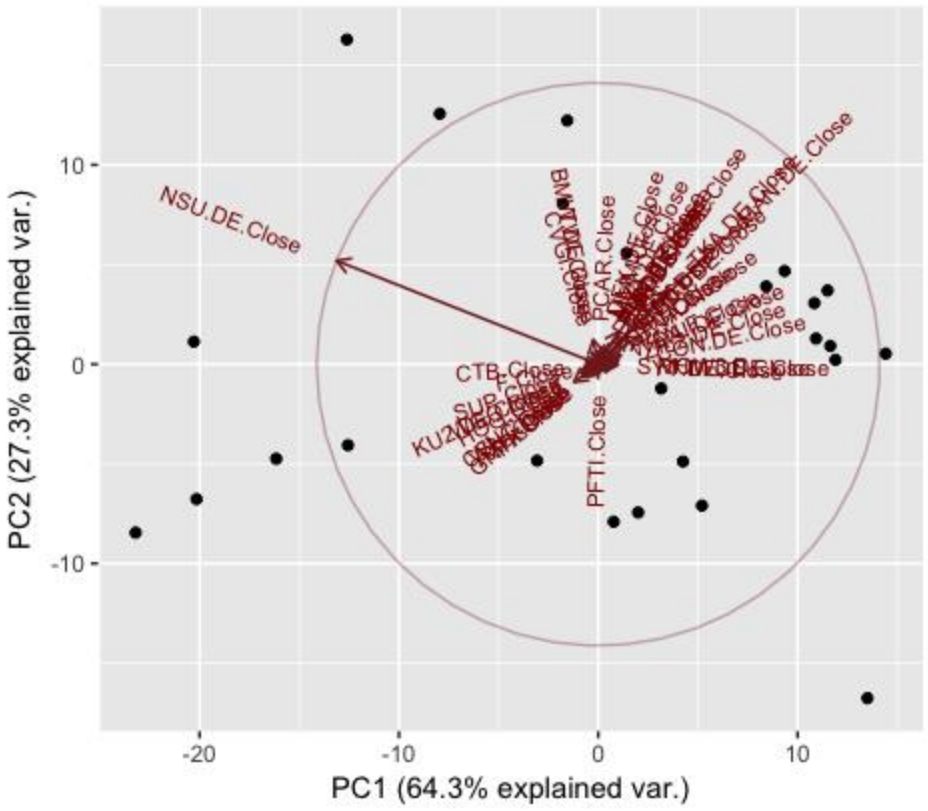
Cloud Appendix

Due to the huge amount of Code and Data this thesis has a cloud appendix in addition to the appendix below. The cloud appendix can be found on the attached USB-Stick or under the following permanent online Link.

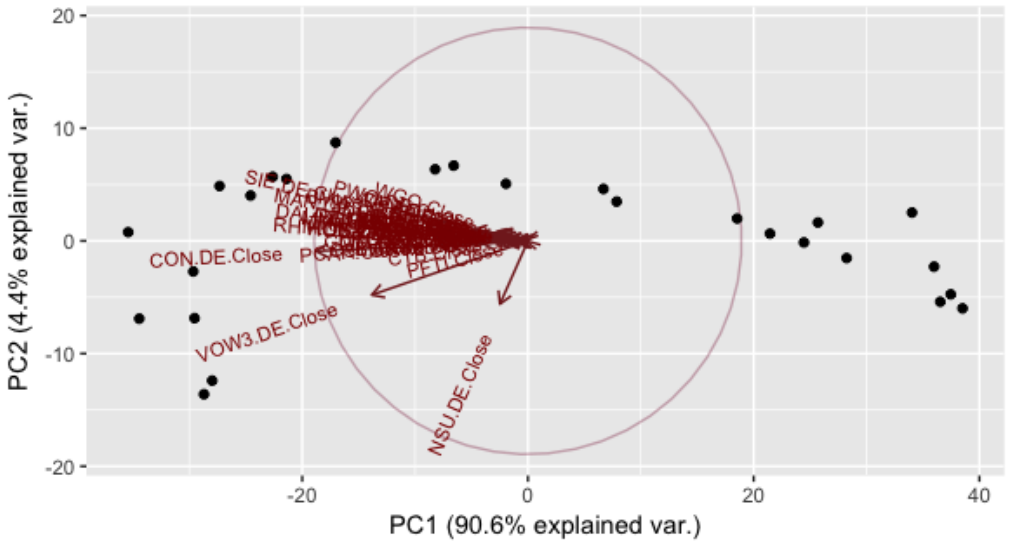
https://www.dropbox.com/sh/sxfuchx46ydhm8r/AADz_6KRCH8QyYiDgHUWtSFma?dl=0

Appendix 1 – Biplot before and after event 1 (Own research)

Biplot before event 1 (Own research / Cloud Appendix M)



Biplot after event 1 (Own research / Cloud Appendix N)



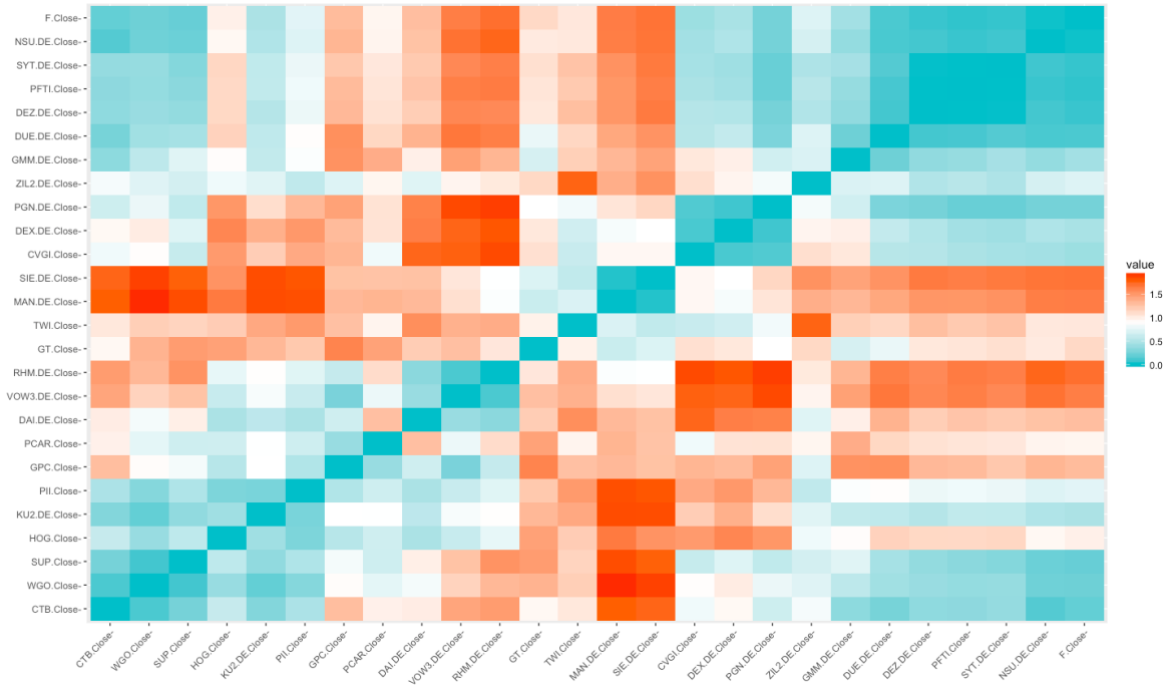
Appendix 2 – Companies with Correlation switch before and after event 1 (own research – Cloud Appendix M/N)

Company Name	Country	Type
Audi AG	Germany	Producer
Volkswagen AG	Germany	Producer
Daimler AG	Germany	Producer
MAN AG	Germany	Producer
Deutz AG	Germany	Supplier
Delticom AG	Germany	Supplier
Dürr AG	Germany	Supplier
Elringklinger AG	Germany	Supplier
Grammer AG	Germany	Supplier
KUKA AG	Germany	Supplier
Rheinmetall AG	Germany	Supplier
Siemens AG	Germany	Supplier
Softing AG	Germany	Supplier
Paragon AG	Germany	Supplier
Winnebargo Industries	USA	Production
Ford Motor Company	USA	Production
Harley Davidson Inc.	USA	Production
Paccar Inc.	USA	Production
Polaris Industries	USA	Production
Commercial Vehicle Group	USA	Supplier
Cooper Tire & Rubber Company	USA	Supplier
Genuine Parts Company	USA	Supplier
Gentex Corporation	USA	Supplier

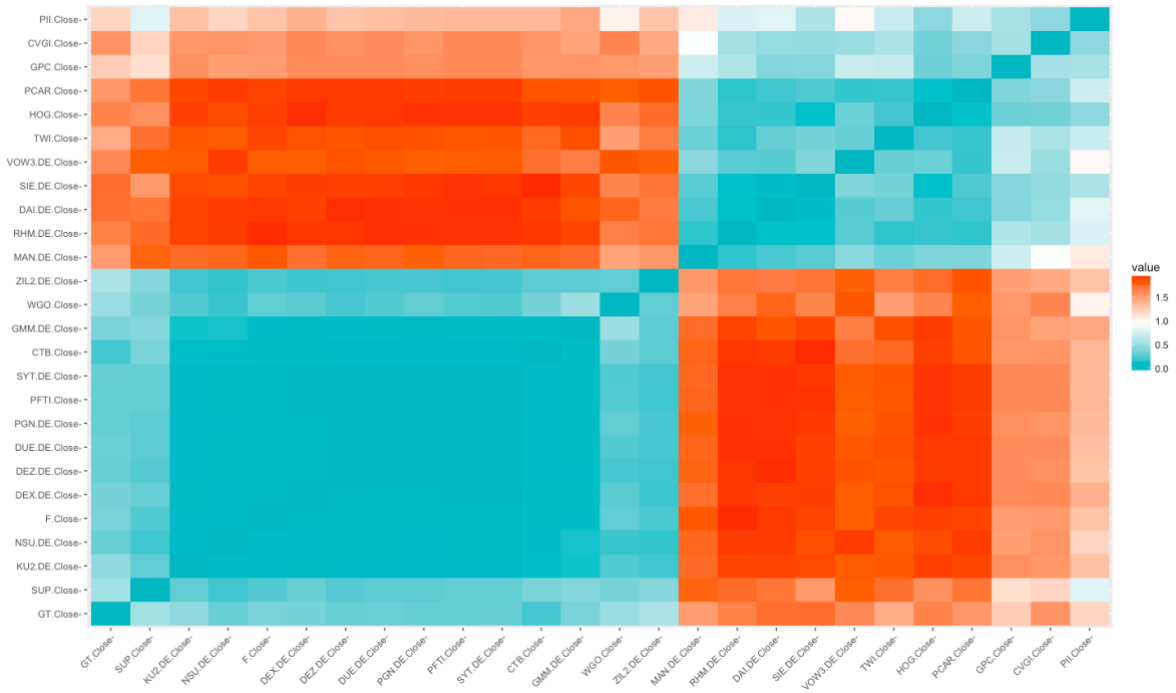
Puradyn Filter Technologies	USA	Supplier
Superior Industries International Inc.	USA	Supplier
Titan Tire Corporation	USA	Supplier

Appendix 3 – Distance measures before and after event 1 (own research)

Distance measures before event 1 (own research / Cloud Appendix A)

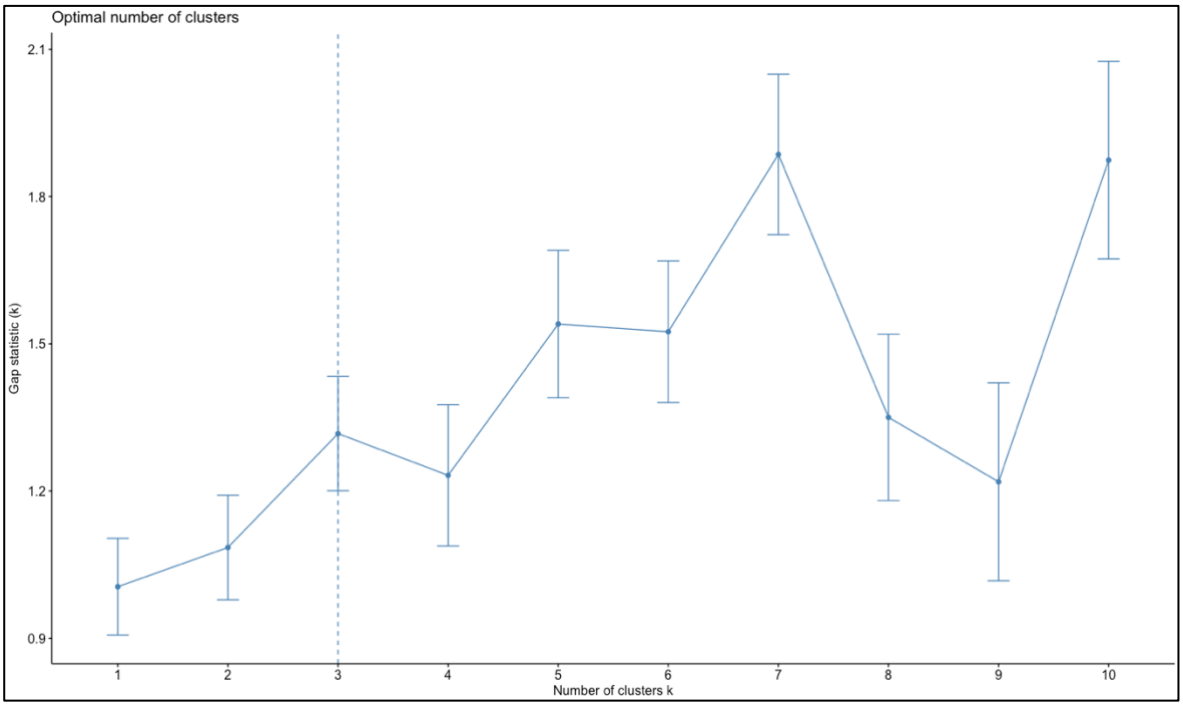


Distance measures after event 1 (own research / Cloud Appendix B)

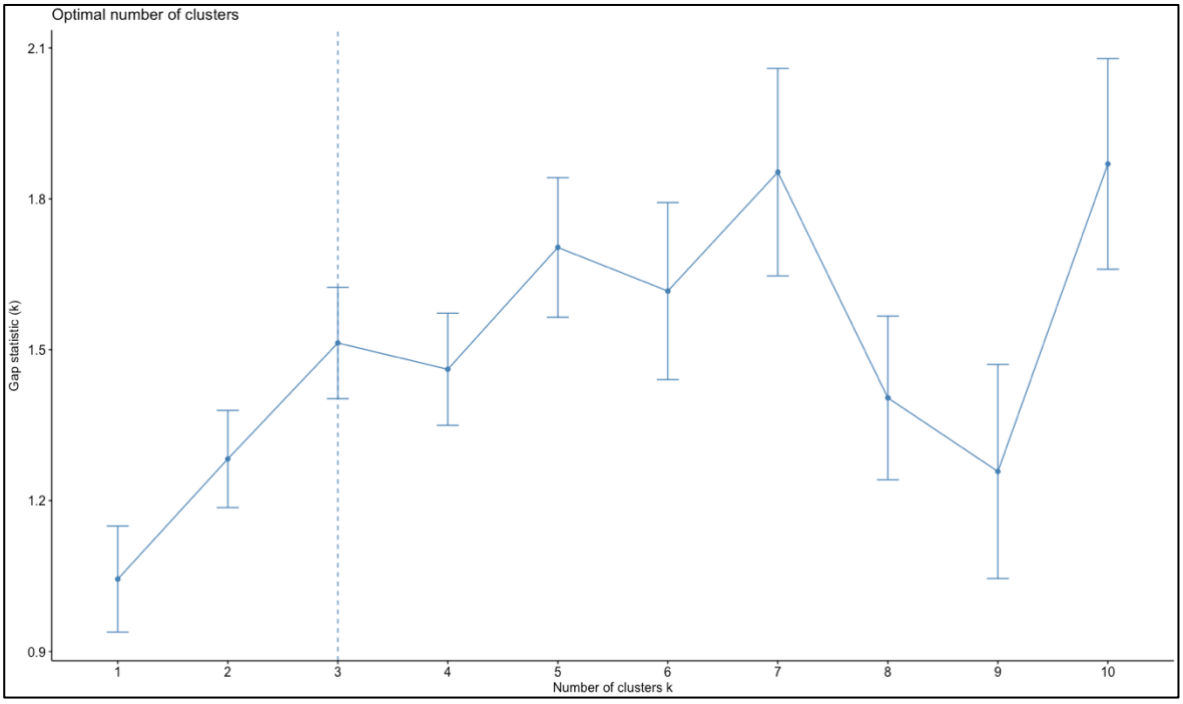


Appendix 4 – Optimal number of clusters event 1 (own research)

Optimal number of clusters before event 1 (own research / Cloud Appendix A)

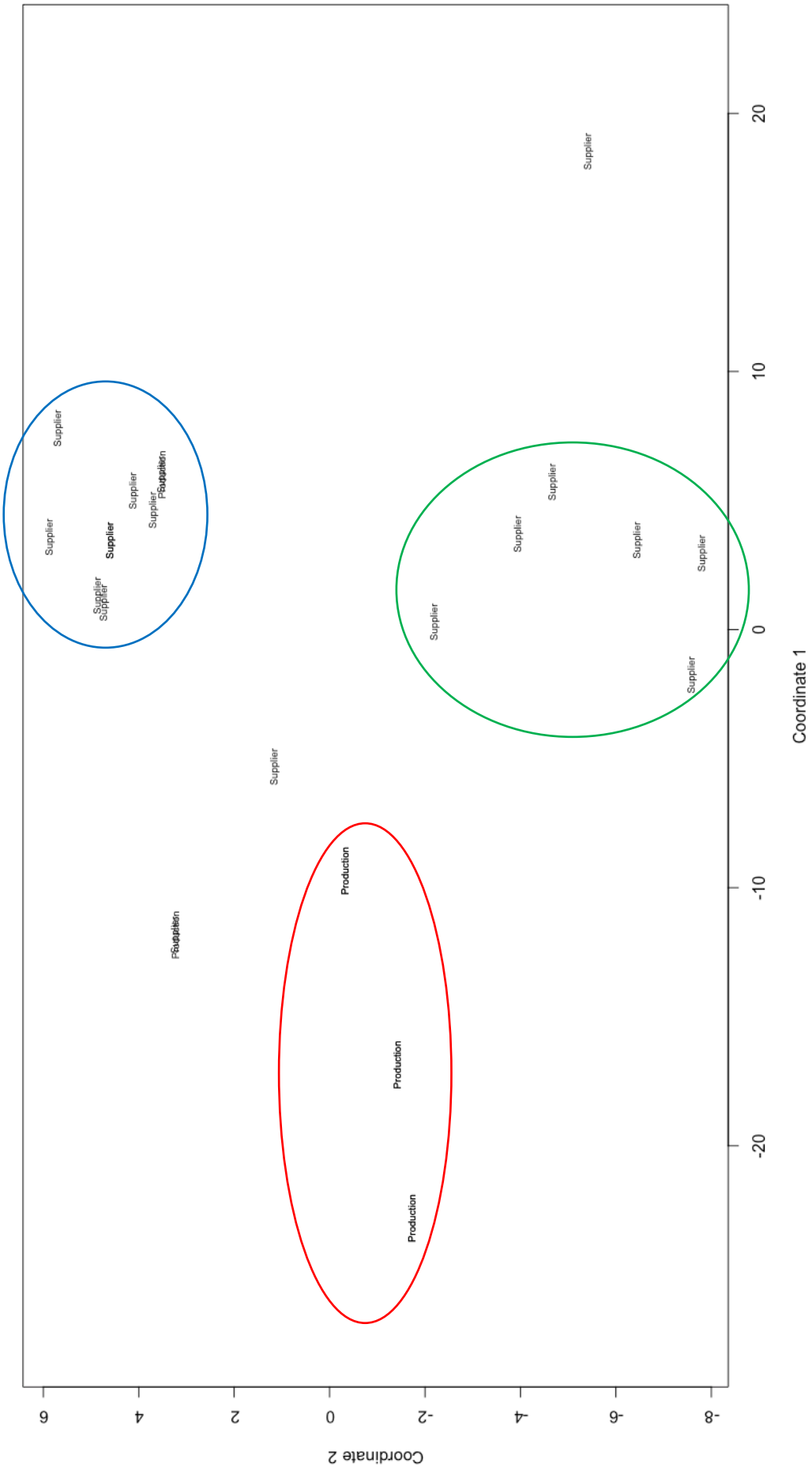


Optimal number of clusters after event 1 (own research / Cloud Appendix B)

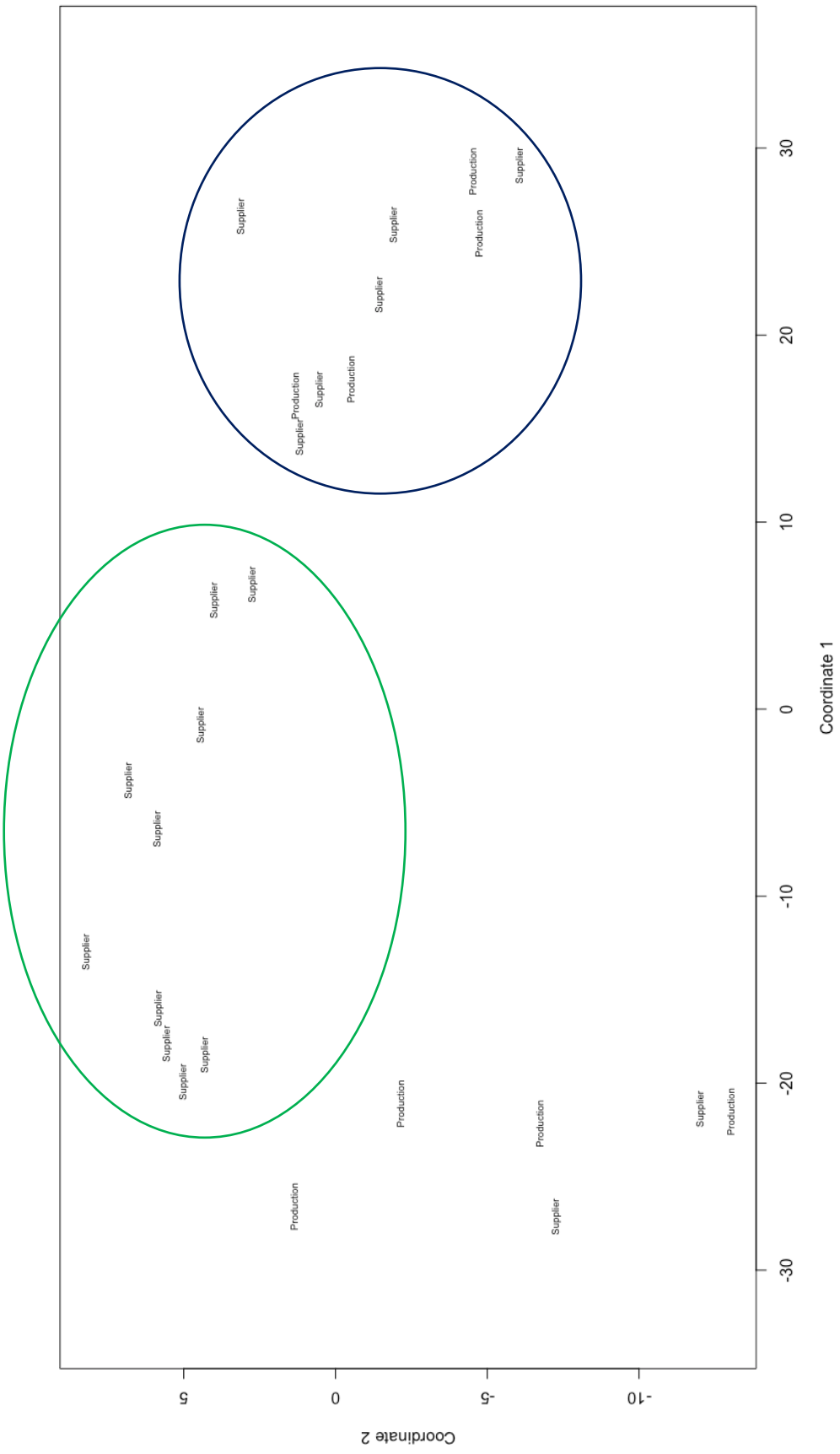


Appendix 5 – Multidimensional Scaling Industries (own research)

Multidimensional scaling industries before event 1 (own research / Cloud Appendix O)

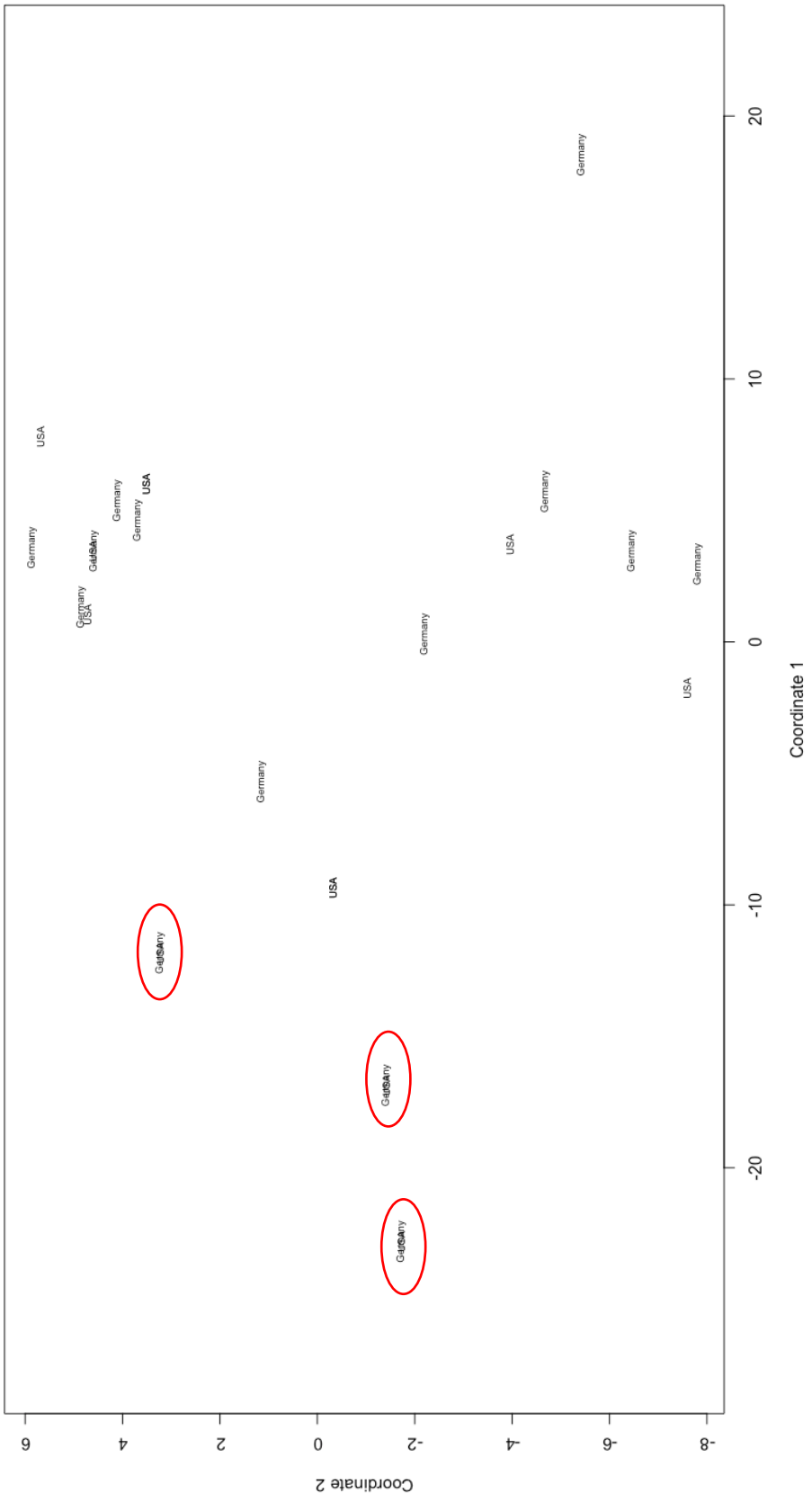


Multidimensional scaling industries after event 1 (own research / Cloud Appendix P)

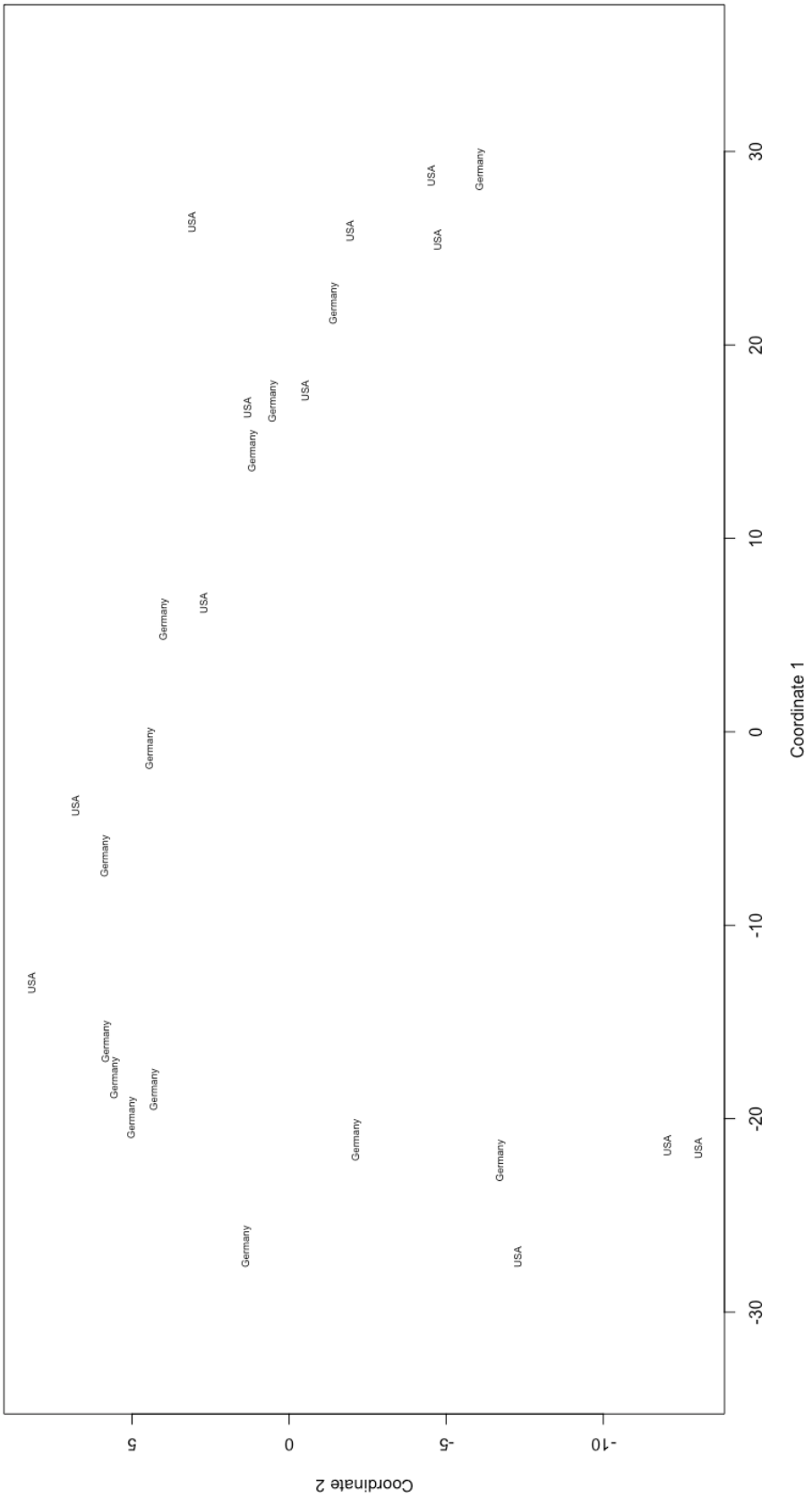


Appendix 6 – Multidimensional Scaling Countries (own research)

Multidimensional scaling countries before event 1 (own research / Cloud Appendix Q)

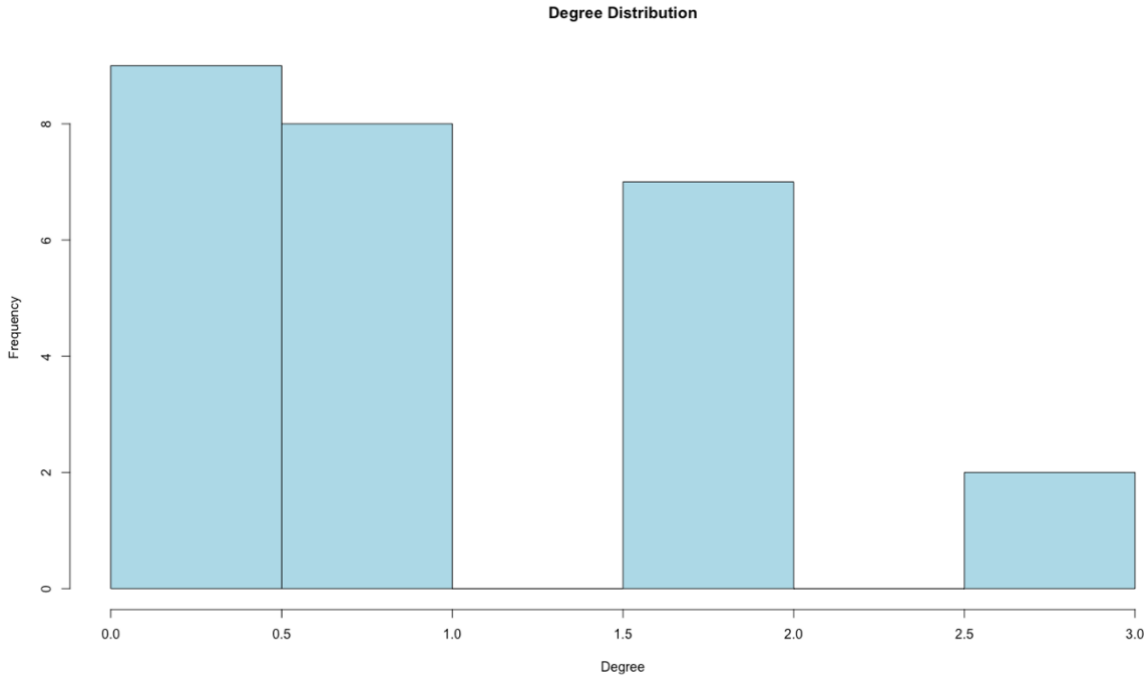


Multidimensional scaling countries after event 1 (own research / Cloud Appendix R)

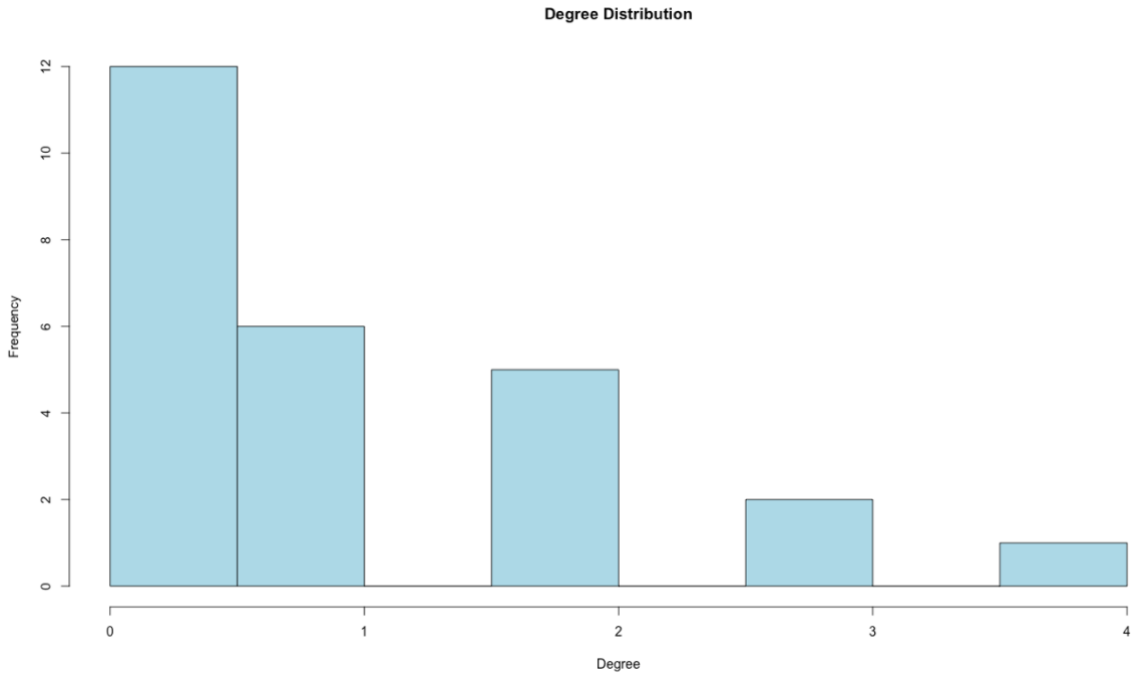


Appendix 7 - Degree Distribution event 1 (own research)

Degree Distribution before event 1 (own research / Cloud Appendix C)



Degree Distribution after event 1 (own research / Cloud Appendix D)



Appendix 8 - Degree Distribution individual event 1 (own research)

Degree distribution individual before event 1 (own research / Cloud Appendix C)

Audi AG	Daimler AG
0	1
Volkswagen AG	Winnebago Industries
1	3
Commercial Vehicle Group	Cooper Tire & Rubber Company
1	2
Delticom AG	Deutz AG
0	2
Derr AG	Elringklinger AG
0	0
Genuine Parts Company	Goodyear Tire & Rubber Company
2	1
Grammer AG	KUKA AG
0	1
MAN SE	Puradyn Filter Technologies
2	0
Rheinmetall	Siemens AG
2	3
Softing AG	Superior Industries International Inc.
0	1
Titan Tire Corporation	Ford Motor Company
0	2
Harley Davidson Inc.	Paccar Inc.
1	2
Paragon AG	Polaris Industries
0	1

Degree distribution individual after event 1 (own research / Cloud Appendix D)

Audi AG	Daimler AG
0	2
Volkswagen AG	Winnebago Industries
0	0
Commercial Vehicle Group	Cooper Tire & Rubber Company
1	1
Delticom AG	Deutz AG
0	0
Derr AG	Elringklinger AG
1	0
Genuine Parts Company	Goodyear Tire & Rubber Company
3	1
Grammer AG	KUKA AG
2	0
MAN SE	Puradyn Filter Technologies
1	0
Rheinmetall	Siemens AG
3	4
Softing AG	Superior Industries International Inc.
0	0
Titan Tire Corporation	Ford Motor Company
1	0
Harley Davidson Inc.	Paccar Inc.
2	2
Paragon AG	Polaris Industries
0	2

Appendix 9 - Individual node closeness event 1 (own research)

Individual node closeness before event 1 (own research / Cloud Appendix C)

high closeness marked yellow

Audi AG	Daimler AG
0.001538462	0.001964637
Volkswagen AG	Winnebago Industries
0.001953125	0.001893939
Commercial Vehicle Group	Cooper Tire & Rubber Company
0.001730104	0.001886792
Delticom AG	Deutz AG
0.001538462	0.001968504
Derr AG	Elringklinger AG
0.001538462	0.001538462
Genuine Parts Company	Goodyear Tire & Rubber Company
0.001736111	0.001872659
Grammer AG	KUKA AG
0.001538462	0.001949318
MAN SE	Puradyn Filter Technologies
0.001980198	0.001538462
Rheinmetall	Siemens AG
0.001972387	0.001984127
Softing AG	Superior Industries International Inc.
0.001538462	0.001879699
Titan Tire Corporation	Ford Motor Company
0.001538462	0.001893939
Harley Davidson Inc.	Paccar Inc.
0.001879699	0.001736111
Paragon AG	Polaris Industries
0.001538462	0.001730104

Individual node closeness after event 1 (own research / Cloud Appendix D)

high closeness marked yellow

Audi AG	Daimler AG
0.001538462	0.001980198
Volkswagen AG	Winnebago Industries
0.001538462	0.001538462
Commercial Vehicle Group	Cooper Tire & Rubber Company
0.001960784	0.001949318
Delticom AG	Deutz AG
0.001538462	0.001538462
Derr AG	Elringklinger AG
0.001972387	0.001538462
Genuine Parts Company	Goodyear Tire & Rubber Company
0.001984127	0.001964637
Grammer AG	KUKA AG
0.001980198	0.001538462
MAN SE	Puradyn Filter Technologies
0.001964637	0.001538462
Rheinmetall	Siemens AG
0.001984127	0.001992032
Softing AG	Superior Industries International Inc.
0.001538462	0.001538462
Titan Tire Corporation	Ford Motor Company
0.001953125	0.001538462
Harley Davidson Inc.	Paccar Inc.
0.001980198	0.001972387
Paragon AG	Polaris Industries
0.001538462	0.001968504

Appendix 10 - Individual node betweenness event 1 (own research)

Individual node betweenness before event 1 (own research / Cloud Appendix C)

high values marked yellow

Audi AG	Daimler AG
0	0
Volkswagen AG	Winnebago Industries
0	7
Commercial Vehicle Group	Cooper Tire & Rubber Company
0	4
Delticom AG	Deutz AG
0	5
Derr AG	Elringklinger AG
0	0
Genuine Parts Company	Goodyear Tire & Rubber Company
2	0
Grammer AG	KUKA AG
0	0
MAN SE	Puradyn Filter Technologies
8	0
Rheinmetall	Siemens AG
5	11
Softing AG	Superior Industries International Inc.
0	0
Titan Tire Corporation	Ford Motor Company
0	6
Harley Davidson Inc.	Paccar Inc.
0	2
Paragon AG	Polaris Industries
0	0

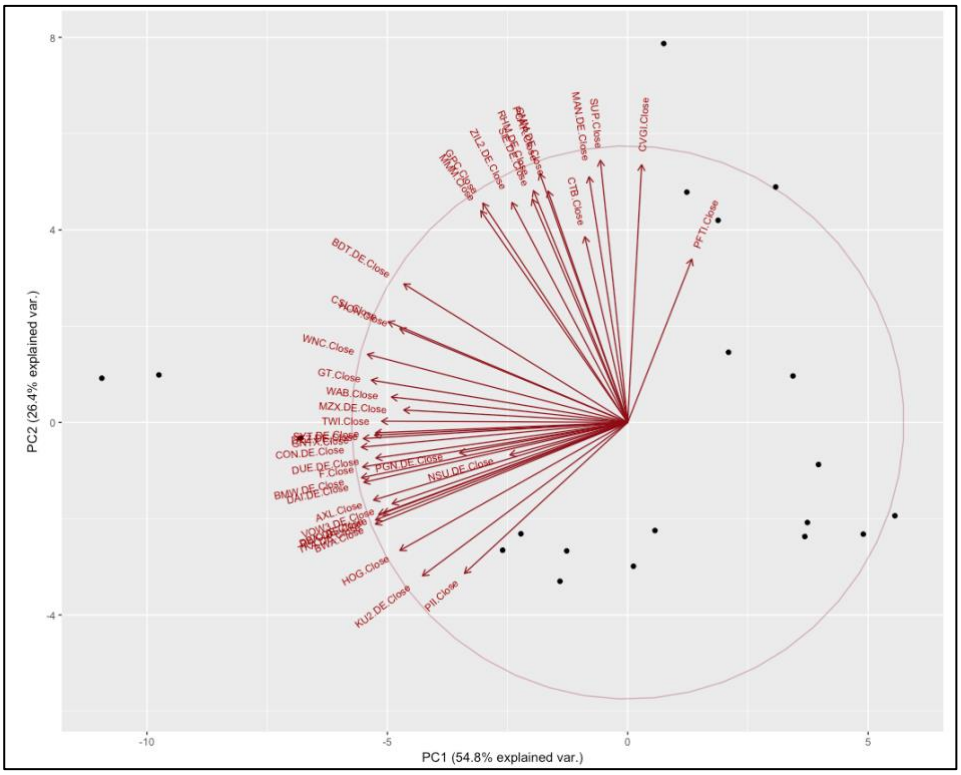
Individual node betweenness after event 1 (own research / Cloud Appendix D)

high values marked yellow

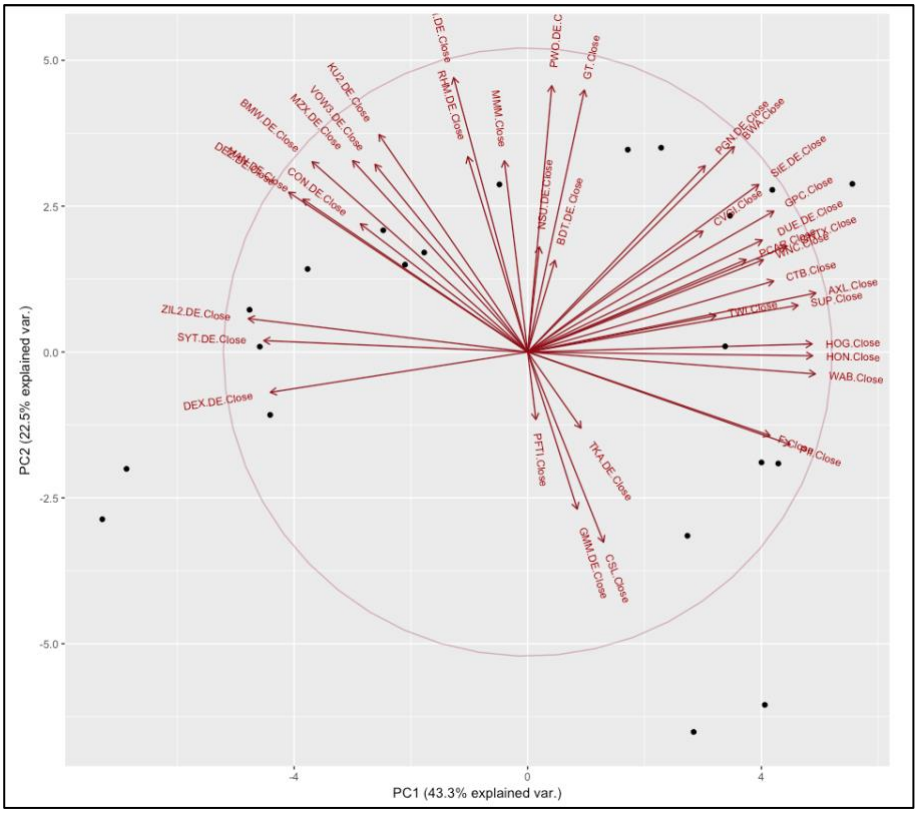
Audi AG	Daimler AG
0	0
Volkswagen AG	Winnebago Industries
0	0
Commercial Vehicle Group	Cooper Tire & Rubber Company
0	0
Delticom AG	Deutz AG
0	0
Derr AG	Elringklinger AG
0	0
Genuine Parts Company	Goodyear Tire & Rubber Company
11	0
Grammer AG	KUKA AG
5	0
MAN SE	Puradyn Filter Technologies
0	0
Rheinmetall	Siemens AG
5	11
Softing AG	Superior Industries International Inc.
0	0
Titan Tire Corporation	Ford Motor Company
0	0
Harley Davidson Inc.	Paccar Inc.
8	5
Paragon AG	Polaris Industries
0	5

Appendix 11 – Biplot before and after event 2 (own research)

Biplot before event 2 (own research / Cloud Appendix S)



Biplot after event 2 (own research / Cloud Appendix T)

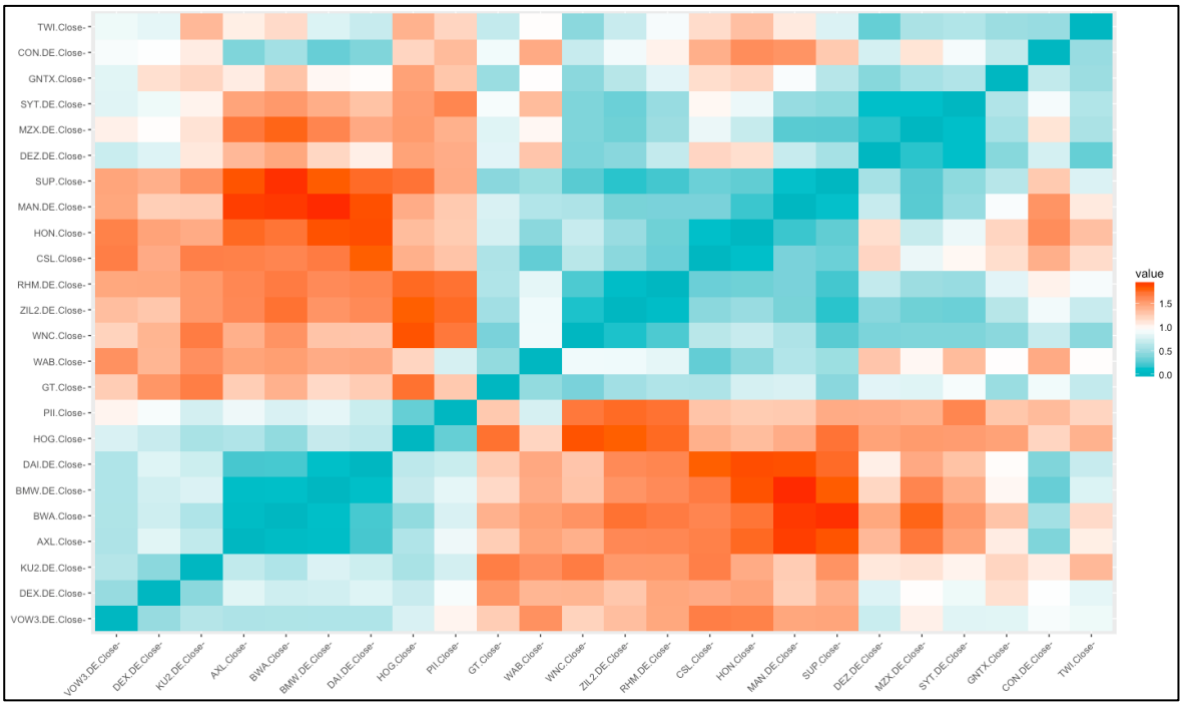


Appendix 12 – Companies with Correlation switch before and after event 1 (own research / Cloud Appendix S/T)

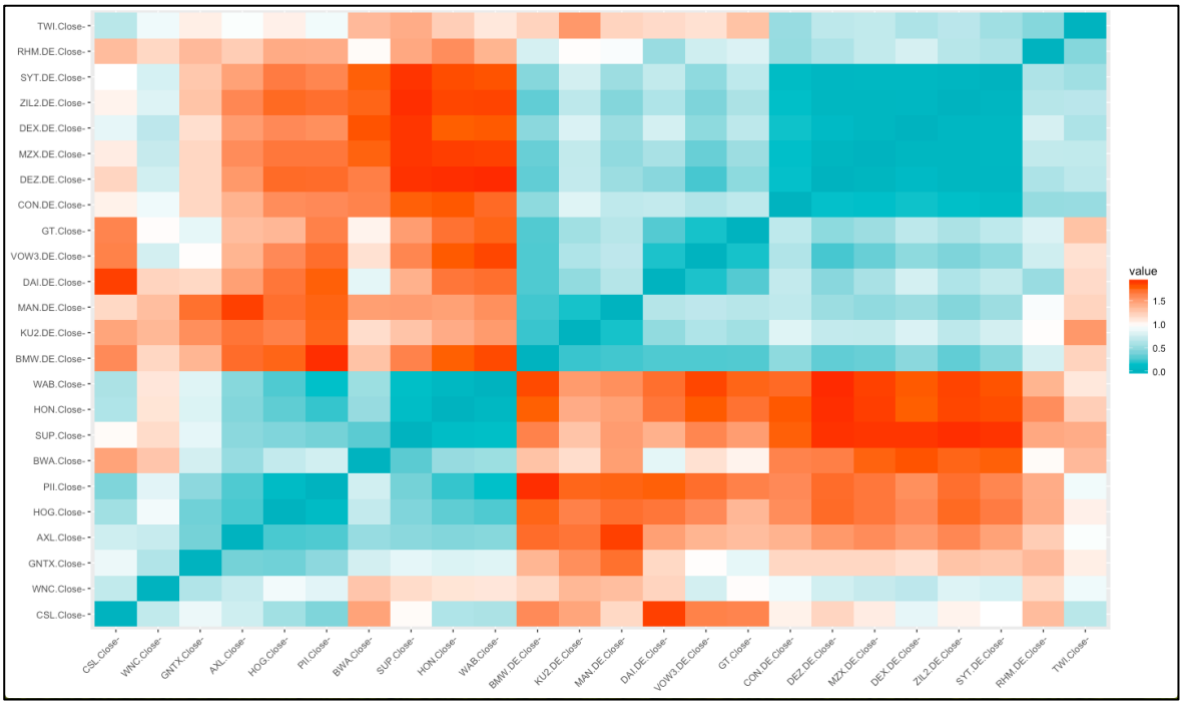
Company Name	Country	Type
BMW AG	Germany	Producer
Daimler AG	Germany	Producer
Volkswagen AG	Germany	Producer
MAN AG	Germany	Producer
Continental AG	Germany	Supplier
Delticom AG	Germany	Supplier
Elringklinger AG	Germany	Supplier
Deutz AG	Germany	Supplier
KUKA AG	Germany	Supplier
Masterflex SE	Germany	Supplier
Rheinmetall AG	Germany	Supplier
Softing AG	Germany	Supplier
Harley Davidson Inc.	USA	Producer
Polaris Industries	USA	Producer
American Axle & Manufacturing Inc.	USA	Supplier
Borg Warner	USA	Supplier
Carlisle	USA	Supplier
Gentex Corporation	USA	Supplier
Goodyear Tire & Rubber Company	USA	Supplier
Honeywell International	USA	Supplier
Superior Industries International Inc.	USA	Supplier
Titan Tire Corporation	USA	Supplier
Wabash National Corp.	USA	Supplier
Wabtech Corp.	USA	Supplier

Appendix 13 – Distance measures before and after event 2 (own research)

Distance measures before event 2 (own research / Cloud Appendix E)

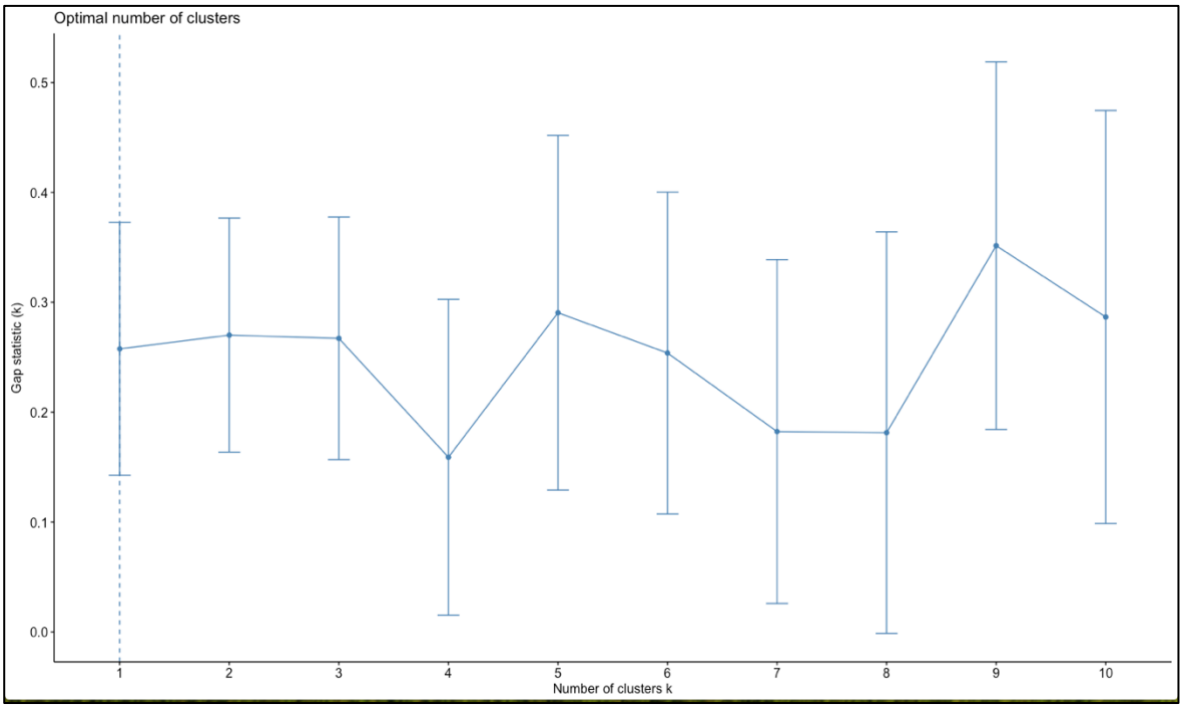


Distance measures after event 2 (own research / Cloud Appendix G)

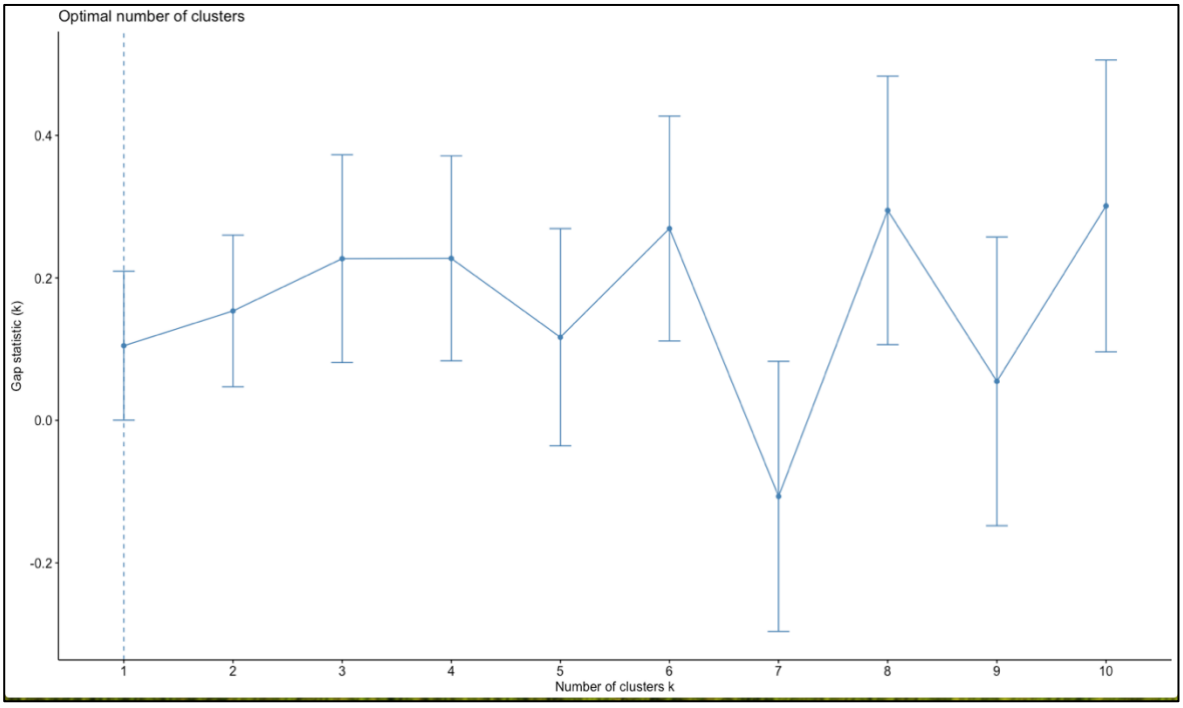


Appendix 14 – Optimal number of clusters event 2 (own research)

Optimal number of clusters before event 2 (own research / Cloud Appendix E)

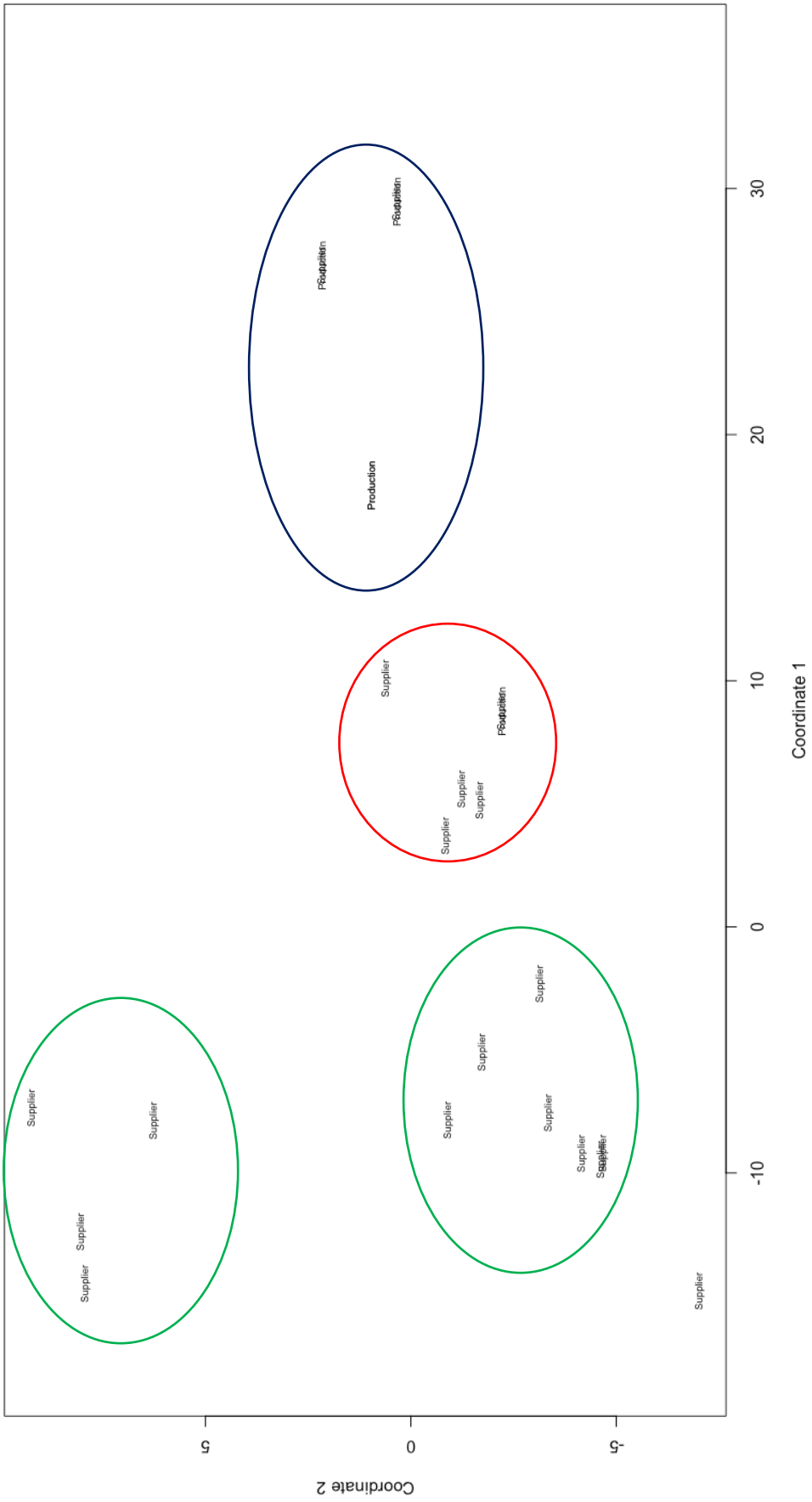


Optimal number of clusters after event 2 (own research / Cloud Appendix G)

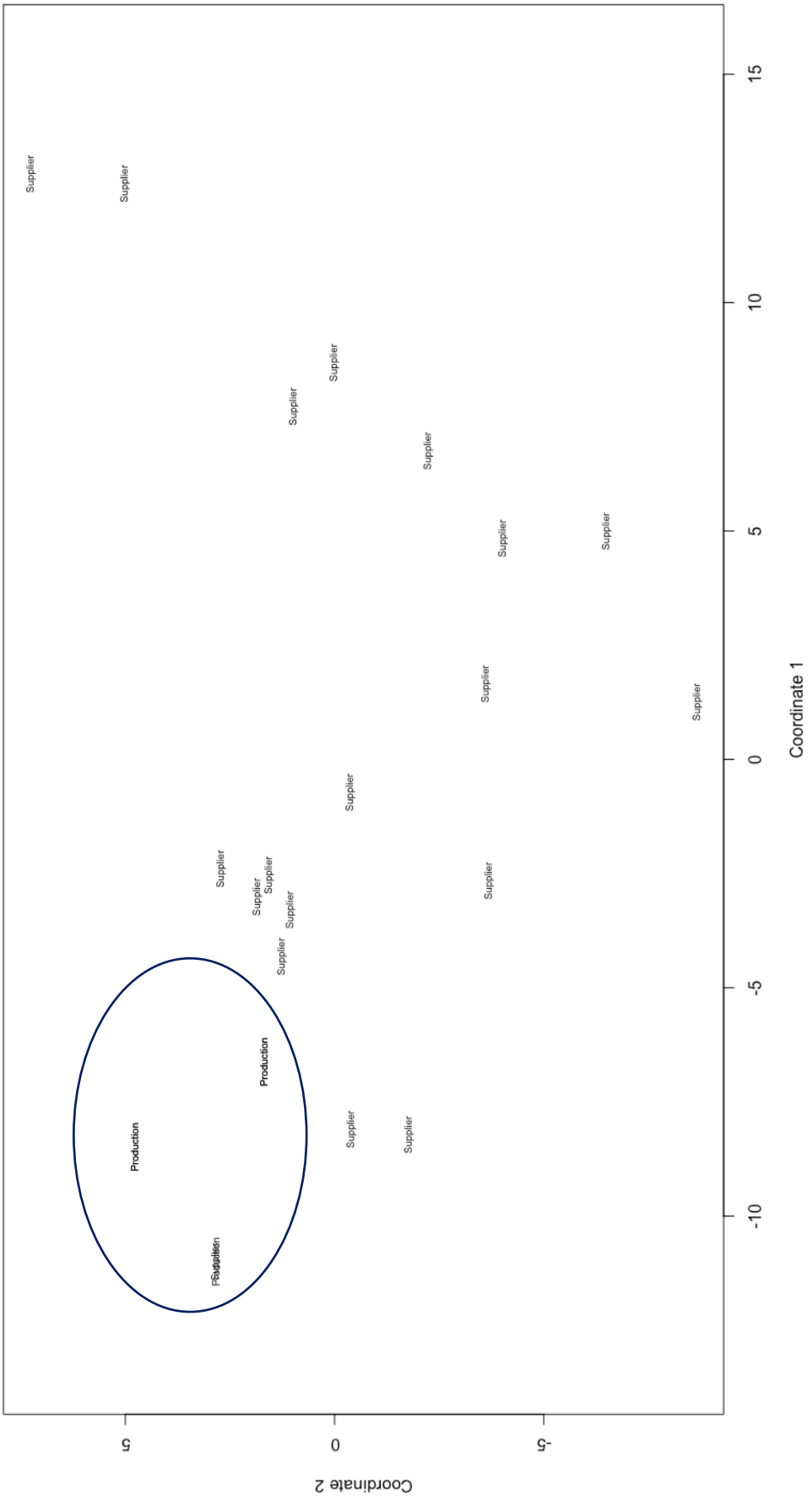


Appendix 15 – Multidimensional Scaling Industries (own research)

Multidimensional scaling industries before event 2 (own research / Cloud Appendix U)

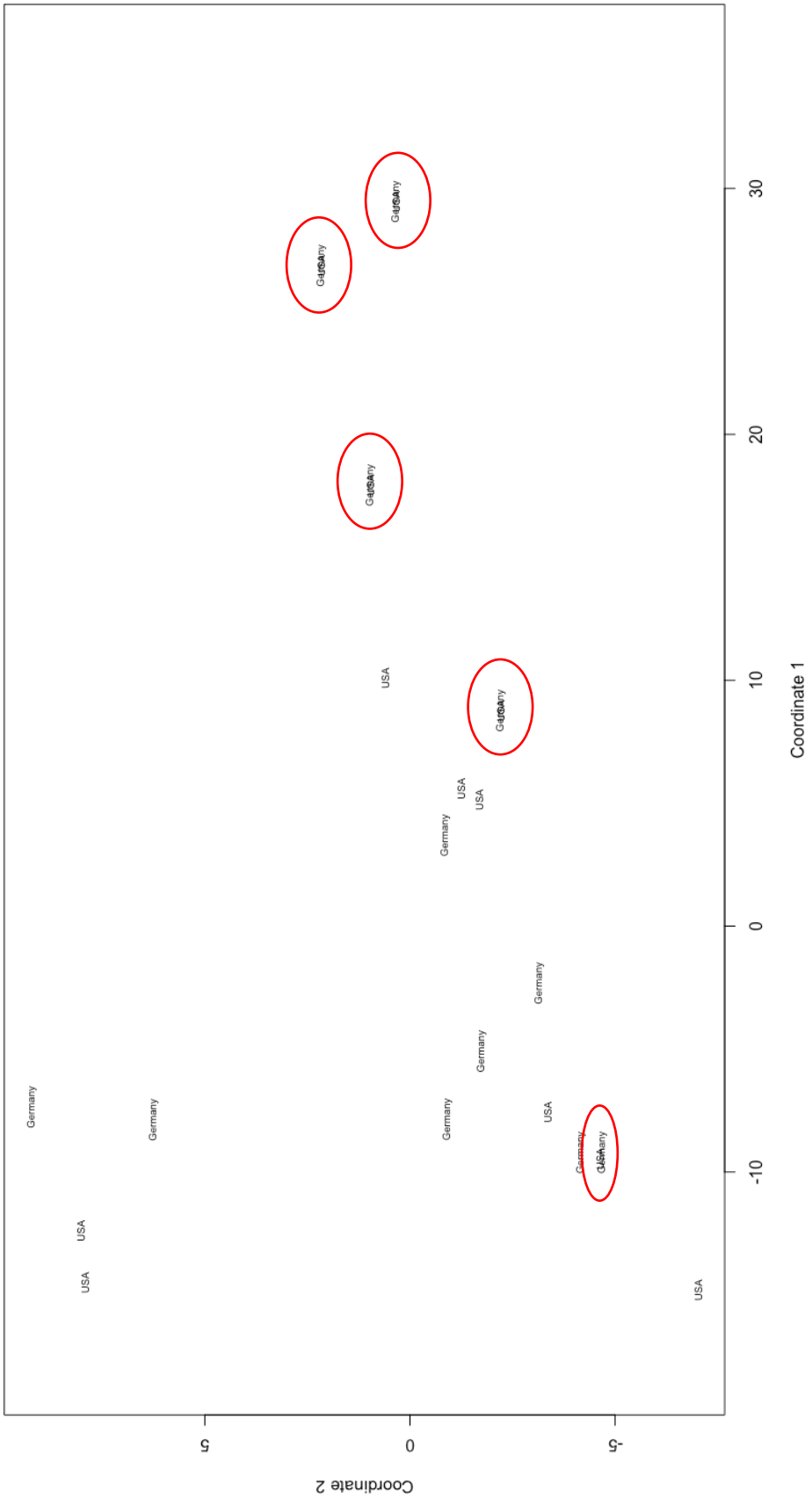


Multidimensional scaling industries after event 2 (own research / Cloud Appendix V)

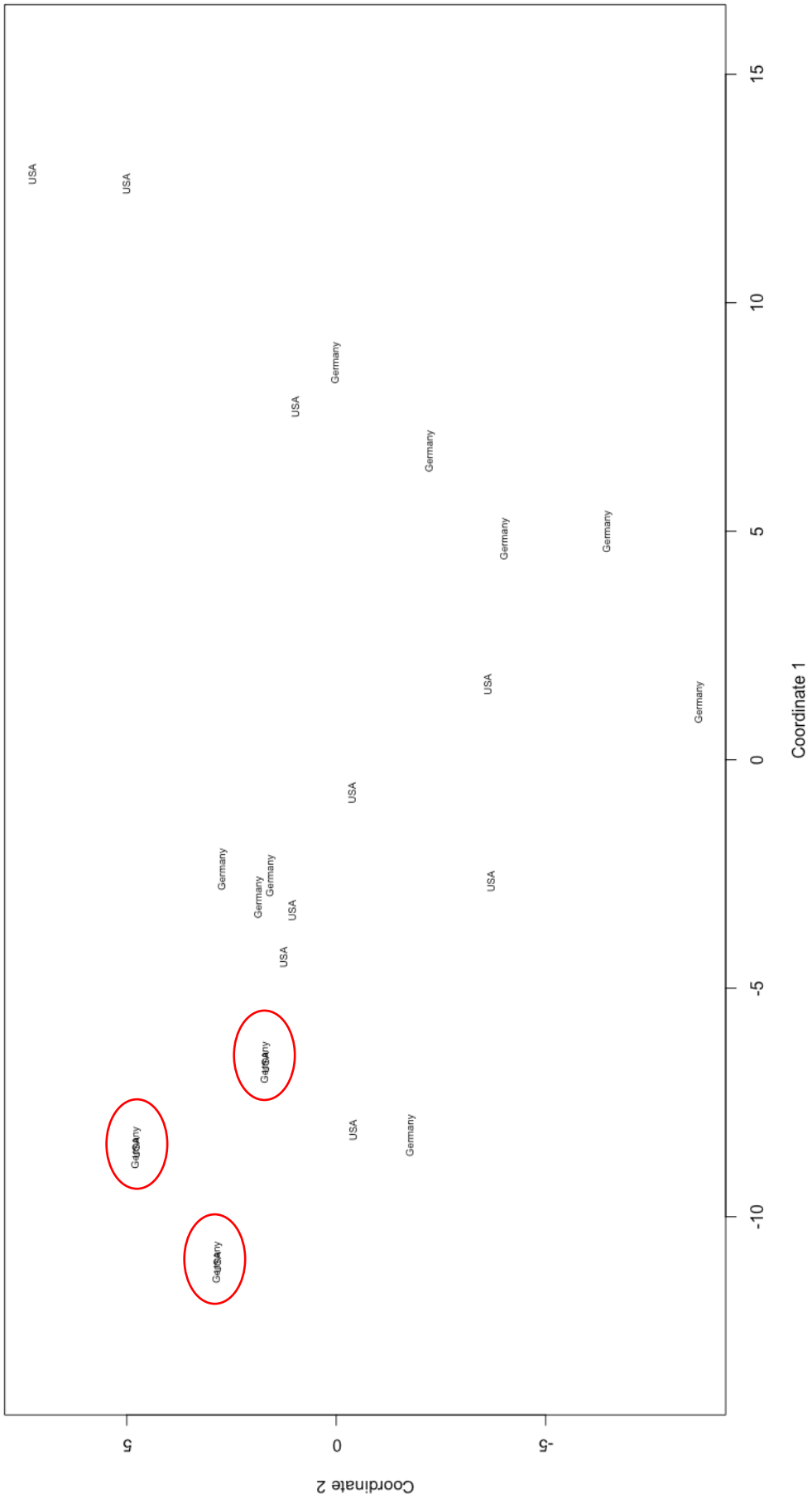


Appendix 16 – Multidimensional Scaling countries (own research)

Multidimensional scaling countries before event 2 (own research / Cloud Appendix W)



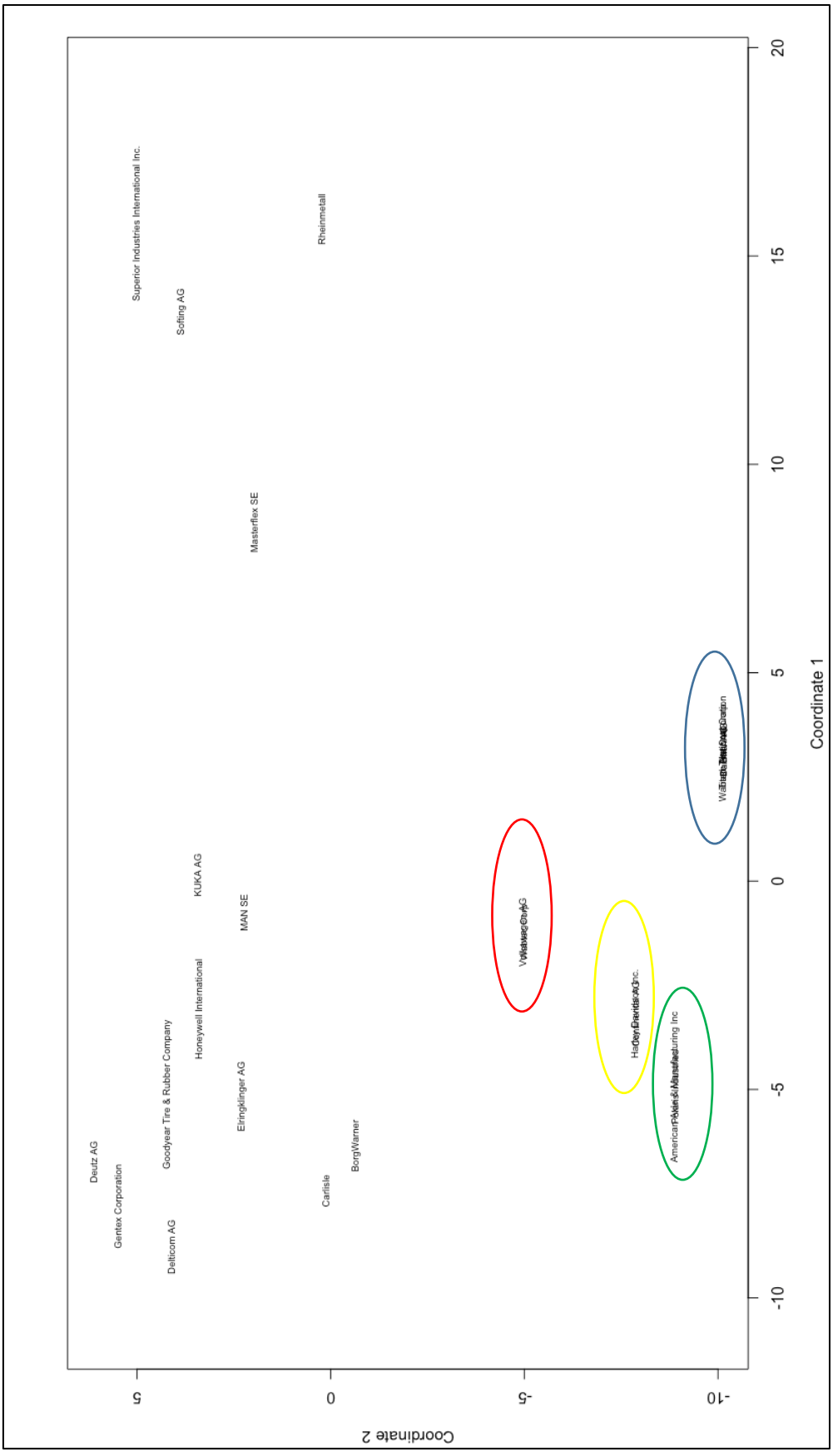
Multidimensional scaling countries after event 2 (own research / Cloud Appendix X)



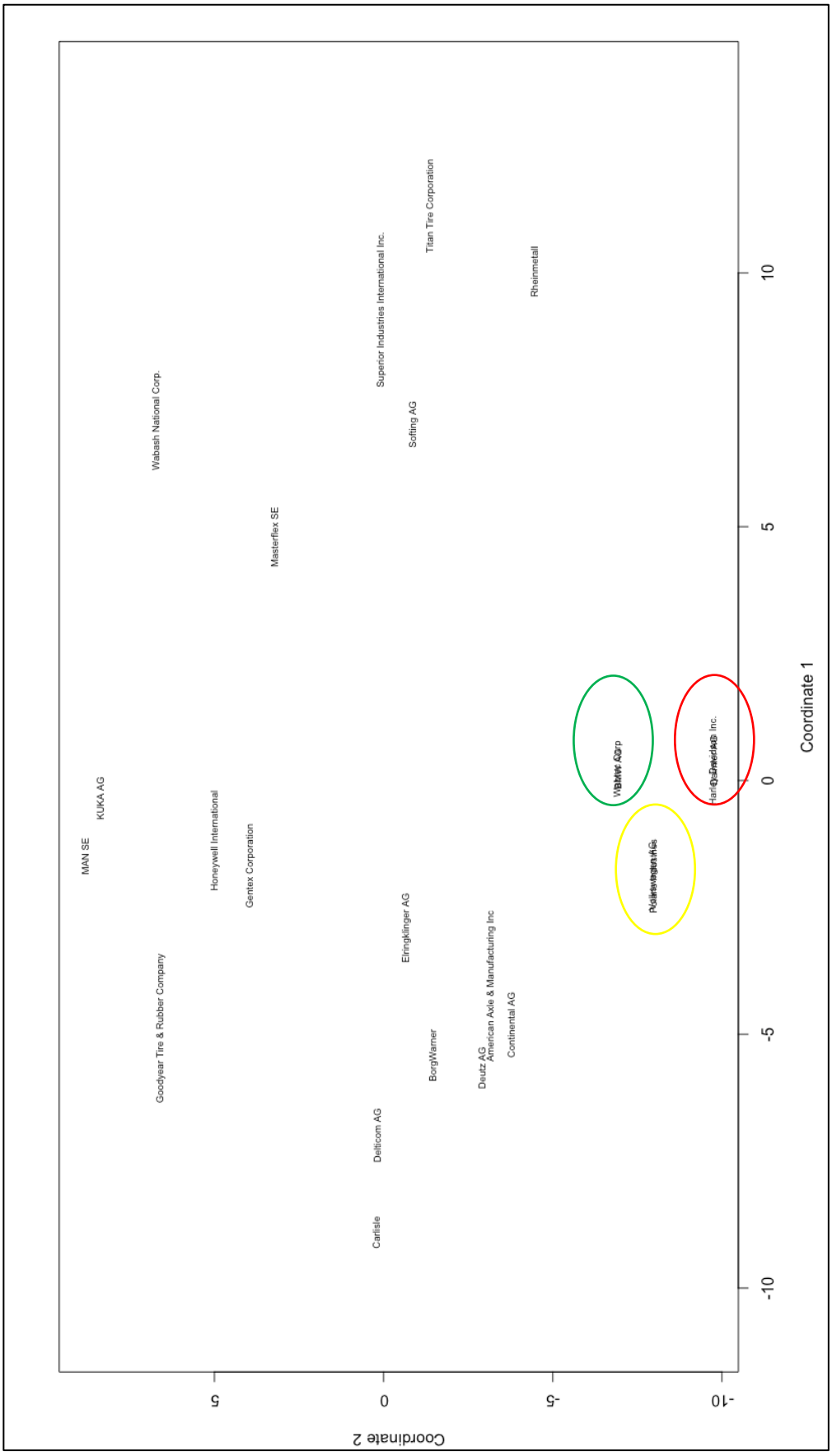
XL

Appendix 17 – Multidimensional Scaling countries (own research)

Multidimensional scaling countries after event 2 – April 2018 (own research / Cloud Appendix Y)

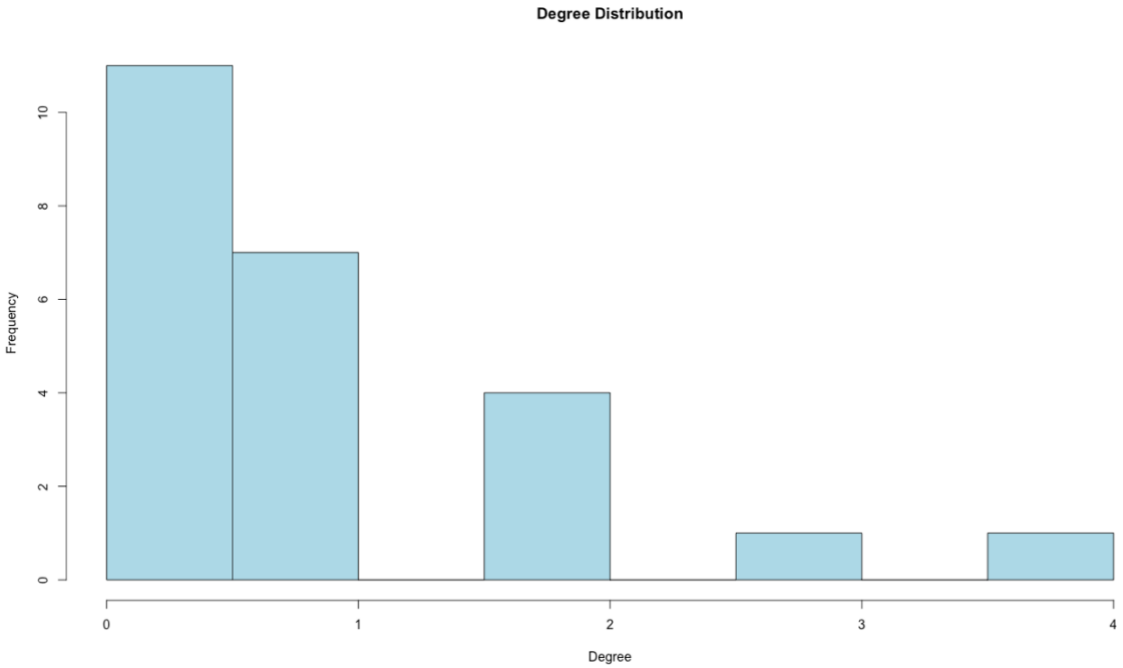


Multidimensional scaling countries after event 2 – March 2018
(own research / Cloud Appendix Z)

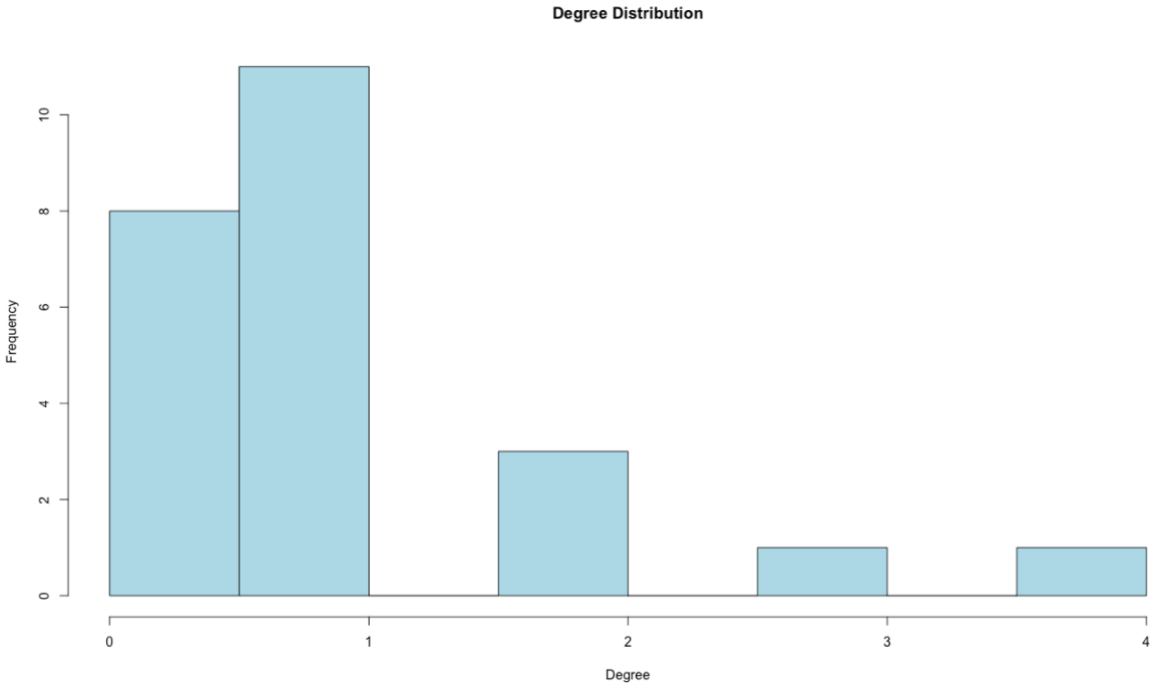


Appendix 18 – Degree Distribution event 2 (own research)

Degree distribution before event 2 (own research / Cloud Appendix J)



Degree distribution after event 2 (own research / Cloud Appendix K)



Appendix 19 – Degree Distribution individual event 2 (own research)

Degree distribution individual before event 2 (own research / Cloud Appendix J)

BMW AG	Daimler AG
3	1
Volkswagen AG	Continental AG
1	1
American Axle & Manufacturing Inc	BorgWarner
1	1
Carlisle	Delticom AG
2	0
Deutz AG	Elringklinger AG
0	0
Gentex Corporation	Goodyear Tire & Rubber Company
2	2
Honeywell International	KUKA AG
1	0
MAN SE	Masterflex SE
0	0
Rheinmetall	Softing AG
0	0
Superior Industries International Inc.	Titan Tire Corporation
4	0
Wabash National Corp.	Wabtec Corp
2	1
Harley Davidson Inc.	Polaris Industries
0	0

Degree distribution individual after event 2 (own research / Cloud Appendix K)

BMW AG	Daimler AG
1	4
Volkswagen AG	Continental AG
1	2
American Axle & Manufacturing Inc	BorgWarner
2	1
Carlisle	Delticom AG
0	0
Deutz AG	Elringklinger AG
1	0
Gentex Corporation	Goodyear Tire & Rubber Company
1	3
Honeywell International	KUKA AG
1	0
MAN SE	Masterflex SE
0	1
Rheinmetall	Softing AG
2	0
Superior Industries International Inc.	Titan Tire Corporation
1	1
Wabash National Corp.	Wabtec Corp
0	1
Harley Davidson Inc.	Polaris Industries
1	0

Appendix 20 – Individual node closeness event 2 (own research)

Individual node closeness before event 2 (own research / Cloud Appendix J)

high closeness marked yellow

BMW AG	Daimler AG
0.002070393	0.002061856
Volkswagen AG	Continental AG
0.002061856	0.002061856
American Axle & Manufacturing Inc	BorgWarner
0.002262443	0.002252252
Carlisle	Delticom AG
0.001976285	0.001811594
Deutz AG	Elringklinger AG
0.001811594	0.001811594
Gentex Corporation	Goodyear Tire & Rubber Company
0.002267574	0.002272727
Honeywell International	KUKA AG
0.001972387	0.001811594
MAN SE	Masterflex SE
0.001811594	0.001811594
Rheinmetall	Softing AG
0.001811594	0.001811594
Superior Industries International Inc.	Titan Tire Corporation
0.002283105	0.001811594
Wabash National Corp.	Wabtec Corp
0.002267574	0.001972387
Harley Davidson Inc.	Polaris Industries
0.001811594	0.001811594

Individual node closeness after event 2 (own research / Cloud Appendix K)

high closeness marked yellow

BMW AG	Daimler AG
0.002369668	0.002398082
Volkswagen AG	Continental AG
0.002369668	0.002392344
American Axle & Manufacturing Inc	BorgWarner
0.002164502	0.002150538
Carlisle	Delticom AG
0.001811594	0.001811594
Deutz AG	Elringklinger AG
0.002369668	0.001811594
Gentex Corporation	Goodyear Tire & Rubber Company
0.002155172	0.002169197
Honeywell International	KUKA AG
0.001890359	0.001811594
MAN SE	Masterflex SE
0.001811594	0.001890359
Rheinmetall	Softing AG
0.002375297	0.001811594
Superior Industries International Inc.	Titan Tire Corporation
0.001890359	0.002347418
Wabash National Corp.	Wabtec Corp
0.001811594	0.001890359
Harley Davidson Inc.	Polaris Industries
0.002155172	0.001811594

Appendix 21 – Individual node betweenness event 2 (own research)

Individual node betweenness before event 2 (own research / Cloud Appendix J)

high values marked yellow

BMW AG	Daimler AG
3	0
Volkswagen AG	Continental AG
0	0
American Axle & Manufacturing Inc	BorgWarner
0	0
Carlisle	Delticom AG
1	0
Deutz AG	Elringklinger AG
0	0
Gentex Corporation	Goodyear Tire & Rubber Company
0	4
Honeywell International	KUKA AG
0	0
MAN SE	Masterflex SE
0	0
Rheinmetall	Softing AG
0	0
Superior Industries International Inc.	Titan Tire Corporation
8	0
Wabash National Corp.	Wabtec Corp
0	0
Harley Davidson Inc.	Polaris Industries
0	0

Individual node betweenness after event 2 (own research / Cloud Appendix K)

high values marked yellow

BMW AG	Daimler AG
0	12
Volkswagen AG	Continental AG
0	8
American Axle & Manufacturing Inc	BorgWarner
3	0
Carlisle	Delticom AG
0	0
Deutz AG	Elringklinger AG
0	0
Gentex Corporation	Goodyear Tire & Rubber Company
0	5
Honeywell International	KUKA AG
0	0
MAN SE	Masterflex SE
0	0
Rheinmetall	Softing AG
5	0
Superior Industries International Inc.	Titan Tire Corporation
0	0
Wabash National Corp.	Wabtec Corp
0	0
Harley Davidson Inc.	Polaris Industries
0	0

DECLARATION OF ORIGINALITY

I hereby declare that this paper and the work reported herein was composed by and originated entirely from me. Information derived from published and unpublished work of others has been acknowledged in the text and references are given in the list of references.

Date

Jan-Christopher Gent

VERÖFFENTLICHUNG

Ich erkläre mich damit **einverstanden,** dass ein Exemplar meiner Master-Thesis in die Bibliothek des Fachbereichs aufgenommen wird.

Date

Jan-Christopher Gent