Professional MBA
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Current Challenges for the German Automotive Industry and their Implications for Medium-Sized Transport Companies

A Master's Thesis submitted for the degree of
“Master of Business Administration”

supervised by
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Affidavit

I, **MANUEL BALLES**, hereby declare

1. that I am the sole author of the present Master's Thesis, "CURRENT CHALLENGES FOR THE GERMAN AUTOMOTIVE INDUSTRY AND THEIR IMPLICATIONS FOR MEDIUM-SIZED TRANSPORT COMPANIES", 120 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

Vienna, 04.03.2020

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Signature

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Abstract

This paper analyzes current events and their impact on the German automotive industry and the related automotive logistics. It is shown that circumstances and events on various levels, such as social, technical and economic, have an impact on this fragile structure. The structure can be described as fragile because it is a highly optimized process of manufacturing, storage and transport, which is clocked like clockwork and correlates with each other like gear wheels.

The evaluation includes, for example, the advancing globalization, political events such as Brexit[1] or the diesel emissions scandal, the trade war between the USA and China, the development of the Turkish economy, the advancing technological development or the changing significance of environmental issues.

A focus lies on the change of customer wishes when buying a car. At the same time, the entire industry suffers from considerable cost pressure. The work will also present the impact of these changes at all levels of the supply chain. This is reflected in political regulations such as driving bans or a complete change to electric mobility.

This paper also presents an evaluation of the current annual and interim reports, using the example of the car manufacturers *Volkswagen*, *Daimler* and *BMW*. It will become apparent that the companies in question are aware of the risks and consider them in their own analysis.

The aim of this paper is to provide an overview of the opportunities and risks facing medium-sized transport companies that transport parts for and to the big automotive suppliers and manufactures. Finally, an analysis will be made as to whether it is advisable to invest in new trucks and trailers, and if so, in which ones.

To underscore this question, it is essential to look at trends, developments and possible future scenarios. One focus is on the development of the automotive industry and the consequences for the companies in question.

[1] *Means the withdrawal of the United Kingdom from the European Union.*

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I. Introduction: Facts and Circumstances

The automotive industry is playing a game of its own. It plays an important role in the field of logistics and takes on a pioneering role in the field. Far-reaching logistics innovations such as Just-In-Time or Just-In-Sequence provision or the introduction of *Kanban*[2] production control was born in the automotive industry. Following its successful establishment in automobile production, these and other innovative logistics solutions have become international standards in almost all the economic branches. The currently emerging challenges faced by the automotive industry in the fields of alternative drive technologies, lightweight construction, new mobility solutions, and concepts, let us expect revolutionary developments in the future as well. Revolutionary product innovations, namely the automobile of the future, and the accompanying services offered all around the topic of mobility need revolutionary logistics innovations. Economy as well as science are equally demanded to take part in this process.[3]

With several thousand supplier parts delivered to the installation site on time or just in time, automotive logistics has one of the most complex supplier networks with multi-level value-added chains. The coordination and management of this network, considering the diverse requirements of the participants in an automotive value-added process, today requires logistics to be more strongly positioned in its integration function in order to achieve maximum customer satisfaction.[4]

Automotive logistics requires excellent processes and structures. Only these structures make it possible to overcome the special logistical challenges of synthesizing many thousands of individual parts from a wide variety of sources to create a customer-friendly automobile that meets very high standards, for example in terms of quality, safety and cost. Automobile manufacturers and their partners take up so many developments at an early stage, take on new tasks and develop best practices that later establish themselves as recognized standards in other areas.[5]

[2] Means a certain method in software development.
[3] *Göpfert/ Braun/ Schulz* (2013), p VI, VII.
[4] *Krog/ Statkevich* (2008), p 185.
[5] *Göpfert/ Braun/ Schulz* (2013), p VI, VII.

After a long period of growth in production and exports, the German automotive industry is threatened with losing its dominant position. It is confronted with international trade disputes and new requirements arising from European climate protection targets. These problems affect not only the production of cars but also the increasing demand for alternative mobility services. This requires drastic changes in the production and distribution system.[6]

The logistics industry will have to face the following future challenges: Climate change as the central challenge, increase in globalization, new growth markets, threats from industrial espionage, crime and terrorism, increase in demand for locally produced goods, increasing individualization of customer wishes, increase in inter-company data complexity, increase in infrastructural bottlenecks, significance of logistics services and expected increase in transport costs.[7] In addition, there is ongoing cost pressure, an increase in electronic components, an increase in the number of models offered, individualization of equipment and a realignment of the supply chain.[8]

Since the automotive industry has so far been Germany's strongest sector of the economy, there are various other sectors which are now also facing the effects of these difficulties. This paper demonstrates different problem areas of the automotive industry and the resulting problems for the logistics market of transportation via trucks on the roads of Europe. The situation for companies that transport supplier parts will be examined in detail.

The main objective of this paper is to consider current and future developments. The focus here is on current issues, which of course only represent an excerpt from the manifold developments of today. Therefore, the essential problems will be worked out and considerations will be made how to counteract this from the perspective of a medium-sized transport company. Since the car manufacturers and the manufacturers of supply parts do not publish detailed figures and no business secrets, only a rough estimate can be made here. The effects of electro mobility on logistics or the relevant influences of international legislation are also important here. Subsequently, the

[6] *Jannsen* (2019), p. 451.
[7] *Göpfert/ Schulz/ Wellbrock* (2017), p 5.
[8] *Göpfert/ Schulz/ Wellbrock* (2017), p10.

development of the figures in this context will be worked out. At the end of this paper, trends and perspectives will be evaluated and will lead to a final outlook.

1. Methods

The research methods mainly consist of the evaluation of various statistics. These include registration figures, traffic volumes, transport volumes and annual reports. These are put into context with the aforementioned current events and evaluated.

Another focus is on the evaluation of current events in the economy, politics and society. News, reports and newspaper articles are evaluated. These can also be used to draw valuable conclusions about trends and effects.

2. Motivation

The benefit of the thesis will be the contribution of ideas, information and impact how to react to this changing branch of the economy. The goal is to provide options for concerned companies, such as electrification of commercial vehicles.

I currently work for a commercial vehicle component supplier, which motivates this analysis. We are aware of the ever-changing business cycles, so the CEO approves the question of this thesis. The question, if buying new vehicles and with that their included components is reasonable in the current economic state is essential to my employer.

I have been working in the automotive and logistics industry for more than 15 years, it is important to me to make a contribution and decision support for transport companies with this work. Furthermore, the automotive industry accompanied myself since my childhood and I had always a special interest with everything related to this industry. Even further, I gained this relationship in my 3,5 years trainee time as car mechanic.

I have spent another 4 years of my professional life in Malaysia, where I gained a deeper insight into the production of automotive parts for the automotive industry. As this work appeals to the customers of my employer and my personal interest in this industry, it is my special pleasure to provide helpful information and support here.

II. Challenges and Trends in the Automotive Industry and its Effects on Automotive Logistics

1. Further Increase in Globalization

If you look at the globalization of the automotive industry, this involves the creation of worldwide value-added networks of customers, manufacturers and suppliers. For logistics, this increases the complexity of supply chain management, which not only raises the proportion of sub-products obtained through global sourcing, but also means that vehicles and spare parts must be provided worldwide. For the operative business, this results in longer transport distances, replacement costs, but also time-consuming planning through additional relations.[9]

The highly distributed production also constitutes a fragile structure with the risk that individual value creation partners may be affected by regional disruptive events. The most striking example of this may be the eruption of the Icelandic volcano Eyjafjallajökull in 2010[10], which paralyzed all air traffic for several days, or the failure of Japanese suppliers due to the accident of the nuclear power plant in Fukushima in 2011[11]. An earthquake in Japan in April 2016 severely disrupted the supply chains of numerous domestic and foreign industrial companies, and automobile manufacturers, including *General Motors*, *Toyota*, *Honda* and *Nissan*, had to temporarily close their plants in Japan. The affected companies were faced with the task of temporarily replacing the affected logistics chains with other suppliers.[12]

However, it is not only such catastrophic events that have an impact, but also various current developments. Company buyers for example fear protectionism and the

[9] *Göpfert/ Schulz/ Wellbrock* (2017), p 11.
[10] *Randelhoff* (2010), https://www.zukunft-mobilitaet.net/688/analyse/europaweite-beeintraechtigungen-im-luftverkehr-durch-vulkanasche-ueberblick-liveblog/688/ [31.10.2019]; *Wäschenbach* (2015), https://www.n-tv.de/panorama/Wie-ein-Vulkan-Europas-Luftverkehr-lahmlegte-article14890046.html [31.10.2019].
[11] *Hartel* (2019), p 28.
[12] *Göpfert/ Schulz/ Wellbrock* (2017), p 11; *Zühlke* (2016), https://www.elektroniknet.de/markt-technik/elektronikfertigung/lieferketten-durch-erdbeben-in-japan-massiv-beeintraechtigt-130378.html [31.10.2019]; *Fischer* (2016), https://www.kloepfel-consulting.com/supply-chain-news/supply-chain/umweltkatastrophen-beeintraechtigen-massiv-lieferketten-18682/ [31.12.2019].

consequences of Brexit more than tsunamis or volcanic eruptions.[13] The following examples of current problems will be highlighted here.[14]

a. "Dieselgate"

The trigger for the current crisis can probably be seen in the diesel emissions scandal, known as "Dieselgate". The scandal began in September 2015 and developed from a crisis that was initially purely VW-brand-related into a cross-brand diesel scandal with far-reaching consequences for the entire automotive industry.[15] This crisis led to various legal disputes worldwide. The manufacturers are accused of intentional immoral damage by placing vehicles with automatic switch-offs on the market.

aa. Background

On September 18, 2015, a Notice of Violation issued by the US Environmental Protection Agency (EPA)[16] publicly announced, that *Volkswagen AG* was using an illegal shutdown device in the engine management system of its diesel vehicles. It had turned out that the US emissions standards had only been achieved in a special test bench mode. In normal operation, a large part of the emission control system was largely switched off. The software is able to detect if the car is on the test bench. If so, and only then it complies with the exhaust emission limits. Actual pollutant emissions are many times higher in normal traffic. The emissions scandal has now contaminated the entire industry worldwide.[17] This resulted in an unprecedented recall. *Audi*, *Porsche*, *Mercedes*, *Volkswagen* and *Opel* had to bring 630,000 vehicles back to the workshops and improve exhaust gas purification.[18] *Volkswagen AG* had made provisions of EUR 16.2 billion for the costs of the scandal in its 2015 annual balance sheet.[19]

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[13] *Schlautmann* (2018), https://www.handelsblatt.com/unternehmen/handel-konsumgueter/logistik-der-neue-nationalismus-bringt-die-lieferketten-in-gefahr/23711316.html?ticket=ST-50803442-hVGWXv2ybmGeke6lyD5G-ap5 [31.12.2019].
[14] *Göpfert/ Schulz/ Wellbrock* (2017), p 11.
[15] *Walter/Zipse*, BKR 2018, 18.
[16] *United States Environmental Protection Agency* (2015) https://www.epa.gov/sites/production/files/2015-10/documents/vw-nov-caa-09-18-15.pdf [28.12.2019].
[17] *Sueddeutsche Zeitung*, https://www.sueddeutsche.de/wirtschaft/abgasaffaere-die-abgasaffaere-ein-debakel-fuer-die-gesamte-autoindustrie-1.2961703 [28.12.2019].
[18] *Legner*, VuR 2018, 251.
[19] *MDR*, https://www.mdr.de/nachrichten/wirtschaft/vw-diesel-skandal-chronik-100.html [27.12.2019].

Affected vehicles by country (2016-2018):	
Germany	2.8 million
Great Britain	1.2 million
France	950.000
Spain	680.000
Italy	650.000
Belgium	500.000
USA	482.000
Austria	363.000
Mexico	32.000
Source MDR[20]	

Table 1: Affected vehicles by "Dieselgate" by country (2016-2018)

The figures show how many vehicles were actually affected. In total 7.657 million vehicles had the disputed software installed. This makes also understandable, why this emission affair has hit such big waves.

bb. Legal Consequences: Product Lawsuits

In Australia, *Volkswagen AG* reached an agreement in principle with the class plaintiffs and the *Australian Competition and Consumer Commission (ACCC)* in September 2019 to end the proceedings by way of settlement. The court has yet to approve both settlements. *Volkswagen AG* expects, according to their interim report, the settlement amount to be up to AUD 127.1 million plus litigation costs to settle the class actions. In May 2019, an appeal judgment was issued in a class action pending in Brazil relating to approximately 17 thousand vehicles that was only partially upheld. In this ruling, *Volkswagen do Brazil's* obligation to pay damages was significantly reduced to an initial EUR 35 million plus interest. The judgment is still not final. In Italy, the court's decision to dismiss the class action suit brought by the consumer organization *Codacons* as inadmissible became final.[21]

[20] *MDR*, https://www.mdr.de/nachrichten/wirtschaft/vw-diesel-skandal-chronik-100.html [27.12.2019].

[21] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf [27.12.2019].

In Germany, more than 60,000 individual lawsuits, mostly seeking damages or reversal, have been filed by automotive customers against *Volkswagen AG* or other Group companies.[22] As far as the manipulation of exhaust emission values is concerned, vehicle buyers not only file warranty claims under purchase law against their sellers, but also sue for damages against the vehicle manufacturer in delict. This is significant when warranty claims are time-barred.[23]

Firstly, manufacturers are liable under warranty law. The are furthermore liable for violation of protective laws according to § 823 (2) German Civil Code (BGB) in combination with § 27 (1) Regulation concerning the EC type-approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (EG-FGV).[24] As holders of type-approvals for vehicles equipped with an inadmissible defeat device, various manufacturers have issued incorrect certificates of conformity, which have become the basis for granting type-approval for individual vehicles.[25]

On September 30, 2019, the hearing in the test case brought by *Verbraucherzentrale Bundesverband e.V.* before the *Braunschweig Higher Regional Court* began.[26]

In the German court cases, it is apparent that *VW* only concludes court settlements in the appellate instance before the respective court has the chance to make a legally binding decision. This represents a clever litigation strategy, as it prevents a final judicial clarification of the question of whether *VW* is liable for damages as a manufacturer. The strategy has largely worked. If, on the other hand, Volkswagen had to compensate all its customers with fraudulent diesels, as in the USA, this would be economically unmanageable with an average amount in dispute of 25,000 euros.[27]

In 2020, in the fifth year after the diesel scandal was uncovered, the complaints of injured customers will finally reach the *Federal Supreme Court (BGH)* in the last instance.[28] The hearing of the first case has been scheduled by the highest civil judges

[22] *Legner*, VuR 2018, 251.
[23] *Legner*, VuR 2018, 251.
[24] (EG) Nr. 715/2007; *Harke*, VuR 2017, 83.
[25] *Harke*, VuR 2017, 83.
[26] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, p. 53 [27.12.2019].
[27] *Strünkelnberg* (2018) becklink 2010808 [26.12.2019].
[28] Ref. VI ZR 252/19.

in Karlsruhe for 05.05.2020, as the court announced on 19.12.2019. According to the *BGH*, further proceedings are to be scheduled in the near future.[29]

In Germany, a large number of lawsuits for breaches of warranty and tort law are also pending against *Daimler*, as well as lawsuits from investors for breach of publicity regulations. Class-action lawsuits are not yet pending. The company has announced, that it considers the lawsuits to be unfounded and will defend itself against them. Should these proceedings be to Daimler's detriment, they could result in substantial fines and compensation payments, remedial work, and other cost-intensive measures. This could consequence in negative impact on the Group's reputation.[30]

cc. Criminal and Administrative Proceedings

In April 2019, the Braunschweig public prosecutor's office brought charges against a former Chairman of the Board of Management of *Volkswagen AG* for fraud in connection with the diesel issue concerning EA 189 engines, among other things.[31]

In September 2019, the Braunschweig public prosecutor's office also brought charges against the incumbent and a former Chairman of the Board of Management and a former member of the Board of Management (current Chairman of the Supervisory Board) of *Volkswagen AG* for market manipulation in connection with the diesel issue and requested that *Volkswagen AG's* secondary involvement in the proceedings be granted.

In July 2019 the Munich Public Prosecutor's Office II also brought charges against the former Chairman of the Board of Management of *AUDI AG* for fraud in connection with the diesel issue relating to 3.0 TDI engines, among other things.

According to the *Volkswagen AG* Interim Report, based on the information currently available, these charges do not give rise to any change in the risk situation for the Volkswagen Group at the present time.[32]

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[29] *beck-aktuell* (2019) becklink 2015062 [26.12.2019].
[30] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 19-21 [29.12.2019].
[31] *beck-aktuell* (2019) becklink 2014216 [26.12.2019].
[32] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, p. 53 [27.12.2019].

Investors are also demanding compensation for the collapse of the stock price at the time: they argue that VW's top management should have informed the financial world earlier about the risks of the diesel crisis. A capital market test case is also underway in Braunschweig.[33]

Daimler is also subject to ongoing governmental inquiries, investigations, orders and ongoing proceedings related to environmental, criminal and other laws and regulations related to diesel exhaust emissions.

In 2018 and 2019, the *German Federal Motor Transport Authority* (KBA) issued various orders in which it determined that particular calibrations in certain Mercedes Benz diesel vehicles must be assessed as illegal shut-off devices. Further such orders are not impossible. Therefore, in view of the *KBA*'s legal opinion, *Daimler* has, as a precautionary measure, ordered a temporary halt to the delivery and registration of certain models, including used cars, leasing and financing transactions. According to *Daimler*, the calibrations required by the *KBA* have been completed and the corresponding recalls have been initiated. However, *Daimler* is keeping a low profile regarding the outcome of inquiries and investigations. The Group is only commenting on preliminary proceedings by the Stuttgart public prosecutor's office. This was concluded by a fine notice. [34]

b. "Brexit"

The UK withdrawal process from the EU ("Brexit"), decided by referendum on 23.6.2016, is in full swing and is heading towards its probable end without an agreement. This poses challenges for companies of English legal form based in Germany: In the case of a "hard" Brexit, these would be subject to German company law with all consequences. Those will especially include liability law. Despite of still existing uncertainties, options for action must already be weighed up now, because there is a threat of the loss of protection under EU law.[35]

If the United Kingdom and the EU are unable to agree otherwise, the European Treaties will no longer apply between the EU and the UK after the exit. This includes

[33] *beck-aktuell* (2019) becklink 2014216 [26.12.2019].
[34] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, pp. 19-20 [29.12.2019].
[35] *Zwirlein/ Großerichter/ Gätsch*, NZG 2017, 1041.

especially the end of the application of the so called "four freedoms of the European Single Market".[36]

This has a huge impact on the international transportation industry, because certain rules for simplified taxation and the employment of workers will no longer apply.

aa. The "Four Freedoms"

The "Four Freedoms" of the single market are free movement of goods, free movement of capital, freedom to establish and provide services and free movement of persons. They are laid down in the Treaty on the Functioning of the European Union (TFEU).

They govern the functionality of the internal market defined by Art. 26 TFEU as "*an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties*".

This equal treatment or equality always refers to the market of a Member State, which is part of the European internal market. If market participants in this market were treated differently under commercial law as those in other parts of the internal market, the free market of the EU would not be possible. That's why the essential of the fundamental freedoms is that products, services, workers and capital are to be treated equally in all parts of the internal EU market and receive the same conditions of competition everywhere. The goal is that they can operate freely within this internal market, regardless of their origin or nationality.[37]

In the starting point, the fundamental freedoms are addressed to the Member States, so only public and not private entities are obliged.[38] The UK, if it is not merged into the single market anymore, will focus on its fundamentally continuing potential interest in privileging domestic products, industries etc. This will have a rather negative effect on the market as a whole. Market participants then no longer benefit from the positive measures to approximate certain standards of economic law in the Member States, so called harmonization. On the other hand, the fundamental freedoms, unlike the other Member States, no longer dictate the UK the maintenance of certain requirements of

[36] *Sauer,* JuS 2017, 310.
[37] *Sauer,* JuS 2017, 310, 311.
[38] *Sauer,* JuS 2017, 310, 314.

national law, a kind of "minimum harmonization". The concrete difficulties for goods traffic on the roads can probably only be estimated.

Most likely, the Brexit will affect logistic road transportation in the following ways: [39]

EU cabotage in UK or vice versa will no longer be possible. Without further agreements, arrangements, the EU-UK road transport could be very problematic, because there is a need for mutually agreed acceptance of documents, driving licenses, etc. Furthermore border controls will be necessary at Channel ports, west coast ports (e.g. Liverpool) and between the UK and Ireland, as well as at the EU ports. Especially the EU-Irish transport will have to transit UK, which won't be easy anymore. Trucks crossing the internal EU borders can't use their Community license, because after the Brexit trucks will need bilateral or ECMT permits to cross the UK border. Furthermore, the *TIR*[40] carnets will be required, which are normally restricted in number. The TIR procedure serves to facilitate the international transport of goods by road.[41]

If you look at the situation in Dover, you see that the Port handles 8,500 trucks per day, of which 8,000 are heading to or from the EU. On average, it takes 20 minutes to clear the non-EU trucks. If this applies to 8,000 more trucks, lots of space for and temporary parking areas need to be installed.[42]

The Brexit could also result in staff or vehicle shortages. Statistically 85% of cross-Channel trucks are in EU-27 ownership, whereas 10% of UK truck drivers and 23% of UK warehouse staff originate from the EU-27.[43] The lack of basic freedoms is particularly noticeable in the case of drivers, as workers from other EU countries can no longer easily be used as drivers in the UK, either because they lose their existing permits or because they will not receive a new work permit.

[39] *Kerridge* (2018) 38.
[40] "*Transports Internationaux Routiers*".
[41] *Kerridge* (2018) 38.
[42] *Kerridge* (2018) 38, 39.
[43] *Kerridge*, (2018) 38.

bb. Corporate Matters

Even the stocks suffer under the pending Brexit. Statistics show that the pending Brexit had negative valuation effects particularly for UK logistics companies due to the high levels of uncertainty about the future UK-EU relationship.[44]

The Brexit also poses challenges for companies of English legal form located in the EU.

According to German company law, the law applicable to a company is generally based on the actual administrative seat of the company.[45] The decisive factor here is the effective head office, i.e. the place where the fundamental decisions of management are effectively translated into ongoing management actions.[46]

In the case of a company operating exclusively in Germany, this means that it is subject to German company law, even if it is founded under foreign law and incorporated abroad. Since the formal requirements for limited liability companies have generally not been complied, those companies are as a rule to qualify as "GbR" or, in the case of a commercial enterprise, as "oHG", in which the partners are liable with their personal assets.[47]

The question arises as to what options exist for English companies, resident in Germany, to avoid the legal uncertainties associated with the Brexit and, in the worst case, the personal liability of their shareholders associated with the loss of the previous limitation of liability. One way could be the transfer of the individual components of the corporate assets of the English company to a company incorporated under German law by way of singular succession (so-called asset deal). In this process, all assets and liabilities of the English company are transferred to a newly founded German company, the English company is then liquidated.[48]

It would also be possible to make an "exit" from English law, in which the identity of the company is preserved or in which there is an asset-based universal succession to a German company. To accomplish this, the English company could for example change

[44] *Tielmann/ Schiereck* (2016) 292; *Schiereck/Kiesel/Kolaric* (2016) 22-28.
[45] MüKoBGB/ *Kindler*, IntGesR, Nr. 420; MüKoAktG/ *Ego*, IntGesR, Nr. 173; *BGH*, O. f. 10.11.2009 – VI ZB 25/09, NJW-RR 2010, 250; *BGH*, D. f. 21.03.1986 – V ZR 10/85, NJW 1986, 2194, 2195.
[46] *Zwirlein/Großerichter/Gätsch*, NZG 2017, 1041, 1042.
[47] *Zwirlein/Großerichter/Gätsch*, NZG 2017, 1041, 1042.
[48] *Zwirlein/Großerichter/Gätsch*, NZG 2017, 1041, 1043.

its legal form to a company incorporated under German law or transfer its assets to a company incorporated under German law by universal succession as a result of a merger.

However, all these solutions require a long-term reorganization of companies, which is associated with enormous costs and high administrative effort. If companies that are actually based within the EU wish to continue to participate in the market and enjoy liability guarantees, such steps are essential. It is questionable, how smaller transport companies should manage this. As a result, it is unavoidable to seek legal advice in this regard.

c. Trade War: China and USA

After US President *Donald Trump* announced the first punitive tariffs on Chinese goods at the beginning of 2018, the trade dispute can now be described as escalated. The trade in goods between the two largest economies in the world has already fallen sharply. This is noticeably depressing global growth. For around 60 years, free trade has been the credo of globalization, because open countries are richer, grow faster and have fewer poor people than closed economies. If the USA and China do not lift their reciprocal punitive tariffs, global economic output is expected to fall by around 700 billion dollars or 0.8 % in 2020.[49]

However, the partial agreement between the USA and China announced in mid-December 2019 has also left many issues unanswered. Economic experts believe that the trade conflict between the USA and China will lead globalization into a new phase. This will consequence in a division of the worldwide supply chains. There will be two supply chains, one dominated by the USA and one by China.[50]

According to the *Association of German Chambers of Industry and Commerce* (DIHK), the trade conflict between the United States and China is hitting the German economy hard. This primarily deprives German companies of export business. German companies obtain so-called certificates of origin for their goods in order to prove that the goods delivered from Germany to the United States originate especially not in

[49] *Informationsdienst des Instituts der deutschen Wirtschaft* (2019), https://www.iwd.de/artikel/handelskrieg-am-ende-verlieren-alle-447505/ [23.12.2019].
[50] *Kohlmann* (2019), https://www.dw.com/de/america-first-gegen-china-first/a-51635373 [26.12.2019].

China. The number of these certificates rose to 1.43 million in 2018. This leads to an unprecedented financial and bureaucratic burden, which makes global business increasingly difficult for German companies. At the same time, the approaching Brexit is causing German companies increasing concern about the consequences of customs law.[51] The two economic powers could weaken to such an extent that the demand for European products could also fall indirectly.[52]

The ongoing disputes between China and the USA could as well lead to positive mid-term effects for German companies. If the trade barriers between the two countries become higher, both Chinese and US companies could look for new trade relations in the EU and thus also in Germany. The European Union will only be able to counter this increasingly protectionist world by maintaining a common trade policy and pooling its market power in order to maintain its global relevance.[53]

At the same time, Germany is losing importance as a location for the global automotive industry in 2019. German car production is currently at a 22-year low. One reason for the decline is the recession in the global automotive industry as a result of the trade wars instigated by US President Donald Trump. Because American customs duties are stalling the car economy in China, fewer German cars are exported there.[54]

The conclusion is that international trade conflicts have an impact on fragile retail chains. The German automotive industry is affected by this. The long-term consequences of this can only be estimated. It is not far off to describe the current situation as a house of cards that could collapse at any time. This would have consequences for all the other branches of the automobile industry, including the transport industry.

d. Turkey as Sales Market

Turkey is particularly important for the German economy as a sales market. The most important trade goods in both directions are textiles, motor vehicles and their parts. By

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[51] *Frankfurter Allgemeine* (2019), https://www.faz.net/aktuell/wirtschaft/der-handelsstreit/handelskrieg-zwischen-usa-und-china-trifft-deutsche-wirtschaft-16411476.html [26.12.2019].

[52] *Steininger* (2019), https://www.xing.com/news/klartext/die-globalisierung-stagniert-nicht-nur-wegen-trump-3576 [26.12.2019].

[53] *Steininger* (2019), https://www.xing.com/news/klartext/die-globalisierung-stagniert-nicht-nur-wegen-trump-3576 [26.12.2019].

[54] *Eckl-Dorna* (2019) https://www.manager-magazin.de/unternehmen/autoindustrie/auto-produktion-deutschland-22-jahres-tief-mit-4-67-mio-gebauten-pkw-a-1301539.html [26.12.2019].

far the most important group of goods among those exported from Germany to Turkey is passenger cars, which reached a total volume of 3.47 billion euros in 2015. In second place come automotive parts and accessories worth 1.24 billion euros, followed by aerospace equipment worth around 760 million euros. Other important products are engines and engine parts, and trucks.[55] In 2017, German goods worth 21.5 billion euros went to Turkey. The country ranked 16th in the list of most important German export customers. The volume corresponds to almost 2 % of total German exports in 2017.[56] Germany has long been Turkey's most important trading partner: from no other country do Turks import so many goods as from Germany. At the same time, 7000 German companies are active locally. The *Rossmann* drugstore chain is represented with stores nationwide in Turkey and employs 1000 people. *Daimler* builds buses and trucks on the Bosporus. *Siemens* has been given an order worth billions for a wind energy project in Turkey in 2017. *BASF* has been active in Turkey since 1880. The chemical company now has 900 employees and six production sites there. The group coordinates its business for Africa, Russia and the Middle East from Istanbul.[57]

The Turkish economy slid into recession at the end of 2018. In September, exports of goods fell by 33 % to 1.2 billion euros compared to the same month last year. The country also struggles with high inflation.[58] In summer of 2018, the Turkish lira slipped to a record low of around 6.50 per dollar. This made imports more expensive for Turkey, whose currency has lost about 40 % in value since the beginning of that year. In 2018, there were signs of a decline in German exports to Turkey: In the first three quarters, they shrank by 4.1 % to 15.2 billion euros, after growing almost by 4 % in the first seven months. German exports to Turkey fell by one third.[59]

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[55] *Spiegel* (2016), https://www.spiegel.de/wirtschaft/soziales/deutschland-so-wichtig-ist-die-tuerkei-als-handelspartner-a-1106113.html [08.01.2020].

[56] *Handelsblatt* (2019), https://www.handelsblatt.com/politik/konjunktur/nachrichten/aussenhandel-deutsche-exporte-in-die-tuerkei-sinken-um-ein-drittel/23601356.html?ticket=ST-54313015-0LdVhB7jPJCaMpOgei4h-ap5 [08.01.2020].

[57] *Neuhaus/ Güsten/ Rövekamp/ Sirleschtov* (2019), https://www.tagesspiegel.de/wirtschaft/spannungen-mit-der-tuerkei-deutsche-unternehmen-zeigen-sich-besorgt/24098642.html [08.01.2020].

[58] *SZ* (2019), https://www.sueddeutsche.de/wirtschaft/tuerkei-rezession-inflation-1.4362581 [08.01.2020]; *Handelsblatt* (2019), https://www.handelsblatt.com/politik/konjunktur/nachrichten/aussenhandel-deutsche-exporte-in-die-tuerkei-sinken-um-ein-drittel/23601356.html?ticket=ST-54313015-0LdVhB7jPJCaMpOgei4h-ap5 [08.01.2020].

[59] *Handelsblatt* (2019), https://www.handelsblatt.com/politik/konjunktur/nachrichten/aussenhandel-deutsche-exporte-in-die-tuerkei-sinken-um-ein-drittel/23601356.html?ticket=ST-54313015-0LdVhB7jPJCaMpOgei4h-ap5 [08.01.2020].

The crisis is based on various factors. Donald Trump threatens Turkey with "economic destruction" in connection with the Syrian conflict.[60] There are also domestic political conflicts that have given the impression to other countries that when travelling to Turkey, there is the threat of arrest of people with different political views. Erdogan's policy is criticized in many places, including Germany, for being in contradiction with international law.[61] The situation can be described as unstable, which has also affected the economy.[62]

In spring of 2018, the Turkish economy grew stronger than expected. The GDP[63] in the second quarter increased by 1.2 % compared to the previous quarter. This has also stabilized the currency. According to the figures, the lira was able to strengthen slightly by 0.7 % against the euro and US dollar on the foreign exchange market. Despite the recovery of the Turkish economy, the country's economic growth is likely to fall short of the government's expectations. Compared with the same period last year, GDP fell by 1.5 % in the second quarter. The turnaround in GDP growth initially led Turkey out of recession.[64] The comeback is mainly due to agriculture, which grew by 3.8 %. Industry also achieved above-average growth of 1.6 %, while service providers grew by 0.6 %. By contrast, the formerly buzzing construction sector shrank by 7.8 %.[65]

As far as cars are concerned, it also shows that Turkey has developed its own ambitions. With a big show, the Turkish government presented two electric car prototypes. From 2022 they will be sold and manufactured entirely in Turkey. The aim is to create a global brand for markets all over the world. Up to now there have only been cars "made in Turkey" by Ford or Fiat for example. But so far none "made by Turkey" that is, a purely Turkish car. It remains to be seen whether this project really

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60 *Gaouette* (2019), https://edition.cnn.com/2019/10/14/politics/trump-turkey-sanctions-skepticism/index.html [08.01.2020]; *Kettenbach/Strobl/Neumann* (2019), https://www.merkur.de/politik/tuerkei-einmarsch-syrien-usa-trump-gruene-sanktionen-erdogan-zr-13166601.html [08.01.2020].

61 *Kettenbach/Strobl/Neumann* (2019), https://www.merkur.de/politik/tuerkei-einmarsch-syrien-usa-trump-gruene-sanktionen-erdogan-zr-13166601.html [08.01.2020].

62 *Handelsblatt* (2019), https://www.handelsblatt.com/politik/konjunktur/nachrichten/aussenhandel-deutsche-exporte-in-die-tuerkei-sinken-um-ein-drittel/23601356.html?ticket=ST-54313015-0LdVhB7jPJCaMpOgei4h-ap5 [08.01.2020].

63 "*Gross Domestic Product".*

64 *Maliszewski* (2019), https://www.focus.de/finanzen/boerse/weg-aus-der-talsohle-tuerkisches-wachstum-ueberrascht-technisch-verlaesst-erdogans-wirtschaft-die-rezession_id_11097381.html [08.01.2020].

65 *WirtschaftsWoche* (2019), https://www.wiwo.de/konjunktur-rezession-beendet-tuerkische-wirtschaft-waechst-wieder/25291192.html [08.01.2020].

has a promising future and will affect the sales figures of German car manufacturers in Turkey and around the world.[66]

The image of the country still is badly damaged.[67] Although the recession is now declining, stable conditions and long-term planning security must first be created before the situation eases in the long term. This again shows that factors outside the industry have an impact on the automotive industry. This means that freight companies in the chain are also affected.

e. The ECBs Interest Rate Policy

The recent monetary policy decisions of the ECB[68] and other central banks have made negative interest rates an economic reality.[69] At the latest since commercial banks have decided to charge negative interest rates on deposits, the phenomenon of negative interest rates, which is in particular also the subject of an economic debate, must be examined from a legal perspective. The effects on entrepreneurs, especially the transport companies that are the focus of attention here, are also questionable.

Interest in the legal sense today means the remuneration for the use of capital provided on a temporary basis, calculated according to a term and independent of profit and turnover.[70]

The legal discussion on whether negative interest should be regarded as interest in the legal sense is still in its beginnings. This seems surprising in so far as negative interest rates are by no new phenomenon. Negative interest rates had already existed in Switzerland in the 1970s as a reaction to the dissolution of the *Bretton-Woods-System*[71]. Japan is currently also caught in a low-interest trap. A glimpse at Japan shows that even after thirty years of low growth, low interest rates and low inflation, it is still a rich country.[72] Even for the rich countries of the west, a phase of low interest

[66] *Senz* (2019), https://www.tagesschau.de/wirtschaft/tuerkei-e-auto-101.html [08.01.2020].
[67] *Neuhaus/ Güsten/ Rövekamp/ Sirleschtov* (2019), https://www.tagesspiegel.de/wirtschaft/spannungen-mit-der-tuerkei-deutsche-unternehmen-zeigen-sich-besorgt/24098642.html [08.01.2020].
[68] "*European Central Bank"*.
[69] *Hingst/ Neumann*, BKR 2016, 95.
[70] *BGH*, D. f. 24.01.1992 – V ZR 267/90, NJW-RR 1992, 591, 592; *BGH*, D. f. 16.11.197 – III ZR 47/77, NJW 1979, 540, 541.
[71] *International monetary system after the Second World War until the early 1970s.*
[72] *Knupfer* (2019) https://www.handelszeitung.ch/invest/lehren-aus-japan-wenn-ein-land-der-tiefzins-falle-steckt [27.12.2019].

rates over years or decades no longer seems an impossible scenario, which could have drastic economic and political consequences.[73] In Germany people tend to understand the negative interest rate as an "attack on savers" or "breaking a taboo", so that both private savers and entrepreneurs are massively insecured.[74] Because even companies and major investors cannot escape the low market interest rate.

Smaller medium-sized companies and craftsmen, if they are granted loans at all, pay relatively high-risk premiums. Larger, capital-marketable companies, on the other hand, benefit from the low interest rates. This leads to the paradox that it is exactly those companies that are most likely to be dependent on low interest rates that benefit least.[75] Although the negative deposit rate is likely to reduce banks' excess liquidity, it is unlikely to stimulate banks' lending to companies.[76]

The economy goes through ups and downs, so that a support tool is needed to ensure certain continuity. This is where the negative interest rate has recently been used to get the money into circulation. Medium-sized transport companies thus have direct contact with the areas of corporate financing and their bank balances. They must pay extra for bank deposits, if they have them, and they pay extra for the holding of their liquid assets. With an interest rate between minus 0.2 and minus 0.4 % per year and a bank balance of 250,000 euros, this would mean additional interest expenses of between 500 and 1,000 euros per year. This leads in the long run to a loss of profits, especially for smaller companies whose profits cannot always absorb such costs.[77]

In contrast to bank balances, the effects of negative interest rates on corporate loans are different. Instead of paying interest, companies would not have to repay the entire loan amount. For example, with a corporate loan of 100,000 euros and a negative interest rate of 1 % per year, only 99,000 euros would have to be repaid to the bank after one year. This requires good credit rating and solvency. The realization of negative interest rates for corporate customers of banks is extremely unlikely at the present time, because banks also must refinance their costs.[78] The long-term

[73] *Knupfer* (2019) https://www.handelszeitung.ch/invest/lehren-aus-japan-wenn-ein-land-der-tiefzins-falle-steckt [27.12.2019].
[74] *Hingst/ Neumann*, BKR 2016, 95.
[75] *Otte* (2015), 9.
[76] *Belke* (2015), 17.
[77] *Ofner* (2019), https://fincompare.de/negativzinsen [27.12.2019].
[78] *Ofner* (2019), https://fincompare.de/negativzinsen [27.12.2019].

consequences can probably only be estimated. In view of the low growth prospects, it is in any case to be expected that the transport industry will be confronted with declining demand in the coming years.

Looking at the financing of vehicle fleets, on the other hand, haulage companies still seem to be buying trucks.[79] If one or more trucks are to be purchased, the fundamental question is the possible consequences for the accounts and profits.

Interest on loans are deductible under commercial and tax law as business expenses. This also applies to annual depreciation. Both positions reduce the taxable profit. While the German commercial law also allows declining balance depreciation, since the end of 2010 tax law only allows straight-line depreciation for movable assets, including trucks, in accordance with § 7 (1) of the German Income Tax Act (EStG). For small and medium-sized enterprises, the special depreciation allowances of § 7g (5) EStG can be helpful.[80]

If the truck is sold again, a capital gain is incurred. This is defined as profit minus residual book value and is also taxable. Borrowing reduces the equity ratio - and thus also the rating. This is not the case with lease financing. With leasing, companies seeking credit can obtain a good rating, which is important for obtaining capital at a favorable rate.[81]

In contrast to purchasing, a leasing truck remains the property of the leasing company under civil law, so that it does not appear on the balance sheet of the transport company. The lessor can collect the truck from the yard and realize it if payment is delayed.[82] If the transport company does not necessarily want to be the owner of the truck, leasing is an alternative way of acquiring new vehicles.

[79] *Lanzinger* (2019), https://www.eurotransport.de/artikel/finanzierung-des-fuhrparks-speditionen-setzen-weiterhin-auf-kauf-von-lkw-10387462.html [27.12.2019].
[80] *Lanzinger* (2019), https://www.eurotransport.de/artikel/finanzierung-des-fuhrparks-speditionen-setzen-weiterhin-auf-kauf-von-lkw-10387462.html [27.12.2019].
[81] *Lanzinger* (2019), https://www.eurotransport.de/artikel/finanzierung-des-fuhrparks-speditionen-setzen-weiterhin-auf-kauf-von-lkw-10387462.html [27.12.2019].
[82] *Lanzinger* (2019), https://www.eurotransport.de/artikel/finanzierung-des-fuhrparks-speditionen-setzen-weiterhin-auf-kauf-von-lkw-10387462.html [27.12.2019].

2. Increasing Focus on the Customer

Due to the saturation of the so-called triad markets of Japan, North America and Western Europe, global competition and worldwide overcapacities of approx. 20 %, manufacturers are under constant pressure to optimize the perceived satisfaction of their customers' needs. It is becoming apparent that the purchasing behavior of customers is changing. Brand loyalty, for example, will decline, so that not only dissatisfied customers will change, but also those who are looking for a change. The relationship to individual mobility also changes in parts, so that many customers no longer want to own a vehicle but only want to purchase mobility as a service.[83]

Thus, not only other manufacturers compete, but also mobility providers such as Car-Sharing companies and driving service providers e.g. *Uber*. The company is already represented in 65 countries. *CNBC* rated *Uber* 2nd on its list of most disruptive companies in the world in 2018.[84] On average 17 million trips are performed per day.[85] OEMs are therefore also beginning to participate in these concepts. *EDAG* Light Car Sharing, for example, is a new offer for Car-Sharing providers. It is a vehicle concept equipped with an electric drive, which responds to the increasingly blurred boundaries between individual mobility and other traffic solutions.[86]

Car subscriptions are the next playing field for car manufacturers, rental car operators and start-ups. The principle of a car subscription: For a monthly fee, the customer receives a vehicle of his choice from a predefined pool and can change the car at a predefined frequency. There are no additional costs for insurance and maintenance, only the fuel is paid for. The market is still in its infancy. More and more car owners are increasingly considering paying a monthly rate for a subscription and choosing a different model depending on their activities, rather than maintaining a car that does not always meet their needs. [87]

In this area too, logistics can contribute to customer satisfaction through its service function. The company is able to provide high product availability, short throughput

[83] *Göpfert/ Schulz/ Wellbrock* (2017), p 11.
[84] *CNBC.com* (2019), https://www.cnbc.com/2018/05/22/uber-2018-disruptor-50.html [07.01.2020].
[85] *Smith* (2019), https://expandedramblings.com/index.php/uber-statistics/ [07.01.2020].
[86] *HAUTE INNOVATION* (2011), http://www.haute-innovation.com/de/de/magazin/mobilitaet/edag-light-car-sharing.html [07.01.2020].
[87] *Wyman* (2019), https://www.oliverwyman.de/media-center/2019/feb/Was-taugt-das-Modell-Auto-Abo.html [23.01.2020].

times for build to order production and high adherence to delivery dates for vehicle deliveries. Flexible systems allow new technologies to be implemented with little effort and expense, thus making new technologies possible. Innovations, also in product features: Within the framework of car-sharing concepts, logistics can improve market performance through intelligent delivery.[88]

3. Continued Cost Pressure

At the same time, customers are not willing to pay additional costs for improved quality. Competitors from abroad with clear wage cost advantages and attractive price/performance ratios reduce price latitude and force manufacturers to re-examine their own supply chain to see if there is any potential for optimization. For the logistics industry, this means that lean production systems will continue to be an essential competitive factor in the future. On average, the logistics costs of the automotive industry is 6.5%, of which 3 %age points for transport, 1.5 for storage, 1.5 for inventory and 0.5 for administration.[89]

Against this background, it is more important than ever to offer regionally different, end customer-oriented services. The individualization of the model to the specific needs of the end customer is becoming the central success factor of the industry. The concept of world vehicles as such is no longer up to date. But in the success story of the *Dacia Logan* can be still seen an example of a world car, with its "relatively low quality, but also relatively low price. The product has a very balanced to positive customer benefit and thus became successful worldwide.[90]

With German quality cars, the "relative quality" is sometimes higher, but so is the price. The decisive question here is whether the "relative price" also represents a balanced quality/price ratio from the point of view of the end customer in the emerging markets. In this sense, the *Dacia Logan* is one of the most innovative products in the

[88] *Göpfert/ Schulz/ Wellbrock* (2017), p 12.
[89] *Göpfert/ Schulz/ Wellbrock* (2017), p 12.
[90] *Lutz* (2016), https://www.vdi-nachrichten.com/technik/die-automobile-zukunft-liegt-in-den-schwellenlaendern/ [07.01.2020].

world, as it still offers positive customer benefits. Consequently, the thinking structures of German car strategists should also move in the direction of "cheap cars".[91]

4. Increase in the Importance of Environmental Aspects

Europe sees itself as a pioneer of the environmental movement and wants to show the world that it is possible to restructure the economy and society according to ecological criteria. In the required reduction of CO2 emissions, the automotive industry is also in focus. After all, road traffic accounts for a considerable proportion of energy related CO2. Therefore, there is increasing pressure on the automotive industry to convert its vehicles to lower-emission drive systems.[92]

That's why the dominant theme for our society in the next 30 years will probably be climate change. Every company must provide a viable answer to this, otherwise there is a risk of being "sorted out". In the wake of the diesel scandal, a driving ban on diesel is now being seriously discussed in many German cities. This has led to a critical consideration of the future of the diesel engine in principle.[93]

That's why ecological aspects when buying a car are becoming more and more important. This is the result of social discourses on climate change, an increasing number of natural disasters and the growing awareness of the limited availability of important resources. A key focus is on fuel consumption, as this also affects the cost of using a car due to rising oil prices and fuel taxes. Among other things, the introduction of low emission zones is also increasing the importance of emission classifications or recyclability. This development forces manufacturers to react to legal and market requirements with numerous innovations.[94]

a. Environmental Awareness

The German population increasingly attaches strategic importance to environmental and climate protection for central political tasks. Even in times of crisis, environmental awareness remains stable in the midfield of problem perception. According to a current

[91] *Lutz* (2016), https://www.vdi-nachrichten.com/technik/die-automobile-zukunft-liegt-in-den-schwellenlaendern/ [07.01.2020].
[92] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[93] *Walter/ Zipse*, BKR 2018, 18.
[94] *Helms/ Pehnt/ Lambrecht/ Liebich* (2010) p 120; *Göpfert/ Schulz/ Wellbrock* (2017), pp 12, 13.

survey, two thirds consider environmental and climate protection to be a fundamental condition for mastering future tasks such as globalization. A good half of those surveyed believe that environmental and climate protection is essential for securing competitiveness and creating jobs.[95]

About four out of five respondents believe that sustainable development brings more health for people, improves their quality of life and enables them to be more in touch with nature. More than half expect sustainable development to lead to more community among people and allow more time for self-determination. In addition, the majority hope that the economy will be more oriented towards the needs of the people. Accordingly, environmental and climate protection continue to be among the central social challenges from the citizens' point of view. For one in five people in Germany, environmental and climate protection is among the most important problems currently facing the country.[96]

Almost all respondents believe that an intact natural environment is an essential part of a good life. In view of the situation in Germany and where they live, most are satisfied with the quality of the environment. Nonetheless, many feel annoyed by noise and air pollution, especially from road traffic. Other environmental burdens are also perceived as unhealthy. In addition, the global state of the environment is perceived to be significantly worse than in Germany. Only just under one in ten assess the global environmental quality as good. About three quarters see plastic waste in the world's oceans and deforestation as threatening environmental risks. Thus, four out of five respondents find it worrying when they think of the environmental conditions in which their children and grandchildren are likely to have to live.[97]

The car is currently still the most important means of transport. 70 % of those surveyed use the car in their everyday lives daily or several times a week. Nevertheless, under certain conditions there is a willingness to switch to environmentally and climate-

[95] *Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)* (2019), https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/gesellschaft-erfolgreich-veraendern/umweltbewusstsein-in-deutschland [08.01.2020].

[96] *Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)* (2019), https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/gesellschaft-erfolgreich-veraendern/umweltbewusstsein-in-deutschland [08.01.2020].

[97] *Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)* (2019), https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/gesellschaft-erfolgreich-veraendern/umweltbewusstsein-in-deutschland [08.01.2020].

friendly alternatives. Walking more is attractive for three quarters and cycling for two thirds of frequent car drivers. Almost half of regular drivers in smaller towns and communities can imagine switching to buses and trains, in large cities the figure is 60 %. Accordingly, urban and regional development that makes the car more easily avoidable meets with acceptance among nine out of ten respondents. Eight out of ten respondents also consider such a mobility change desirable in their own city or community.[98]

However, the statistics show that the majority of households currently still have their own vehicles. What is interesting for automobile logistics, however, is that the proportion of newly purchased vehicles is declining. This means that fewer parts also have to be transported.[99]

The figures show that in private households mainly used cars are purchased. Despite the increasing environmental awareness, there is nevertheless an increase in the number of private households with cars.

Private Households with Vehicles in %[100]

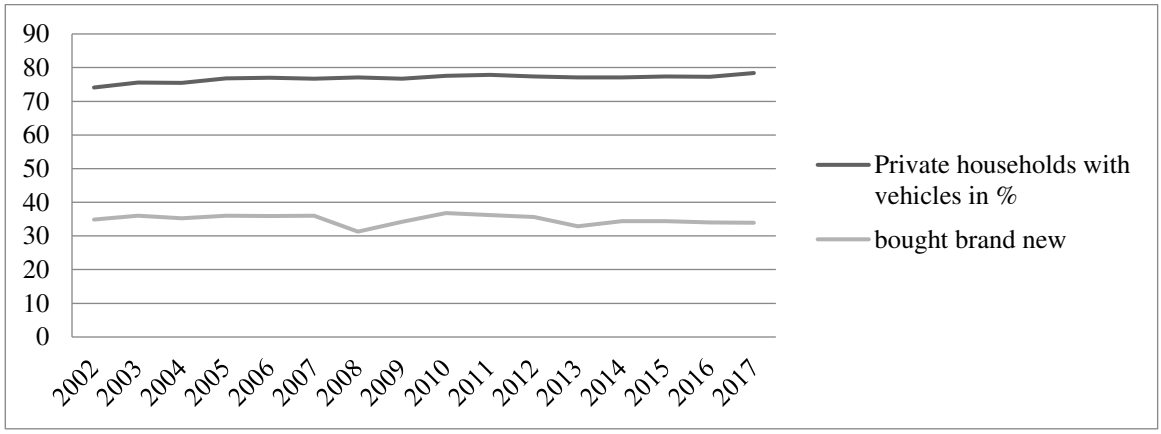

Table 2: Households with Vehicles in % in Germany

[98] *Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)* (2019), https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/gesellschaft-erfolgreich-veraendern/umweltbewusstsein-in-deutschland [08.01.2020].
[99] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 296, 297.
[100] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 296, 297.

Number of Vehicles per 100 Households[101]

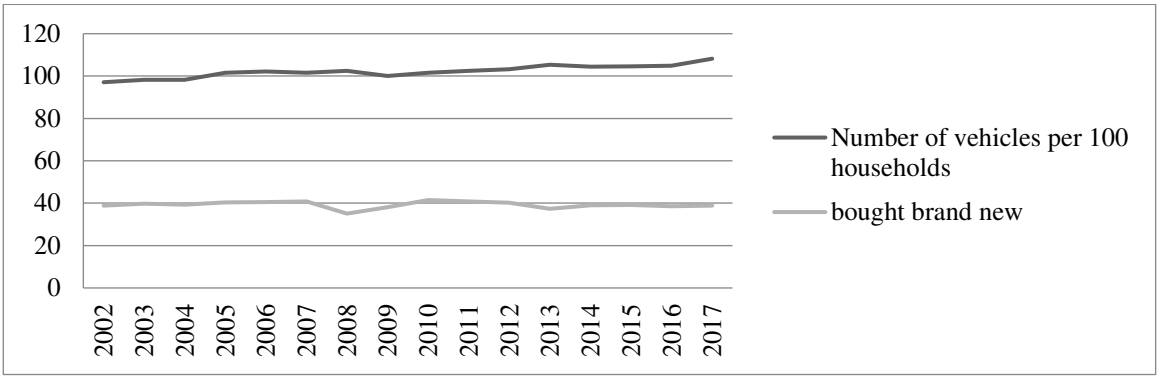

Table 3: Number of Vehicles per 100 Households in Germany

Many citizens are even on strike for more climate protection and are thus part of the worldwide movement *"Fridays for Future"*. The demands of the climate fighters are proving to be difficult to implement and are even worsening people's lives. *"Fridays for Future"* demands a renunciation. But those who need a job, want to take advantage of health insurance benefits and are dependent on a pension in old age will feel the full force of the economic downturn. A massive economic downturn leads to unemployment, implosive tax revenues and, due to demographic developments, to a collapse of the social security systems. Mass unemployment, poverty and harsh social conflicts would be the consequences. The climate would also suffer, because climate protection would then hardly be on the agenda of a population fighting for its existence. The dynamics of innovation and investment would flag and thus both the economic and ecological basis of present and future generations would be destroyed. In any case, panic and emotions are not good advisors and do not solve the problems.[102]

b. Risk of Inability to Use the Vehicle due to Diesel Driving Bans

Despite the installation of software updates, there is a latent risk of the vehicle being unusable due to diesel driving bans. For example, the question is raised, whether a material defect could consist in the fact that the customer could in future be affected by diesel driving bans in certain major German cities.[103]

[101] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 296, 297.
[102] *Flossbach* (2019) https://www.focus.de/finanzen/boerse/experten/fridays-for-future-wer-sich-gretas-botschaft-naeher-anschaut-entdeckt-grossen-irrtum_id_11385231.html [08.01.2020].
[103] *Legner*, VuR 2018, 251, 254.

This is contradicted by the fact that these driving bans are threatening all diesel vehicles not classified in the "EU6" emissions standard, irrespective of the so-called emissions scandal. Therefore, the customers' vehicles would be affected anyway. Furthermore, these bans did not exist either at the time the contract was concluded or at the time the vehicle was handed over and were therefore not foreseeable for any of the contracting parties.[104]

In a decision issued in November 2017, the *Dresden Regional Court (LG Dresden)* stated, that since the beginning of 2017 there has been a noticeable drop in prices for used vehicles with a EURO 5 diesel engine. This decline is not specifically limited to the diesel vehicles of the VW fleet affected by the emissions scandal but affects the diesel vehicles of all vehicle manufacturers equally. The court concluded from this, that the reluctance to buy diesel vehicles and the resulting drop in prices was not due to the manipulation of the exhaust software by the vehicle manufacturer.[105]

The *Essen District Court*, for example, takes a different view, considering the risks regarding the possibility of use (operating permit and driving ban as a defect according to § 434 BGB.[106] The *Nuremberg-Fuerth District Court* also points out that the publicly conducted discussions on driving bans for diesel vehicles in city centers were triggered, among other things, by the installation of the shutdown software by the VW group. It is obvious that the uncertainties triggered by this led to a mercantile reduction in value for potential car buyers, even if the software update is successful in eliminating defects.[107]

The *Itzehoe District Court* also sees a causal link in the fact that the mass use of such manipulated software contributes to increased nitrogen oxide concentrations in city centers, with the consequence that even Euro 6 diesel vehicles could be threatened with driving bans in city centers in future.[108] These "uncertainties" have now grown due to the fact that the *German Federal Administrative Court (BVerwG)* decided in

[104] *LG Düsseldorf* , D.f. 16.03.2017 – 3 O 152/16, juris Nr. 17; D. f. 13.07.2017 – 3 O 307/16, juris Nr. 13; *Legner*, VuR 2018, 251, 254.
[105] *LG Dresden*, D. f. 08.11.2017 – 7 O 1047/16, juris Nr. 52; similar *LG Braunschweig*, D. f. 16.03.2018 – 11 O 3669/16, BeckRS 2018, 3242.
[106] *LG Essen*, D.f. 12.10.2017 – 6 O 302/17, BeckRS 2017, 138907.
[107] *LG Nürnberg-Führt*, D.f. 23.10.2017 – O 8283/16, juris Nr. 25.
[108] *LG Itzehoe* D.f. 27.07.2017 – 7 O 42/17, juris Nr. 34.

February 2018 that municipalities may in principle impose driving bans on diesel cars.[109]

It is obvious that the effect of driving bans on warranty rights has not been conclusively clarified in court. Even though the claims are statute-barred until 31.12.2018, hundreds of court decisions are still pending, which hopefully will provide final clarification.

The fact that a vehicle is affected by the VW exhaust scandal is in any case a value-forming factor about which the manufacturer must inform the customer, because the software manipulation by the manufacturer can be regarded as a contributory cause for existing and future diesel driving bans.[110]

A drop in the price of old diesel engine cars can be observed. The *German Automobile Club* (ADAC) reports that Germans are turning away from diesel.[111]

c. Approaches

In research and development, on the other hand, thought is given to practicable solution concepts. Lightweight construction has solution potential, which saves weight and reduces consumption. In the background of an ever more fragile energy supply and increasing environmental protection requirements, the entire automotive industry is faced with the task of contributing to the saving of primary energy by means of vehicles with optimized fuel consumption and exhaust emissions. The energy balance of future low energy and low emission vehicles depends especially on effective, systemic lightweight construction. This applies equally to conventional vehicle concepts, hybrid drives and electric mobility.[112]

Alternative drive concepts like for example LPG[113] offer even more significant possibilities for reducing CO2 emissions. Electric and hybrid vehicles are considered to be more promising for the future. However, given the current energy mix and the

[109] *BVerwG*, D. f. 27.2.2018 – 7 C 30/17, NVwZ 2018, 883.
[110] *Legner*, VuR 2018, 251, 255.
[111] *ADAC* (2019), https://www.adac.de/verkehr/abgas-diesel-fahrverbote/dieselkauf/diesel-wertverlust/ [28.12.2019].
[112] *Lutz* (2016), https://www.vdi-nachrichten.com/technik/die-automobile-zukunft-liegt-in-den-schwellenlaendern/ [07.01.2020].
[112] *Helms/ Pehnt/ Lambrecht/ Liebich* (2010) p 120.
[113] *„Liquefied Petroleum Gas“.*

high environmental impact of the manufacturing processes, they cannot necessarily be classified as more ecologically compatible than modern diesel engines.[114]

However, if one considers only the emissions during vehicle operation, the electric motor is a sensible and attractive sales argument, especially for vehicles with a matching market positioning. Here, too, logistics can make its contribution by means of suitable control concepts, means of transport and packaging recycling in order to optimize the life cycle assessment of vehicles. Apart from this, a transport company can achieve a valuable market position by approaching climate neutrality or even implementing it at some point and use this as a sales argument to win customers. *DB Schenker Rail Transporte*, for example, has already implemented this by offering transports whose required energy comes entirely from renewable sources. This product, called *"Eco Plus"*, is already being used regularly by some car manufacturers.[115]

The company advertises rail freight transports without CO2 emissions. *DB Schenker's* trains relieve Europe roads day after day by around 98,000 truck journeys and avoid about 17,000 tons of CO2. The biggest advantage of *"Eco Plus"* is that no climate-damaging CO2 is produced and does not have to be compensated for subsequently. In addition, *"Eco Plus"* also helps you to make sustainable progress in environmental protection. Ten % of the additional revenue from *"Eco Plus"* goes towards the construction and expansion of facilities for the generation and storage of electricity from renewable sources.[116] This can serve as a model for a contemporary marketing concept in which customers are not only sold the transport service itself, but also a positive feeling.

5. Increasing Traffic Volume

The volume of traffic in Germany will increase slightly in the long term. Above all, both people and goods travel longer distances in a long-term comparison. The globalization of the economy and increasing mobility, including in leisure time, are

[114] *Göpfert/ Schulz/ Wellbrock* (2017), p 13.
[115] *Göpfert/ Schulz/ Wellbrock* (2017), p 13.
[116] *DB Schenker Rail* (2013), https://ch.dbcargo.com/resource/blob/1424558/2513fa7ead7f2d1afc651ce4e138b9ed/eco_plus_von-db_schenker_rail_klimaschutz_durch_co2-data.pdf [07.01.2020].

promoting this development. The majority of traffic still takes place on the road. The transport sector can only partially increase its value added despite the increased traffic volume. Transport services are booming, including, for example, freight handling, the operation of airports, ports and railway stations as well as traffic brokerage. But in land transport, which employs the most people in the transport sector, value added tends to decline. Here, more companies are being abandoned than founded.[117]

Transport Volume in Germany[118]

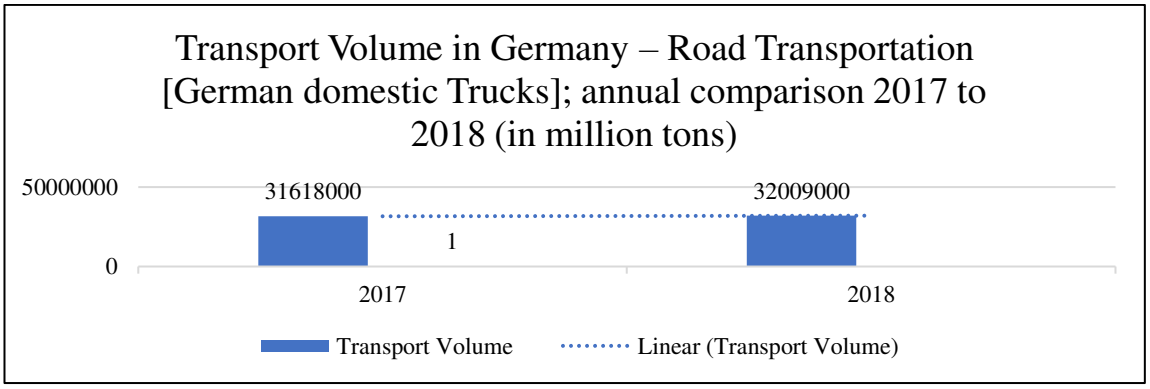

Table 4: Transport Volume in Germany – Road Transportation

Looking at the transport volume in Germany in a year-on-year comparison between 2017 and 2018, an increase of 39.1 million tons is evident.[119] This represents growth of 1.23 %. At the same time, the *Federal Statistical Office (Destatis)* announced that, adjusted for calendar and seasonal factors, automobile production in the second half of 2018 was 7.1% lower than in the first half.[120] This shows a paradox, since on the one hand the transport volume for vehicle manufacturers and vehicle parts is decreasing, but the general transport volume is increasing overall.

Despite stricter safety and environmental protection measures, the negative impact of transport is the price of mobility. Although the number of accident victims falls in a long-term comparison over time the emissions of many pollutants are also declining.

[117] *Statistisches Bundesamt* (2013), Verkehr auf einen Blick, p. 4.
[118] *Keller* (2019) https://de.statista.com/statistik/daten/studie/171383/umfrage/gueterverkehr-in-deutschland-nach-transportweg-transportmittel/ [28.12.2019].
[119] *Keller* (2019) https://de.statista.com/statistik/daten/studie/171383/umfrage/gueterverkehr-in-deutschland-nach-transportweg-transportmittel/ [28.12.2019].
[120] *Statistisches Bundesamt (Destatis)*; Press release No. 139 of 9 April 2019, https://www.destatis.de/DE/Presse/Pressemitteilungen/2019/04/PD19_139_811.html [27.12.2019].

In contrast, emissions of the greenhouse gas carbon dioxide on Germany's roads are only falling in passenger traffic, while in freight traffic, emissions of the greenhouse gas carbon dioxide are decreasing.[121]

The international comparison illustrates the special features of the German transport sector. For example, the choice of transport mode in German passenger transport is more often made by car than the average in EU. By contrast, more environmentally friendly means of transport, such as rail and inland waterways, are used more frequently in German freight transport. The negative effects of transport are also slightly lower in Germany.[122]

For German trucks, the *KBA* has been conducting and processing a sample survey of the total and domestic transport of German trucks since 1994. The data cover the traffic of German trucks over 3.5 t payload and German tractor units.[123]

Freight Traffic Development in Germany[124]

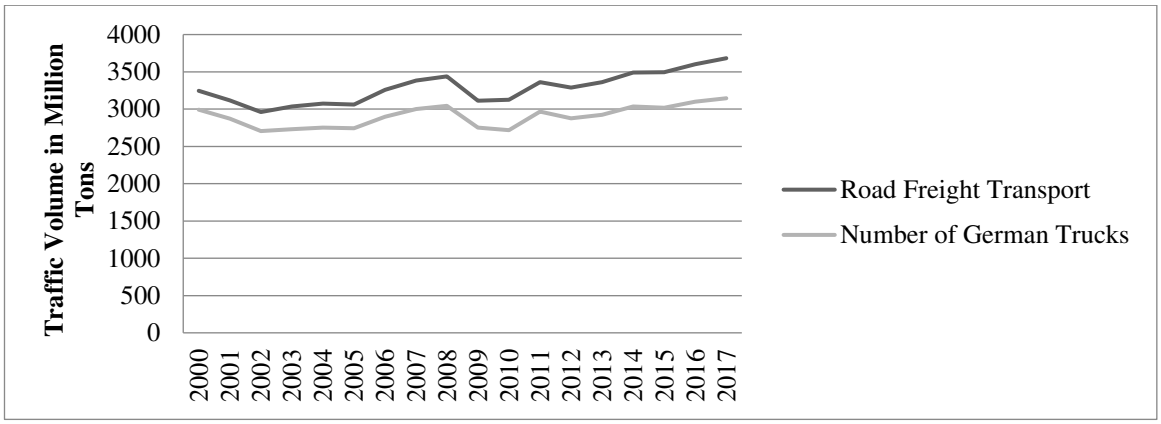

Table 5: Freight Traffic Development in Germany

The tables presented here show a steady increase in freight traffic on German roads. This also affects the number of German trucks. But if you look at the percentage ratios, the picture is different. There is also a tendency to see that the proportion of trucks registered in Germany is decreasing.

[121] *Statistisches Bundesamt* (2013), Verkehr auf einen Blick, p. 4.
[122] *Statistisches Bundesamt* (2013), Verkehr auf einen Blick, p. 4.
[123] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 238.
[124] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 240, 241.

Share in the traffic volume in % in Germany[125]

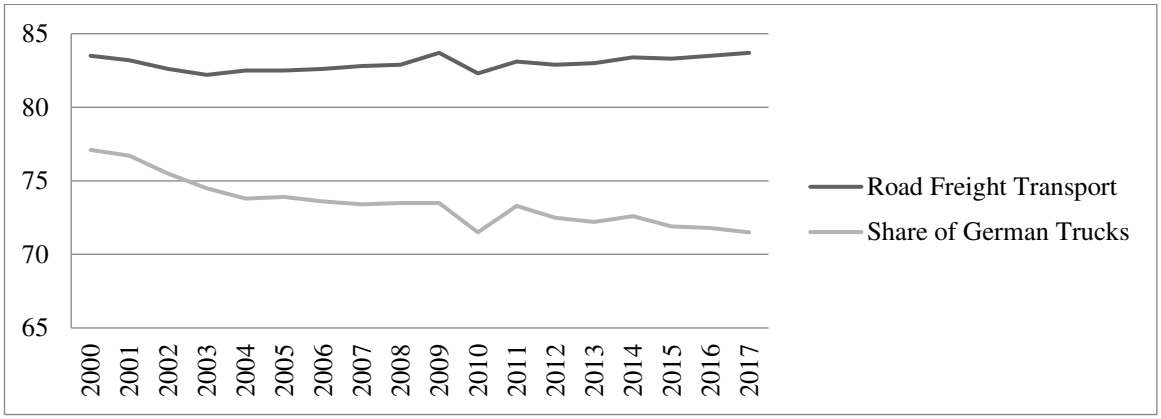

Table 6: Share of freight traffic in the traffic volume in % in Germany

6. High Innovation Pressure/ Increase in the Number of Electronic Components in Vehicles

For a new vehicle to successfully establish itself on the market, the product also requires a certain number of product innovations, depending on the price class. These poses increasing challenges for manufacturers. On the one hand, with increasing technology diffusion, more and more services are becoming basic requirements (e.g. power steering or electric windows). On the other hand, components from the classic OEM core competencies (e.g. engine, chassis or body) have already been optimized to a very high degree, so that the scope for optimization is becoming ever smaller. The automotive industry is therefore turning to developments in the electronics and software industry by taking advantage of their high innovation rate. As a result, 90% of the innovations are now only possible through the use of software and electrical engineering. This inevitably leads to an increase in the number of electrical components in the vehicle. The value share of electronics has therefore risen steadily in recent years to around 30-40%.[126]

Electronic components usually have a high ratio of product value to weight or volume, which means that transport costs play a relatively small role, so these parts are often stored centrally and transported to their destination by express delivery (e.g. airplane). Electronic components are also very sensitive, for example to temperature, shocks or

[125] *Bundesministerium für Verkehr und digitale Infrastruktur*, VIZ 2018/2019, pp. 242, 243.
[126] *Göpfert/ Schulz/ Wellbrock* (2017), p 13.

electromagnetic fields, so that special packaging must often be used. In addition, there are special challenges on the procurement market due to networking in the automobile, for example when new components are to be installed in vehicles with older software, whose compatibility cannot be guaranteed.[127]

7. New Growth Markets

Many regions of the world are experiencing high market growth, especially the so-called BRIC[128] countries, which are characterized by large populations, low current car density and high economic growth. In order to avoid import duties, such markets are initially opened up with a CKD[129] delivery. For example, the pest clearance of the wooden frames must be properly certified. However, the usual CKD assembly plants can be expanded as an existing basis for full production facilities.[130] It is true that the new growth markets are making a positive contribution to the development of global networks. However, the possibilities of global sourcing are limited by the prescribed local content shares, so that the branches cannot be integrated into the production networks to a regular extent.

It is predicted that the automotive future lies in the emerging markets. Experts see the German and European automotive industry in particular as facing the challenge of no longer relying exclusively on the premium segment that has proven itself in these growth markets. Although the German automotive industry is the import king in the BRIC countries, in order to remain successful in the emerging markets with their recent economic problems, some of which have been massive, the analysts recommend thinking about producing low-cost cars along the lines of Renault/Dacia. Key figures such as the number of new passenger car registrations in Germany, which has even fallen slightly from 2000 to the present day despite positive forecasts, are sending clear and comprehensible warning signals to the market. Although the number of annual new registrations in Germany has been hovering around 3 million since the 1990s, this is stagnation instead of growth. Although significantly more vehicles are being produced than before, these vehicles have to be sold outside the triad, where the

[127] *Göpfert/ Schulz/ Wellbrock* (2017), pp 13, 14.
[128] *„Brazil, Russia, India and China"*
[129] *„completely knocked down"*
[130] *Göpfert/ Schulz/ Wellbrock* (2017), pp 14, 15.

business is more of a replacement business. German manufacturers predict an absolute growth in the medium and long term mainly in emerging markets such as Brazil, Russia, India and China. This is where the international automotive business will probably be decided in the future.[131]

8. Increase in offered Vehicle Models and Vehicle Derivatives.[132]

Since the 1970s, manufacturers have been designing more and more different vehicle classes to better meet individual customer needs. In addition to the classic limousines, sports cars and coupés came station wagons, MVPs[133], SUVs[134] etc. This trend has resulted in the number of basic models available on the market increasing by half between 1998 and 2008. The number of derivatives has even tripled during this period.[135] The following figure shows a typical development of the vehicle range using *Audi AG* as an example:

Increase in the number of models and derivatives in the example of *Audi AG*[136]

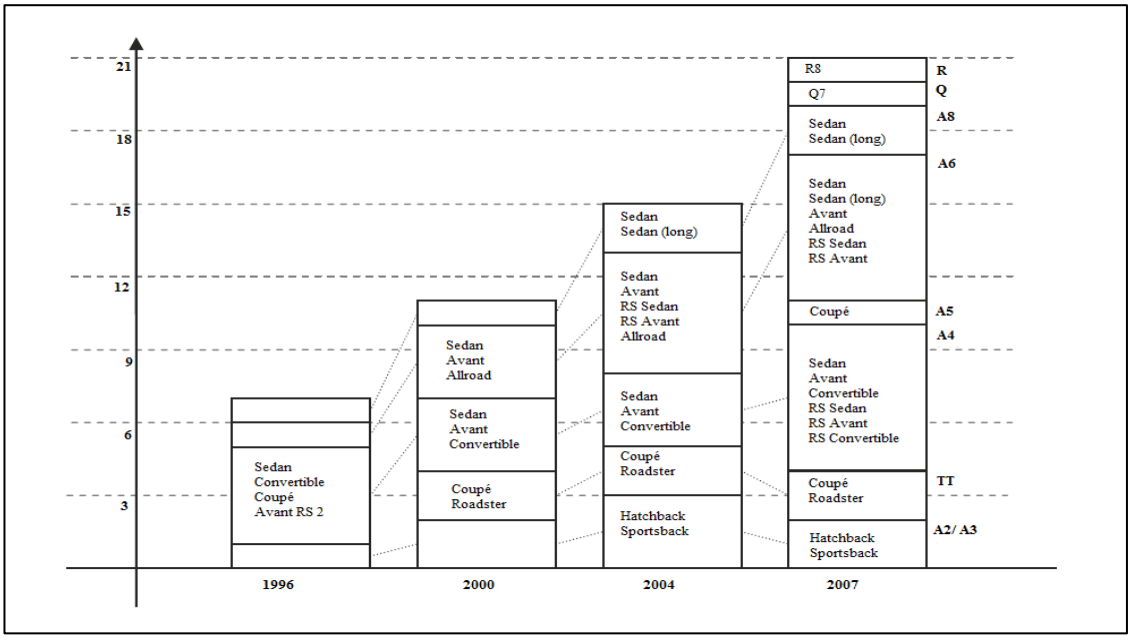

Table 7: Increase in the number of models and derivatives in the example of Audi AG

131 *Lutz* (2016), https://www.vdi-nachrichten.com/technik/die-automobile-zukunft-liegt-in-den-schwellenlaendern/ [07.01.2020].
132 *Göpfert/ Schulz/ Wellbrock* (2017), pp 15, 19.
133 *„Multi Purpose Vehicles“.*
134 *“Sports Utility Vehicles”.*
135 *Göpfert/ Schulz/ Wellbrock* (2017), p 15.
136 *Krog/ Statkevich* (2008), p 187.

This example from Audi shows the extent of the increase in derivatives. Whereas in 1996 there were 4, the number had risen to 21 by 2007. This development may even have intensified in the past 10 years.

For the logistics industry, these additional body variants not only mean additional effort in control and all operative processes, but also increase the importance of more effective and efficient start-up logistics due to the high number of vehicle developments. The increase in the number of model variants is also associated with shorter product life cycles, so that investments in shorter periods of time have to be amortized and the number of individual derivatives reduced.[137]

9. Individualization of the Vehicle Features

In order to be able to offer a vehicle that is as precisely tailored to the customer as possible, they are becoming more and more individualized. Examples of this are the most diverse motorizations, exterior colors, special equipment, but also country-specific variants due to local laws (e.g. right- or left-hand drive). This development has led to 10 final variants of each Audi A3, Mercedes Benz A-Class and VW Golf. This results in an enormous control effort at all stages of the value chain.[138]

Effects of variant diversity on the value chain[139]

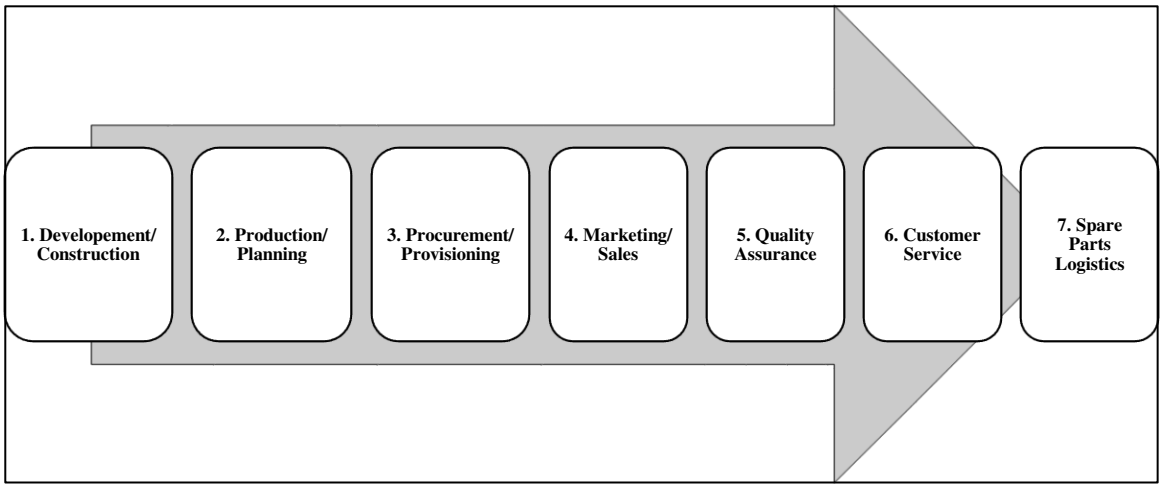

Table 8: Effects of variant diversity on the value chain

[137] *Göpfert/ Schulz/ Wellbrock* (2017), p 15.
[138] *Göpfert/ Schulz/ Wellbrock* (2017), p 16.
[139] *Ihme* (2006), p 21.

This scheme is intended to illustrate how the different levels of the supply chain are interlinked.

The chain begins with Development and Construction (1). New designs, tests and releases, parts list maintenance, change management, creation, administration and maintenance of technical documentation as well as adaptation of variants to technical changes are all affected by the diversity of variants. This is followed by production and planning (2). Affected here are workplace production, tool design, tool production and procurement, more complex parts lists, complex assembly and production control, smaller batch sizes, provision area/routes for workers and the risk of mixing up parts.[140]

The next part in the chain is procurement and provision (3). The variety of variants has an effect on the selection of suppliers, the number of ordering processes, the complex determination of material requirements, the number and variety of transport containers, complex inventory management, higher inventory levels and order picking. In marketing and sales (4), this leads to complex pricing, higher error rates in the ordering process and makes additional employee training necessary.[141]

Quality assurance (5) is also affected. For example, test plans have to be drawn up, extensive sampling and complex supplier qualification has to be carried out. This also has an impact on customer service. Customer service (6) requires additional documentation, tools and workshop equipment, training to meet requirements and the risk of complaints is increased. At the end is the spare parts logistics (7), which is confronted with documentation, a growing range of parts, difficult demand forecasts and higher inventory levels.[142]

10. Realignment of the Value Chain

All these changes also require a realignment of the value chain. Thus, a structural change is taking place in the automotive industry. This is reflected on the one hand in the strong tendency towards consolidation. In 1970 there were still 36 independent

[140] *Ihme (2006),*
[141] *Ihme (2006),*
[142] *Ihme (2006),*

manufacturers. In 2009, however, there were only 13. Acquisitions are intended to cut costs and open up new markets.[143]

In addition, there is a growing trend towards outsourcing. Today, the average vertical range of manufacture is only around 20-30%. The depth of development is now at 50%. In order to reduce complexity and make better use of the competencies of suppliers, more and more modules and systems are being purchased, sometimes even complete vehicles.[144]

Also, there is an increasing number of cooperation, even between competing OEMs. For example, manufacturers of pure premium vehicles often cooperate with volume manufacturers to enter a lower-cost segment. Some manufacturers make their distribution network available to competitors or enter into purchasing cooperation for non-branded parts. The production of vehicles on common platforms is also increasing.[145]

All these developments require a change away from networking of products and processes and the creation of a network of horizontal networking across supply chains.[146]

11. Labor Market Situation

The fact that the major car manufacturers are also having to contend with sales problems due to court cases, image problems, increased requirements and regulations regarding more environmentally friendly drive methods and threatened import restrictions, and are therefore producing less, is reflected in the supplier industry. These companies, of which we have a large number in Germany, are dependent on the manufacturers, their market potential and innovative power, their international strength and their efficiency.[147]

[143] *Göpfert/ Schulz/ Wellbrock* (2017), p 17.
[144] *Göpfert/ Schulz/ Wellbrock* (2017), p 17.
[145] *Göpfert/ Schulz/ Wellbrock* (2017), p 17.
[146] *Wibbe/ Rohde* (2017), p 42.
[147] *Via Delcredere* (2019), https://www.viadelcredere.de/blog/kurzarbeit-entlassungen-und-weniger-stellenausschreibungen-die-rezession-erreicht-die-bevoelkerung/ [19.01.2020].

In total, an estimated 1.7 million employees in Germany are associated with the automotive industry.[148] Looking ahead to the future development, market conditions in the automotive industry in 2020 are unlikely to be significantly different from those in the year 2019, although most of the companies affected have now introduced countermeasures. To this end, groups have begun to cut costs, almost always including a moderate reduction in jobs.[149]

The change towards e-mobility in the area of labor has negative consequences in Germany. The challenge in the coming 2020s will be to preserve jobs, especially in Germany, the traditional car country. For example, horror scenarios are predicted for 2030, according to which 330,000 additional jobs will be lost compared to earlier studies. As late as 2018, it was assumed that around 80,000 jobs would be lost as a result of the transition. A gasoline engine consists of at least 1200 parts, whereas the electric motor only has about 200. This, too, will cause a chain reaction. The faster the switch to the electric car takes place, the fewer supplier parts will be needed. This results in a higher risk for more jobs. In addition, the production of electric vehicles can be more automated. This will further increase productivity in the future, but at the price of a parallel reduction in personnel requirements. Now, many workers are still needed for the production of "traditional vehicles", so this change will probably take place slowly.[150]

When the production structure of such an important sector as the automotive industry is changed, the investment requirements increase first of all. Replacing the combustion engine with the far less complicated electric motor means that numerous work steps are eliminated. The personnel requirement in production is reduced. The reduction in personnel will initially be achieved through natural fluctuation. The large manufacturers will try to secure the employment of their own staff by bringing parts of the production outsourced to suppliers back into their own company. Suppliers will be particularly affected by this, and pressure will increase, especially among suppliers specializing in the powertrain. This will probably have the most extensive impact on

[148] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[149] *Pieper* (2019), https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [29.12.2019].
[150] *Poppe* (2020), https://www.focus.de/finanzen/news/arbeitsmarkt/studie-ergibt-schreckensszenario-fuer-2030-330-000-job-fallen-zusaetzlich-weg-kahlschlag-durch-e-mobilitaet-schlimmer-als-gedacht_id_11545267.html [18.01.2020].

production and employment, and numerous comparatively well-paid skilled worker jobs will be lost.

By contrast, broad-based suppliers will adjust their portfolios accordingly and reduce their involvement in internal combustion engines.[151]

a. Labor Law Situation

The location Germany offers high quality but at high costs. The competitiveness of Germany as a business location has worsened noticeably over the past ten years. Globalization and tougher international competition have made a successful location for companies even more important than before. This is certainly also due to the high demands and costs for personnel.[152]

The following points also contribute to this: Energy prices for companies are particularly high in Germany. German companies pay more corporate tax than their international competitors, broadband expansion is making only slow progress and bureaucracy is slowing down small and medium-sized companies in particular. All this has led to Germany slipping from 10th to 16th place in terms of competitiveness.[153]

In Germany, a company with an annual electricity consumption of between 20,000 and 70,000 megawatt hours pays around 8.9 cents per kilowatt hour. In France and Sweden, on the other hand, it is only 5.9 and 4.8 cents respectively. Only in Slovakia and Great Britain is it more expensive than in Germany. The lack of broadband infrastructure, the lack of fiber optic connections in rural areas is indeed a major obstacle for businesses. This is a major obstacle for rural companies. The overall burden of regulation for businesses is growing as a result of the increasing density of regulation. This is a burden especially for smaller companies, which usually do not have employees trained to deal with it.[154]

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[151] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].

[152] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020]; *Informationsdienst des Instituts der deutschen Wirtschaft* (2018), https://www.iwd.de/artikel/standort-deutschland-hohe-qualitaet-hohe-kosten-372443/ [19.01.2020].

[153] *Hommer/ Gräfe* (2019), https://www.daserste.de/information/wirtschaft-boerse/plusminus/sendung/standort-deutschland-100.html [19.01.2020].

[154] *Hommer/ Gräfe* (2019), https://www.daserste.de/information/wirtschaft-boerse/plusminus/sendung/standort-deutschland-100.html [19.01.2020].

In addition to all these points, companies in Germany have to pay very high taxes and the German tax system is complicated. Companies are liable for trade tax, corporate income tax and income tax. In international comparison, Germany paints a poor picture. For example, the USA and France have plans to lower taxes until 2022. The last reform in Germany took place in 2008. there are no concrete signs yet of any relief for companies in the political arena. As a result, Germany could lose many companies that relocate to the much cheaper Eastern Europe or Asia countries.[155]

Germany's labor costs in the industrial economy in 2018 will be around 32 % above the EU average of around 35 euros per hour worked. The legally induced non-wage labor costs also represent a burden for companies and jobs. The situation will intensify in the coming years. The total contribution rate for the four central branches of social insurance is currently still just under 40 %. According to the forecast of the *Confederation of German Employers' Associations (BDA)*, social security contributions will rise to almost 50 % by 2040 unless drastic reforms are made.[156]

Unit labor costs have a high influence on the attractiveness of a country as a location for business. The decision whether to invest in the country depends on them. The lower the unit labor cost level, the greater the likelihood of investment. In Germany, most of the unit labor costs are determined by agreements between the parties to collective and employment agreements. In recent years, the parties to collective agreements have pursued an overall employment-oriented wage policy. This has already led to a significant improvement in the price competitiveness of the German economy in international comparison.[157]

What should not be forgotten, however, is that Germany cannot be compared with low-wage and threshold countries. It is essential that policymakers create a climate in which the advantages offered by Germany can be achieved at a reasonable price.

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155 *Hommer/ Gräfe* (2019), https://www.daserste.de/information/wirtschaft-boerse/plusminus/sendung/standort-deutschland-100.html [19.01.2020].

156 *Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA)* (2019), https://arbeitgeber.de/www/arbeitgeber.nsf/id/7B7AA8A7EF7D2988C1256DE70069F2DB [19.01.2020].

157 *Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA)* (2019), https://arbeitgeber.de/www/arbeitgeber.nsf/id/7B7AA8A7EF7D2988C1256DE70069F2DB [19.01.2020].

b. Lack of Drivers

The *Bavarian Freight Forwarders' Association (LBS)* reports a decline in the number of trainees in the professional driver sector. According to *LBS*, the supply of young drivers has long since ceased to be enough to compensate for the outflow of skilled workers into retirement.[158]

Production, which is geared to the delivery of parts and components at an exact time and which largely dispenses with warehousing, can be endangered as a result. In order to at least alleviate the lack of personnel, company bosses are rumored to encourage their own drivers to approach other employees of competitors at motorway rest areas and persuade their colleagues to change jobs. As an argument, the boss offers a success bonus as well as a change bonus of 500 euros.[159]

The driver's profession suffers from a bad image. Not many people dream of the romantic idea of a life on the road. In reality, this image is revealed. There aren't enough job candidates to replace the older generations. The profession is not very popular with young people because of the unattractive working conditions. Stress, excessively long working hours and a poor quality of life are daily challenges for many truck drivers and shape the drivers' tough everyday working lives. In addition, this profession is associated with low wages and low social status. The social status of truck drivers is low and receives little recognition. In addition, there is a high level of crime, which poses a danger to truck drivers. These are not only attacks on drivers, but also stolen freight. In addition, there are costs of 900 million euros due to contractual penalties for delivery delays, repair costs, as well as loss of sales and production losses at the actual customers.[160]

The end of compulsory military service in Germany on 1 July 2011 has also affected the shortage of drivers. In the past, the *Bundeswehr* used to be one of the largest driving schools in Germany, because thousands of young men were able to obtain their truck driver's license free of charge during their military service and use it later in their

[158] *Nieß* (2018), https://www.eurotransport.de/artikel/ausbildungsstart-2018-lbs-beklagt-mangel-an-fahrer-nachwuchs-10392641.html [27.12.2019].
[159] *Nicolai* (2019), https://www.welt.de/wirtschaft/article194672173/Lkw-Fahrermangel-Speditionen-wollen-Bosnier-Serben-und-Ukrainer-anwerben.html [19.01.2020].
[160] *Transportlogistic* (2018), https://www.transportlogistic.de/de/messe/industry-insights/lkw-fahrermangel/ [19.01.2020].

professional lives. Originally, the *Bundeswehr* trained about 15,000 truck drivers annually, but these young drivers are now no longer available.[161]

The number of professional drivers in Germany subject to social insurance contributions was 555,505 at the end of 2016. This is not enough to satisfy the needs of the market. In 2018, 20 % of German trucks were standing still. Shortages in logistics will slow down economic growth in the long term. Many companies in Germany can only keep their heads above water thanks to cooperation with freight carriers from Central and Eastern Europe.[162]

12. Rising Bankruptcies

The need for entrepreneurial action increases massively if an active shaping of the future within a company is planned, regardless of the size of the company.[163] This is already reflected in the numbers of large freight companies. The Hungarian large fleet operator *Waberer's*, for example, is already in the red and is trying to reduce costs by further reducing its fleet. The company has already deregistered 360 trucks in recent months and intends to decommission another 300 by the end of the year. Currently, the company's own international fleet amounts to 3,540 vehicles. The workforce at its headquarters in Budapest was also reduced by 160 employees.

The company cites the consequences of the shifts in the Brexit market and the introduction of a new transport management system as reasons for the imbalance and the decline in demand in the international segment. Transports to and from Great Britain account for around 10 % of the business.

In addition, the share of the transport volume for suppliers to the German automotive industry is reduced. The most important foreign market for *Waberer's* is Germany with a 14 % share of sales. The EBIT for the second quarter of 2019 amounted to minus 5.9

[161] *Flemming* (2018), https://www.logistik-watchblog.de/neuheiten/1769-logistik-newsflash-ende-wehrpflicht-fahrermangel-digitalisierungswerkzeugen-zukuft-fedex-wettbewerb-kmus-dpd-vollelektrisches-depot.html [19.01.2020]; *Kulikowska – Wielgus* (2018), https://trans.info/de/akuter-fahrermangel-beunruhigt-deutsche-transportbranche-97254 [19.01.2020].
[162] *Kulikowska – Wielgus* (2018), https://trans.info/de/akuter-fahrermangel-beunruhigt-deutsche-transportbranche-97254 [19.01.2020].
[163] *Göpfert/ Schulz/ Wellbrock* (2017), p 3.

million Euro, compared to plus 3.3 million Euro in the same period of the previous year. Sales declined by 6.4 % to 173 million euros.[164]

The switch to the electric motor and the development of the market could lead to a wave of bankruptcies. First suppliers have already filed for insolvency or are in Chapter 11 proceedings.

The specialist for plastics and injection molding solutions *Schlemmer Group* had to file for bankruptcy. The reason is considered to be the strong expansion, but also the decline in demand and the reorientation of the industry. The bankruptcy affects the locations Aschheim, Hassfurt and Münchingen with about 600 employees, including 167 at the company headquarters.[165]

The *Schlemmer Group* is not the first automotive supplier having to struggle with difficulties and the weakening demand. Even big players like *Schaeffler*, *Conti* or *Bosch* have announced job cuts due to the reorientation in the industry. Plants planned to be closed, and several hundred thousand jobs will be affected by the transition in the automobile industry.[166]

In the first nine months of 2019, *Euler Hermes* credit insurance recorded 27 insolvencies involving companies with turnover in excess of 50 million euros, compared with 19 in the same period the year before. This represents an increase of 42 %. One of the major bankruptcies is the automotive supplier *Eisenmann*. According to *Euler Hermes*, the truly dramatic aspect of these major bankruptcies is the domino effect on many companies in the entire supply chain.[167] The automotive supplier *JD Norman Germany* is bankrupt, too.[168] Also affected by bankruptcy are the manufacturer of drive components *Weber Automotive and Gusswerke Saarbrücken*.

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[164] *Rathmann* (2019), https://www.eurotransport.de/artikel/grossspedition-in-den-roten-zahlen-waberer-s-verkleinert-flotte-weiter-10982874.html [26.12.2019].
[165] *Passarge* (2020), https://www.sueddeutsche.de/muenchen/landkreismuenchen/aschheim-schlemmer-group-insolvenz-1.4757137 [19.01.2020].
[166] *Passarge* (2020), https://www.sueddeutsche.de/muenchen/landkreismuenchen/aschheim-schlemmer-group-insolvenz-1.4757137 [19.01.2020].
[167] *Zeit Online* (2020), https://www.zeit.de/news/2019-11/29/studie-mehr-grosse-insolvenzen-in-deutschland [19.01.2020].
[168] *Böhler* (2019), https://www.automobil-produktion.de/zulieferer/automobilzulieferer-jd-norman-germany-insolvent-329.html [19.01.2020].

TWB Prevent is also experiencing difficulties, with the workers even surprisingly standing in front of closed factory gates.[169]

A study by the credit insurer *Atradius* forecasts payment defaults and even more bankruptcies for automotive suppliers. The study concludes that the crisis in the automotive industry has already reached the day-to-day business of the entire value chain in the entire automotive industry. More and more suppliers in Europe and China are no longer able to keep up with the current structural change in the automotive industry towards more electric vehicles, fuel cell drives or autonomously driving mobiles with new technical equipment as well as the changing consumer demands.[170] The key drivers of this development are the shift from internal combustion engines to e-mobility, fuel cells and other engine systems, new technologies such as digitalization, autonomous driving, changing consumer habits and new mobility services.[171]

The innovation cycles are also shortening. At the same time, there are often several years between order placement and delivery. Small and medium-sized suppliers suffer from a high prefinancing burden and increasingly have to accept the manufacturers' specifications, for example flexible acceptance figures for series parts. It can often be observed that fewer parts are then accepted than originally calculated in view of the global decline in car sales. As a result, companies find themselves in liquidity straits. It is predicted that corporate bankruptcies in the automotive sector in Germany will increase by at least 2 % in 2020.[172]

There is a higher risk for automotive suppliers from the second level up, whose focus is on components for gasoline and diesel engines. They will have to adjust their business model when the liquidity situation is already tense. There is often a lack of financial resources to drive innovation. A lower risk can be observed among German automobile manufacturers and direct suppliers. They are able to absorb the current weak sales phase thanks to their financial flexibility and their strong market situation.

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169 *Otto* (2019), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [19.01.2020].
170 *Otto* (2019), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [19.01.2020].
171 *Atradius* (2019), https://atradius.de/publikation/market-monitor-automotive-deutschland-2019.html [19.01.2020].
172 *Otto* (2019), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [19.01.2020].

Uncertainties will follow if there will be US tariffs on European automotive parts, a further escalating trade dispute between the US and China or a global recession.[173]

Affected companies in the sector should therefore prepare themselves for the loss of receivables and insure them, if necessary.[174]

13. Connection and Interrelation

Another important aspect is that the individual trends are interdependent. For example, globalization is strengthening the trend towards increasing customer orientation, as the customer is being served by additional providers.

Due to the competition with foreign OEMs[175], which in many cases have to bear lower personnel costs in their home countries (e.g. Korea), the need for German OEMs to close the productivity gap by using intelligent value-added concepts is increasing. On the other hand, increased cost pressure leads to more global sourcing.[176]

The growing importance of environmental aspects has had a negative impact on globalization, but the increased transport distances and the procurement of raw materials and sub-products from best-cost countries, some of which have lower ecological standards, increase the environmental impact of vehicle manufacture and delivery. This changing value chain further reduces brand loyalty, because the suppliers often produce almost identical assemblies for different OEMs whose products are therefore approaching each other in customer perception.[177]

New strategies and concepts are required wherever two trends are running in different directions to close the gap or to counteract each other so that the development is additionally boosted. For example, two trends, which are mutually reinforcing, are the customer orientation, in particular the shift in consumer behavior from owning a car to buying mobility, together with the high profit potential of product-related services in electric vehicles, the risks of a globally positioned value system that has creation

[173] *Otto* (2019), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [19.01.2020].
[174] *Otto* (2019), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [19.01.2020].
[175] *"Original Equipment Manufacturer"*.
[176] *Göpfert/ Schulz/ Wellbrock* (2017), p 18.
[177] *Göpfert/ Schulz/ Wellbrock* (2017), p 18.

network in combination with strong outsourcing is essential, also to analyze and evaluate risks on the part of the supplier or, if necessary, to determine the causes or effects. These developments pose challenges for all partners involved in the value chain, but if these challenges can be overcome, supply chains can generate sustainable competitive advantages for themselves.

Logistics is increasingly making a valuable contribution to this and will remain an important success factor in the automotive industry in the years to come.[178]

[178] *Göpfert/ Schulz/ Wellbrock* (2017), p 20.

III. Market Analysis of the Automotive Industry

Economies typically specialize along their comparative advantages on production of certain goods. This enables them to take advantage of the international trade and increase their welfare. This reflects also the high share of the German automotive industry in the gross domestic value in the area and in the high export quota of passenger car production.[179]

The transport of parts for the automobile industry makes up a large part of the German transport volume. Therefore, the figures of the automobile manufacturers are directly reflected in the transport volume. Production in the automobile and automobile parts industry dropped by more than 8% in 2018. In the third quarter, production fell by more than 9% compared to the previous quarter. With this sector of the economy accounting for 4.7 % of Germany's total gross value added (2016), this decline is likely to have depressed the GDP by more than 0.4 %.[180]

1. Analysis of German Car Manufactures using *Volkswagen* as an Example

Looking at the economic development from the perspective of Volkswagen the following picture appears:

a. Overall economic Development from the Perspective of *Volkswagen*

In the first three quarters of 2019, the global economy continued their robust growth with a declining speed. The average GDP expansion rate was lower than in the same period last year, both in the advanced economies and in the emerging markets.

In connection with the trade policy distortions and economic uncertainties, global trade in goods declined in the period of January until September 2019. In the same period, the economy in Western Europe recorded slight growth overall, with a declining momentum. The economies of central Europe continued to achieve relatively high growth rates, but most of them did not achieve the same growth as in the previous years. This development was observed in nearly all Northern and Southern European

[179] *Jannsen* (2019), 451.
[180] *Jannsen* (2019), 451.

countries. Uncertainty continued to be caused above all by the uncertain outcome of the negotiations on Britain's withdrawal from the EU.[181]

In Eastern Europe, GDP growth slowed down, which was mainly due to the economic development of Russia - the largest economy in that region. The phase of economic weakness that began in Turkey in 2018 also continued in 2019.

The robust growth of the US economy gradually weakened to the end of 2019. Private domestic demand was the main driver. The US Federal Reserve lowered the key interest rate in a stable situation on the labor market and relatively steady inflation. At a slower pace, the Chinese economy continued to grow. Regarding the trade policy disputes between the USA and China, the Chinese government continued the support measures in 2019.[182]

b. Development of the Markets for Passenger Cars from the Perspective of *Volkswagen*

In the first three quarters of 2019, the global demand for passenger cars was weaker (- 5.0%) than in the same period a year ago. While new registrations in the Central and Eastern Europe region were slightly higher than in the previous year, the overall markets in Western Europe, the Middle East, North America, South America and Asia-Pacific recorded declines.[183]

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[181] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 6-7 [27.12.2019].

[182] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 6-7 [27.12.2019].

[183] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

Passenger Car Deliveries to Customers by Market from January 1st to September 30th of 2019				
		Deliveries (per vehicles)		
		2019	2018	difference in %
Europe / Remaining Markets		**3.563.301**	**3.567.330**	**-0,1**
Western Europe		**2.765.282**	**2.743.360**	**0,8**
thereof:	Germany	1.004.791	982.226	2,3
	Great Britain	427.687	434.858	-1,6
	Italy	235.430	220.288	6,9
	Spain	234.713	246.294	-4,7
	France	221.909	210.269	5,5
Central and East Europe		**564.091**	**565.608**	**-0,3**
thereof:	Russia	158.992	152.739	4,1
	Poland	122.433	121.408	0,8
	Czech Republic	101.712	108.980	-6,7
Remaining Markets		**233.928**	**258.362**	**-9,5**
thereof:	South Africa	65.961	66.789	-1,2
	Turkey	46.466	83.582	-44,4
North America		**700.564**	**710.860**	**-1,4**
thereof:	United States of America	485.023	478.583	1,3
	Mexico	131.088	142.071	-7,7
	Canada	84.453	90.206	-6,4
South America		**403.579**	**401.598**	**0,5**
thereof:	Brazil	302.886	257.471	17,6
	Argentina	57.454	98.745	-41,8
Asia Pacific		3.158.631	3.284.476	-3,8
thereof:	China	2.951.842	3.036.502	-2,8
	India	36.636	45.500	-19,5
Worldwide		**7.826.075**	**7.964.264**	**-1,7**
By brand:	Volkswagen passenger car	4.514.552	4.622.842	-2,3
	Audi	4.514.552	4.622.842	-3,6
	SKODA	913.723	939.064	-2,7
	SEAT	454.797	415.575	9,4
	Bentley	7.155	7.107	0,7
	Lamborghini	6.517	3.554	83,4
	Porsche	202.318	196.562	2,9
	Bugatti	62	52	19,2
	Volkswagen commercial vehicles	369.849	371.836	-0,5
Source: Volkswagen AG (2019) Zwischenbericht, pp. 9 - 10				

Table 9: VW Passenger Car Deliveries to Customers by Market from January 1st to September 30th of 2019

The downward trend is clearly visible in this table. In most regions of the world, deliveries of *VW* passenger cars are declining. Argentina, India, Spain, Mexico, Canada and the Czech Republic are particularly noticeable. China as one of the main

markets is only slightly down in percentage terms, but the large decrease volume in numbers is a burden.

Volkswagen is mentioning that a big impact in the western European countries comes from the WLTP[184]. Due to the ongoing exit negotiations with the EU, the passenger car market volume in Great Britain was also slightly below the previous year's level. The share of newly registered diesel vehicles in the overall passenger car market in Western Europe fell to 32.2% in the period under review, compared with 36.9% in the previous year. In Germany, the positive development was favored in the first 9 months due to the economic situation, increased commercial demand and in the form of environmental bonuses.[185]

According to the first official estimation, real GDP growth in Russia in the third quarter was 1.7% year-on-year, which corresponds to an acceleration of economic momentum compared with the second quarter.

The atmosphere in the service sector has also improved, but income development has been very weak since the last crisis in 2014/15 and does not allow for strong consumption dynamics, especially as the VAT increase has burdened the population, especially in the first half of 2019.[186]

In Turkey the demand for passenger cars continued to fall drastically due to the deterioration in the overall economic situation. The currency decline in 2018 has led to significantly higher financing costs and an increase in insolvencies. For the next quarters, the investment activities will continue to suffer from the weak lending by private banks. Consumers will be burdened by the sharp rise in prices, even if the inflation rate has fallen again. In the long term, Turkey will have to focus its growth model more strongly on exports in order to solve the problem in the current account to get a sustainable grip on the situation.[187]

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[184] *"Worldwide harmonized Light vehicles Test Procedure"*

[185] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 6-7 [27.12.2019].

[186] *Orlova* (2019), https://www.deka.de/site/dekade_deka-gruppe_site/get/documents/dekade/Publikationen/2019/Emerging%20Markets/Trends/20191113_Emerging_Markets_Trends.pdf, p. 4 [28.12.2019].

[187] *Hübner* (2019), https://www.deka.de/site/dekade_deka-gruppe_site/get/documents/dekade/Publikationen/2019/Emerging%20Markets/Trends/20191113_Emerging_Markets_Trends.pdf, p. 7 [28.12.2019].

The development of the passenger car market in China is significantly below the level of the previous year. The trade conflict between China and the USA had a major negative impact here. From January to September 2019, the *Volkswagen Group* delivered 8,005,166 vehicles to customers worldwide, compare to 8,130,592 the year before. This is 1.5 % or 125,426 units lower than in the same period of the previous year. The drop mainly came from the passenger car side, with 1,7% in units 138,789 below. On the other hand, commercial vehicle sales went a bit up with a plus of 7,7% in units 12,763 vehicles. The decline is particularly due to the declining overall markets, especially in the Asia-Pacific and Middle East regions. Delivery figures for the months of July and August were below the respective comparative figures due to purchases brought forward in the previous year in relation to the WLTP conversion. In September, the WLTP effect then showed a positive impact in the West-European markets. Further reasons were a lack of available gasoline engines and changing models.[188]

In the following, *Volkswagen* passenger car brands didn´t achieve in row the high previous year's figures. *SEAT* which recorded the best nine-month result in the company's history with + 9.4 % and *Lamborghini* (+ 83.4 %) brands performed very well. *Porsche*, *Bentley* and *Bugatti* also increased their delivery figures compared with the previous year.

In a declining global market, the passenger car market share of *Volkswagen* was expanded to 12.7% (12.2%). In Western Europe, the Volkswagen Group delivered 2,765,282 vehicles to customers in the first nine months of 2019. Overall, it was possible to compensate for the negative effects of customer uncertainty caused by the public debate on diesel vehicle driving bans and capacity restrictions on gasoline engines.[189]

Volkswagen raised the market share of passenger cars in Western Europe from 22,0% to 22,6%. In Germany alone the growth from January to September 2019 was +2,3%

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[188] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

[189] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

compared to the same period of the year before.[190] The *Volkswagen* model Golf was again the most widely registered vehicle in Germany in the first 9 months of 2019. Still, on the production side from the *Volkswagen* Group from January to September 2019, production fell by 2.5% year-on-year to a total of 7,974,795 vehicles. In Germany, production totaled 1,600,658 units, a decline of 6.6%. The proportion of production in Germany fell to 20.1% compared to 21.0%.[191]

In the period from January to September 2019, the Automotive Division of *Volkswagen* generated sales revenue of EUR157.0 billion, up 5.8% compared to the same period in 2018, mainly as a result of improvements in the mix and price positioning and the higher sales volume excluding the Chinese joint ventures. In the same period the sales revenue of the passenger car division rose to 134,666 coming from 128,218, the operating result increased to 7.5% from 6.3%.[192]

Volkswagen together with *Ford* are investing in a company called *Argo Al*. The alliance allows both companies to independently integrate *Argo AI*'s self-driving system into their own models. This system should enable fully automated driving and open new possibilities for ridesharing providers and delivery services in city centers in particular by means of fully automated vehicles. Furthermore, *Ford* will use the *Modular e-drive construction kit / system*[193] of *Volkswagen* from 2023 onwards for the European market. With this cooperation, *Volkswagen* and *Ford* want to increase their competitiveness, tailor their products even better to the wishes of customers worldwide and at the same time leverage synergies in costs and investments.[194]

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[190] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

[191] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

[192] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, pp. 9 - 10 [28.12.2019].

[193] „MEB“.

[194] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, p.4 [28.12.2019].

c. Outlook

The Management Board of the *Volkswagen Group* expects global economic growth to slow down slightly in 2019. They continue to see risks in protectionist trends, turbulence on the financial markets and structural deficits in individual countries. In addition, growth prospects are being impacted by ongoing geopolitical tensions and conflicts. The Board therefore expect both, the advanced economies and the emerging markets to experience weaker dynamics than 2018.[195]

They expect the passenger car markets to develop unevenly in the individual regions in 2019. Global demand for new vehicles is expected to be below the previous year's level. The estimate for the German market is at the previous year's level. Sales in the Central and Eastern European markets will slightly exceed the previous year's figure. A slight decline is expected for the North and South American markets, the same applies to the Asia-Pacific region. However, Volkswagen anticipates that deliveries to *Volkswagen Group* customers in 2019 will be at the previous year's level, if market conditions remain challenging. Further challenges for the group are increasing intensity of competition, volatile exchange rate developments and intensified WLTP requirements. Nevertheless, the group expects a 5% growth in revenue.[196]

2. Analysis of German Car Manufactures using *Daimler AG* as an Example

Daimler AG is also critical of current developments. But these are reflected more seriously in the figures.

a. Overall Economic Development from the Perspective of *Daimler AG*

Daimler believes that the temporary relaxation in the discussion about punitive tariffs in the wake of the trade conflict between the United States and China has led to a calming of the stock markets. This positive trend also affected automotive stocks with

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[195] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, p. 22 [28.12.2019].

[196] *Volkswagen AG* (2019) https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf, p. 22 [28.12.2019].

their globally ramified supply and production networks. The expected interest rate cut by the *US Federal Reserve* also led to a recovery on the stock markets.[197]

Daimler AG Assumptions for the automotive markets in 2019[198]

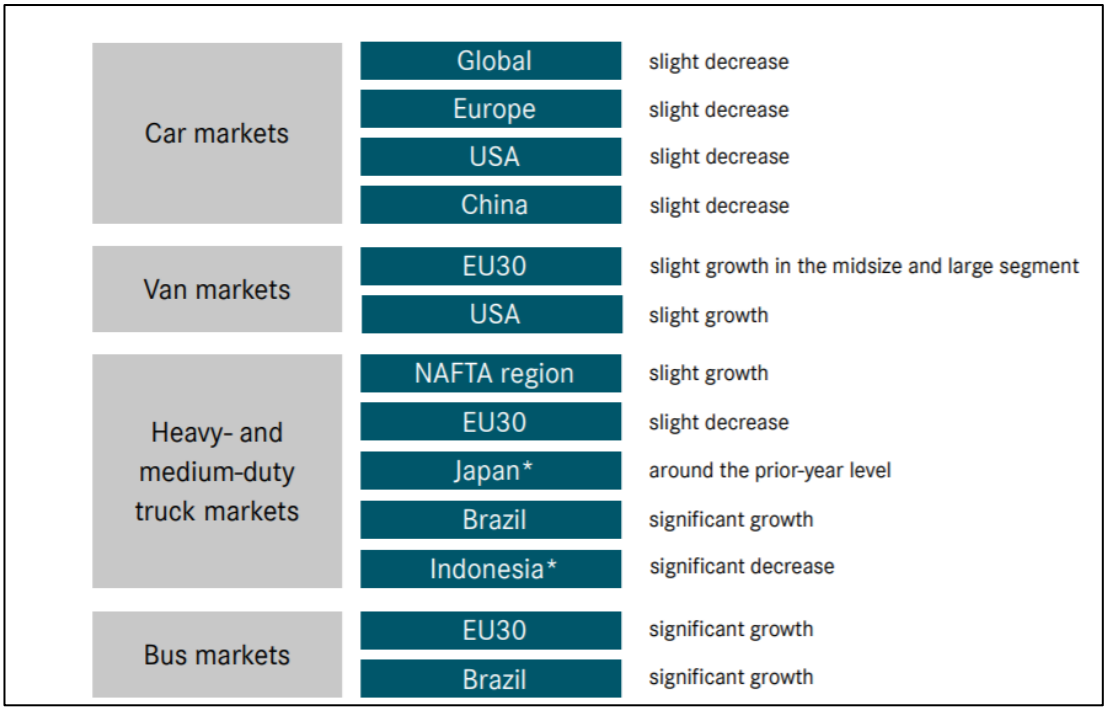

Figure 1: Daimler AG Assumptions for the automotive markets in 2019

Mercedes assumes that declines are to be expected in all passenger car markets. These are, however, considered to be only slight. For the van market, however, slight growth is expected. For heavy and medium duty trucks, a significant decline is expected in one market, Indonesia. In contrast, the bus market is expected to grow worldwide.

In Europe, the announcement of the resumption of the *ECB*'s bond purchase program gave the stock markets a boost. Due to the high level of investment in future technologies and existing uncertainties in connection with the transformation of the automotive industry, automobile stocks remain low.

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197 *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 7 [29.12.2019].

198 *Wilhelm* (2019), https://www.daimler.com/dokumente/investoren/praesentationen/daimler-ir-capitalmarketpresentation-q3-2019.pdf, p. 19 [02.11.2019].

Daimler's share price was unable to fully recover from the price losses in the middle of the third quarter. Even the positive sales figures at *Mercedes-Benz* Cars business unit could not provide any lasting impulses for the share price development. At the end of the 3rd quarter, the stock price was at 45,62EUR and with that, compared to the 2nd quarter, 7% below. In the same period, the Europe Auto Index fell by 2% and the *DAX*[199] remained virtually unchanged.[200]

The global economy cooled off further in the 3rd quarter and is likely to have grown by only around 2.5 %. Key economic indicators, especially for the industrial sector, have continued to decline and do not yet point to a turnaround. The further deterioration of the situation in the manufacturing industry led to a further slowdown in growth in the European Monetary Union, and sentiment therefore deteriorated considerably in the 3rd quarter.

Thanks to robust consumer spending, the US economy was able to roughly maintain its growth rate compared to the 2nd quarter but remains significantly below the momentum at the beginning of the year.

In China, the trade conflict continues to leave its mark and continuing uncertainty is leading to restrained consumption and investment. Growth has slowed further down and at 6% it is at the lower end of the government´s target corridor.

Daimler does not see any significant revival of the global passenger car market in the 3rd quarter. Although the decline was less than in the two previous quarters, global demand remained slightly below the previous year's level.[201]

The weak Chinese market had a negative impact here, and after the significant declines in the first half of the year, China recorded only slightly lower sales figures in the 3rd quarter.

According to *Daimler*, sales of passenger cars in the European market are approximately at the prior-year level, which also applies to Western Europe, France

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[199] *„Deutscher Aktien-Index 30“.*

[200] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 6 [29.12.2019].

[201] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 7 [29.12.2019].

and the United Kingdom. Germany, on the other hand, is slightly above the prior-year volume, while the Turkish market continues to shrink significantly.

The US market for passenger cars and light commercial vehicles remained at a high level, roughly maintaining the volume of the prior-year quarter. Passenger car sales in Japan significantly exceeded the previous year's level due to pull-forward effects ahead of the VAT increase that took effect at the beginning of October. The market in India declined strongly. Demand for heavy and medium-duty trucks continued to show regional differences.[202]

b. Overview: Daimler Mercedes-Benz Cars

The North American markets once again significantly exceeded, the comparable figure in the 3rd quarter of the previous year. In contrast in the European region (European Union, Switzerland and Norway), demand was weaker and recorded a significant decline compared to the robust level of the previous year. The Turkish market again experienced a double-digit decline due to the economic crisis, like the Indian market, which experienced strong declines. In contrast, the Chinese market is slightly above the previous year's level.[203]

[202] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 7 [29.12.2019].

[203] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 7 [29.12.2019].

Sales Daimler Mercedes-Benz Cars[204]

		January - September		
		2019	**2018**	**Change**
Mercedes-Benz Cars		**1,735,606**	**1,744,528**	**-1%**
European Union, Switzerland and Norway		**733,299**	**717,919**	**2%**
of which	Germany	245,689	232,592	6%
North America countries		**254,573**	**272,318**	**-7%**
of which	USA	215,422	224,507	-4%
Asia		**686,215**	**688,194**	**0%**
of which	China	514,786	516,170	0%
	of which locally produced	425,233	370,553	15%
Rest of the World		61,519	66,097	-7%

Daimler Mercedes-Benz Cars Overview (in units)	**January - September 2019**	**2018**	**Change**
Unit Sales	**1,735,606**	**1,744,528**	**-1%**
Retail Sales	**1,813,019**	**1,811,471**	**0%**
Production	**1,857,755**	**1,811,471**	**1%**
Revenue (millions of EUR)	**67,018**	**67,245**	**0%**
EBIT (millions of EUR)	**2,049**	**5,333**	**-62%**
Return on Sales (%)	**3,1%**	**7,9%**	
V-Class / X-Class Retail Sales (Included in Mercedes-Benz Cars retails sales)	**56,614**	**54,722**	**3%**

Source: Daimler Fact Sheet for Q3 and January-September 2019, pp. 13-14

Table 10: Sales Daimler Mercedes-Benz Cars

The figures show only slight declines in sales, for example in North America, but an exorbitant drop in EBIT of 62% due to the provisions for the diesel lawsuits.

The *Daimler* worldwide Group Sales of passenger cars and light duty vehicles in the 3rd quarter in 2019 are at 839,300 units, slightly above the same period of the last year with 794,700 units. At 604,700 cars, *Daimler's Mercedes Benz Cars* business unit achieved its best result in the third quarter with an 8% increase over the prior-year

[204] *Daimler AG (2019),* https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-factsheet-q3-2019.pdf , pp. 13-14 [29.12.2019].

quarter. In the same period, they sold 253,200 cars a plus of 13% in Europe under the brands *Mercedes Benz* and *Smart*.

In the core market of Germany, there was a plus of 18% of 85,100 cars. In the Chinese Market, *Daimler* had a quarterly record with 173,300 cars and with that number of sold cars the highest quarterly sales ever in that market with a plus of 2%. On the same level as the year before with around 76,000 cars, the USA is a stable market for them.[205]

[205] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 13 - 14 [29.12.2019].

c. Overview: Daimler Trucks

In the business unit *Daimler Trucks*, 125,400 units in the 3rd quarter of 2019 was significantly below the previous year's level of 136,100 units.

Daimler Trucks – Incoming Orders[206]Fehler! Keine gültige Verknüpfung. That lower result is mainly caused from the markets Europe with 19,900 to 21,900 units to the year before, Turkey with 600 to 900 units, Indonesia with a big trop from 17,800 to 9,800 units and India with 2,700 compared to 5,300 units the year before. In the North American region, sales roughly matched the previous year's level and amounted to 53,200 (previous year 52,700) units. In Japan *Daimler* was able to increase the sales to 11,700 (previous year: 10,700) trucks. In Brazil, too, the unit sales of 8,200 trucks (previous year 6,000) were significantly higher than in the previous year.

The 3rd quarter sales for the Business Unit were 839,329 compared to 794,749 in the prior year, an increase of 6%. The *Mercedes-Benz Cars* division generated revenue of 604,655 compared with 559,539, *Daimler Trucks* generated sales of 125,382 to 136,055, a decrease of 8%, *Mercedes Benz Vans* generated sales of 100,332 to 91,414, an increase of 10%, and finally *Daimler Buses* generated sales of 8,957 to 7,741, an increase of 16%.[207]

d. EBIT Development

Sales revenue of *Mercedes-Benz Cars* increased by 9% to EUR23,525 million (previous year: EUR21,672 million) in the third quarter of 2019, primarily due to a significant increase in unit sales. EBIT of the business segment amounted to EUR1,423 million (previous year EUR1,372 million). The return on sales of 6.0% was thus below the previous year's figure of 6.3%.

Daimler Trucks increased its revenue in the third quarter of 2019 by 3% to EUR10,349 million (prior year: EUR10,045 million). EBIT amounted to EUR774 million (prior year: EUR850 million). At 7.5%, the business unit achieved a return on sales below the previous year's level of 8.5%.

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206 *Daimler AG (2019),* https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-factsheet-q3-2019.pdf, pp. 18, 20 [02.11.2019].

207 *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, pp. 8 – 9 [29.12.2019].

Higher expenses for upfront expenditures for new technologies and vehicles had a negative impact on earnings. Volume declines, particularly in the Europe region and Asia, also had a negative impact on earnings in the 3rd quarter of 2019. [208]

Positive EBIT earnings contributions resulted from income in connection with the updated risk assessment of the extended *Takata* airbag recall of EUR39 million, stronger price enforcement and positive exchange rate effects. The overall EBIT was positively influenced by higher unit sales and a more favorable model mix. Advance outlays for new technologies, start-up costs for new products and other product-related expenses impacted earnings. In the prior year, earnings were impacted by expenses in connection with the ongoing official proceedings and measures for diesel vehicles and lower unit sales due to delivery delays.[209]

Daimler slid into the red in the second quarter of 2019 after having to absorb a series of one-time payments of approximately EUR 4.16 billion:

- EUR 2.55 billion for expected litigation costs in connection with the diesel scandal,
- EUR 1.15 billion for recall costs, mainly for the ongoing worldwide recall of airbags from the Japanese manufacturer *Takata*, and
- EUR 459 million for expenses in connection with a product line renewal in the Mercedes-Benz Vans division.[210]

The KBA stated that *Daimler* has installed inadmissible switch-off devices on the bestselling *Sprinter* van, among other vehicles. In total, the number of vehicles that *Daimler* must recall in the diesel scandal adds up to more than one million cars and vans. Despite all the difficulties, the Group, unlike many other car manufacturers and suppliers, intends to manage the transformation of the industry without compulsory redundancies.

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208 *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 10 [29.12.2019].

209 *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 10 [29.12.2019].

210 *Rosevear* (2019), https://www.fool.de/2019/08/09/diesel-sorgen-grosse-verluste-fuer-mercedes-benz-muttergesellschaft-daimler-ag/ [29.12.2019].

German employees will be protected against dismissal until the end of 2029.[211]

e. Outlook

Daimler believes that the important leading indicators for 2019 have deteriorated noticeably, so that the lower growth momentum of the global economy should continue in the 4th quarter.

The current growth forecasts for 2019 for global GDP are only just over 2.5 %. *Daimler* believes that most economic indicators for the European Monetary Union do not point to a significant recovery, nor do they indicate an acceleration of economic output towards the end of the year. Despite continued solid domestic demand, growth is likely to decline by only around 1 % as a result of weaker foreign trade and the crisis in the industrial sector.

The Management of *Daimler* sees the global demand for passenger cars in 2019 falling slightly short of the previous year's level. The same will probably happen in the European market. In Western Europe, they expect demand to remain unchanged in the view of the market level, which is now again above average. Germany, the largest single market, should also develop steadily at the prior-year level.[212]

In Eastern Europe, the passenger car market is expected to decline slightly. The Russian market should be able to maintain approximately the previous year's level, while a sharp decline is expected in Turkey. The US market for passenger cars and light commercial vehicles is likely to record a slight decline, starting from a high level. In China, despite a certain stabilization, the market is still expected to decline slightly. Demand in India is expected to decline significantly. In Japan the expectation is constant market level.[213]

Mercedes-Benz Cars is forecasting unit sales for the full year 2019 at the level of the previous year. Their sales development is significantly influenced by life-cycle effects

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[211] *Hubik* (2019), https://www.handelsblatt.com/unternehmen/industrie/mercedes-hersteller-daimler-macht-nach-milliardenverlust-wieder-gewinn-doch-kaellenius-hat-einige-probleme/25149438.html?ticket=ST-46695437-3dhA0QPGIcTFjF6o5PE9-ap4 [29.12.2019].

[212] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 23 [29.12.2019].

[213] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 22 [29.12.2019].

of certain model series. Overall, *Mercedes-Benz* intends to bring more than a dozen new and revised vehicles to the market in 2019.[214]

The business unit *Daimler Mobility* expects further growth in contract volume in 2019. Business for now is expected to be at the level of the prior year due to a lower penetration rate. They are developing new market potential through higher efficiencies in traditional sales channels, the digitalization of customer contact and fleet management.[215]

Daimler Trucks has been on heightened alert since summer 2019. Because sales are shrinking slightly, and orders are dropping dramatically. Specifically, orders for new trucks fell from 457,000 to 289,000 vehicles between the beginning of January and the end of September compared with the previous year. This corresponds to a drop of around 37%; in the core market of North America, the order backlog has more than halved.

However, the situation is also particularly critical in Europe. In August, the lines in the largest factory for *Mercedes Trucks* stopped one day a week. In contrast to *Daimler*, market researchers like *IHS Markit* see *Mercedes* truck production in Europe falling by more than 14 % for 2019- from 101,500 to 87,000 units. Improvement is only in sight again in 2021.[216]

3. Analysis of German Car Manufactures using *BMW Group* as an example

If the figures of car manufacturer BMW are considered, a completely different picture emerges.

a. Overall Sales and Market Development from the Perspective of *BMW*

Despite the high level of economic and political uncertainty, regarding international trade and custom policies, the Brexit issue and a predominantly declining market

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[214] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 23 [29.12.2019].

[215] *Daimler AG* (2019), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf, p. 23 [29.12.2019].

[216] *Hubik* (2019), https://www.handelsblatt.com/unternehmen/industrie/lkw-und-busse-naechste-daimler-sparte-schwaechelt-auftraege-der-truck-sparte-brechen-ein/25339116.html?ticket=ST-46977493-y1bJbeu0hcGXEm9qugLM-ap4 [29.12.2019].

environment, the *BMW Group* set new records for car sales both for the third quarter 2019 and for the first nine months of the year.

BMW Group Sales

		January - September		
		2019	**2018**	**Change**
Total		**1,866,198**	**1,834,810**	**1,7%**
Europe		809,497	816,037	-0,8%
of which	Germany	239,601	224,933	6,5%
of which	United Kingdom	177,126	181,727	-2,5%
Americas		**334,785**	**336,258**	**-0,4%**
of which	USA	261,278	260,086	0,5%
Asia		681,773	638,449	6,8%
of which	China	526,824	460,200	14,5%
other Markets		**40,143**	**44,066**	**-8,9%**

BMW Group Sales by Segment

	January - September		
	2019	**2018**	**Change**
BMW Total	**1,601,397**	**1,566,216**	**2,2%**
1	128,159	149,659	-14,4%
2	93,04	116,295	-20,0%
3	250,425	278,499	-10,1%
4	58,442	84,197	-30,6%
5	260,318	286,18	-9,0%
6	18,350	20,146	-9,4%
7	35,965	41,078	-12,4%
8	7,496	-	-
Z4	11,963	-	-
X1	199,243	213,633	-6,7%
X2	72,281	42,395	70,5%
X3	230,497	132,478	74,0%
X4	44,789	31,233	43,4%
X5	116,475	117,621	-1,0%
X6	17,849	27,182	-34,0%
X7	25,125	-	-
i	30,98	25,520	21,4%

Source: Bayerische Motoren Werke Aktiengesellschaft (2019)

Table 11: BMW Group Sales

In general, the *BMW Group* show a slight increase in sales. However, this is very volatile in the model range. Standard vehicles are declining strongly. Strong growth is only seen in the X-Models. This can be explained by the strong sales in China. Without the Chinese market, *BMW* would experience an equally strong decline in sales as other manufacturers.

BMW delivered 525,438 vehicles to customers worldwide during the 3rd quarter of 2019 compared to 506,920 units the year before, which is a plus of 3.7 %, of which 86,680 units were attributable to the *MINI* brand compared 84,505 units year to year a plus of 2.6 %. In addition, 1,243 cars were manufactured by *Rolls-Royce Motor Cars* a plus of 41,6% with 878 cars in 2018. In the first nine month of 2019, a total of 1,601,397 units were sold by *BMW* compared to 2018. With 1,566,216 units sold, this states a plus of 2.2% to 261,024 units. With 265,935 units sold *MINI* states a minus of 1.8% compared to 2018. *Rolls-Royce* sales states a plus of 42.0% with 2,659 units sold compared to 2018.[217]

The general market development in Europe was mainly affected by the uncertainties surrounding the Brexit. Nevertheless, the *BMW Group*'s sales volume in Europe for the third quarter 2019, was with plus 2,0% and 259,051 units, higher than one year earlier with 253,935. From July to September 2019, the sales volume growth in Germany was a solid 4,1% at 78,239 units for the three Group brands compared to 2018 with 75,215 units. The growth was even higher in the first nine month of the year with 6,5%, and 259,051 compared to 253,935 in 2018. [218]

The *BMW Group* sold a total of 228,418 vehicles in Asia during the 3rd quarter of 2019 (2018: 214,559 units / + 6.5%). The sales volume there for the first nine months increased by 6.8% to 681,773 2 units (2018: 638,449 units). In China, 176,232 units were delivered to customers, 10.1% more than in the previous year (2018: 160,047 units). Sales figures for the period from January to September also grew at a double-digit rate of 14.5 % to 526,824 units (2018: 460,200 units).

By contrast, as a result of the Brexit uncertainties, deliveries in the UK fell short of the previous year's figures both in the third quarter (56,550 units, 2018: 57,433 units / - 1.5 %) and for the full reporting period from January to September (177,448 units, 2018: 181,727 units / - 2.4 %).[219]

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[217] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf, pp. 10, 12 [29.12.2019].

[218] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf, pp. 10, 12 [29.12.2019].

[219] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf, pp. 10, 12 [29.12.2019].

The *BMW Group* sold a total of 112,513 cars in the Americas during the third quarter 2019 (2018: 110,197 units / + 2.1%). Sales volume in the Americas for the first nine months of the year, at 334,785 units, was around at the previous year's level (2018: 336,258 units / - 0.4%). In the USA, the *BMW Group* recorded an increase of 3.6% to 86,499 cars compared to 2018 with 83,516 cars in a stagnating market in the 3rd quarter. In the nine-month period, deliveries in the USA and on the continent as a whole were at the previous year's level (261,278 cars, 2018: 260,086 cars / + 0.5 %).[220]

The *BMW Group* management continues to confirm the unchanged volatile conditions described in the Risk and Opportunities Report 2018.[221] UK, the continuing uncertainties in connection with the Brexit negotiations are impairing the companies' planning security. The company also anticipates that trade tensions between the USA and China will continue to cause uncertainty. The management also assumes that there will be no duty increases between the EU and the USA. Furthermore, the *BMW Group* and *Daimler AG* have decided to bundle their mobility services in a new joint venture. The outlook for the global economy remains subject to several uncertainties, and global economic growth for 2019 should nevertheless be slightly above 3%. The global economy remains burdened with a whole series of uncertainties. These include, above all, the exit negotiations between the EU and the UK and the future foreign trade policy of the US government. If they develop unfavorably, they could lead to a significant burden. [222]

The debt situation of Chinese companies and the high level of government debt in Japan and in some Eurozone, countries could also threaten stability in the financial markets. Finally, an excessively restrictive monetary policy by the *Federal Reserve* in

[220] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf, p. 13 [29.12.2019].

[221] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf, p. 21 [29.12.2019].

[222] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 85 [15.11.2019].

the USA and the *ECB* in Europe would also be a potential burden on the global economy.[223]

In the financial report 2018 the *BMW Group* expects a weaker state of the Automobile Industry and no trend reversal in 2019 (85.5 million vehicles / - 0.3%). By contrast, the automobile markets in Europe should grow slightly (15.8 million units / + 1.0 %), with Germany leading the way (3.5 million units / + 1.9 %). In France (2.2 million units / - 0.3%) and Italy (1.9 million units / - 0.2%), the car market is expected to fall slightly in 2019. The registration forecasts for the UK are also negative for 2019 (2.3 million units / - 2.3%).[224]

In 2019, the USA is unlikely to be able to emerge permanently from the weakness of the previous year. According to current forecasts, the downward trend in US registrations will continue (17.0 million units / -1.6%). A decline in car registrations is also expected in China and Japan. China (23.0 million units / - 0.6%), Japan (5.0 million units / - 2.4%). The *BMW Group* is also expecting an increase in registrations in Russia of approximately 8.4% to 1.8 million units. In Brazil, too, an increase in registrations of around 11.6% to 2.3 million units are expected.[225]

b. Economic Risks and Opportunities

General economic conditions have a profound influence on business activities and thus on the earnings, financial and asset situation of a company like the *BMW Group*. Economic risks potentially lead to a reduction in purchasing power in the countries and regions affected and could thus cause a fall in demand for products and services. Overall, the risk levels associated with economic risks are classified in the *BMW Group* as high. Due to the political events of recent years, there is still a high degree of uncertainty about future economic development. A reorientation of economic policy

[223] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 85 [15.11.2019].

[224] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 86 [15.11.2019].

[225] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 86 [15.11.2019].

in the USA but also changes within the EU could lead to more restrictive trade practices in the coming years.[226]

Risks and Opportunities according to BMW

	Risks		**Opportunities**	
	Risk level classification	Change to previous year	Classification	Change to previous year
Economic risks and opportunities				
	High	Constant	Insignificant	Constant
Strategic and industry-specific risks and opportunities				
Changes in laws and regulations	High	Constant	Insignificant	Constant
Market development	High	Constant	Insignificant	Constant
Risks and opportunities from operational areas of responsibility				
Production and technology	Medium	Constant	Insignificant	Constant
Purchasing	High	Constant	Insignificant	Constant
Sales	Low	Constant	Insignificant	Constant
Information security, data protection and IT	High	Constant	Insignificant	Constant
Financial risks and opportunities				
Currencies	High	Constant*	Essential	Constant
Raw materials	Medium	Constant*	Essential	Constant
Liquidity	Low	Constant	-	-
Pension liabilities	High	Constant*	Essential	Constant
Risks and opportunities from financial services				
Credit default	Medium	Constant	Essential	Constant
Remaining value	High	Constant*	Essential	Constant
Interest rate changes	Medium	Constant*	Essential	Constant
Operational risks	Medium	Constant*	-	-
Legal risks				
	Medium	Constant	-	-

*For the risks marked, the adjusted figures for the previous year are higher than those reported in the 2017 Annual Report of the BMW Group.
Source Bayerische Motoren Werke Aktiengesellschaft (2019)

Table 12:Risks and Opportunities according to BMW

In essence, *BMW* operates a risk management system which focuses on the overall economy, industrial specific issues, operational, financial and legal risks. This classification shows that different risks are anticipated at different levels. Risks are particularly high in the legal and market area.

[226] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 93 [15.11.2019].

The *BMW Group* strategy "Production follows the market" involves local production both in the USA and with other major retail partners. Regional production reduces the existing risk of trade barriers, but these would nevertheless have a negative impact on the *BMW Group*.[227]

The *BMW Group* considers Brexit to be the biggest risk for the European market, especially the emergence of trade barriers in the form of customs duties to the European internal market could be damaging. These could lead to negative volume and cost effects for both vehicles and components produced in the EU for the UK and for vehicles and components produced in the UK for the European market. In extreme cases, production stoppages due to customs clearance could occur.[228]

Should Chinese economic growth be significantly lower than expected, a decline in automobile sales could be accompanied by a more moderate demand for raw materials, which would have a negative impact especially on the economies of emerging markets such as Brazil, Russia and South Africa. A further fall in raw material prices could therefore lead to reduced demand in these countries.[229]

A too rapid increase in interest rates by the *US Federal Reserve* may also pose a not insignificant risk to global financial stability. This could lead to major currency fluctuations and affect the emerging markets in particular. Furthermore, increasing political and military conflicts like in Turkey, Syria or Russia as well as terrorist activities, natural disasters or pandemics can have a sustained negative impact on the global economy and international capital markets.[230]

The *BMW Group* counters economic risks mainly by internationalizing sales and production structures, thus minimizing the impact of risks on earnings in individual countries and regions. In addition, the flexibility of the *BMW Group*'s sales and

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[227] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

[228] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

[229] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

[230] *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

production processes offers the limited possibility of reacting quickly to regional economic developments.[231]

The sales figures could be positively influenced by significantly stronger GDP growth in China, demand-boosting reforms within the euro zone, the avoidance of Brexit and an intensification of trade relations between the EU and the UK. In addition, growth impulses from the tax reduction program in the USA or more robust consumer behavior in the emerging markets, triggered by rising raw material prices, could lead both to significantly stronger sales growth and to a reduction in competitive pressure and the associated improved price enforcement. However, the *BMW Group* considers these economic opportunities, which could have a lasting positive impact on the earnings position of the Group, to be insignificant.[232]

c. Strategic and Industry-specific Risks and Opportunities

The *BMW Group* is already pointing out in 2018 that there is a risk for the automobile industry if laws and regulations are tightened up in the short term, particularly regarding emission, safety and consumer protection regulations and regional vehicle purchase and use taxes. Country- or sector-specific trade barriers can also lead to increased investment and running costs or influence customer behaviors.[233]

The occurrence of risks due to changes in laws and regulations could have a high impact on earnings. Compared to 2017, the potential impact on earnings has increased and the associated risk levels are considered high. Consequently, the risk from further tightening of emission laws is estimated to be constant compared to the previous year. An additional tightening in the area of emissions of the legal framework conditions for conventional drives continues to become apparent, not only in the main markets of Europe, China and the USA but also in Brazil and India.[234]

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231 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

232 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

233 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

234 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

The *BMW Group* is countering this risk with their *Efficient Dynamics* concept and is playing in their eyes a pioneering role in reducing fuel consumption and emissions in the premium segment. One of the *BMW Group*'s priorities is the consistent electrification of all brands and model series. As early as 2013, electric drives and, since 2015, plug-in hybrid technologies have been increasingly supplementing the product range and helping to meet legal requirements and demands regarding vehicle emissions.[235]

Essential for new innovative mobility offers is the definition of regulatory frameworks as well as state support. These include *BMW Group* product innovations such as autonomous driving and the scaling of the e-mobility offering. For electrified vehicles, accelerated expansion of the charging infrastructure could increase the acceptance and sales of planned future or recently introduced product innovations compared to forecasts. These include the implementation of *BMW*'s *360° ELECTRIC* portfolio in the context of electro mobility and the cooperation with *Toyota* in the field of hydrogen as a drive technology.[236]

Here again, the *BMW Group* considers additional opportunities arising from changes in legislation and regulation to be immaterial compared to the forecast for the *BMW Group*'s earnings position.[237] *BMW Group* published on January 10th 2020 that with 2,520,307 (+1.2%) *BMW*, *MINI* and *Rolls-Royce* brand cars delivered worldwide last year, the group set a new record for the ninth consecutive year. Furthermore, the *BMW Group* has already sold half a million electrified vehicles worldwide by the end of 2019.

For 2020 the Group aims to achieve a slight increase in global sales volume in the current year. On the Chinese mainland, they expect a solid sales volume growth. In Europe, the *BMW Group* expects sales volume growth to remain at the previous year's

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235 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

236 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

237 *Bayerische Motoren Werke Aktiengesellschaft* (2019), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf, p. 94 [15.11.2019].

level due to the gloomy economic environment. In the USA, the company expects a slight sales volume increase in the current year.[238]

The *BMW Group* has purchased direct production material for 40.3 billion Euros in 2018, of which 38.0% came from Germany, 17.0% from other Western European countries, 22.4% from Eastern Europe, 6.5% from Asia and Australia, 14.9% from North America and only 1.2% from the rest of the world. In addition, it purchased indirect goods and services to the value of 18.2 billion, 64.0% of which come mostly from Germany, but also 16.9% from other European countries and 11.6% from North America.

As a result of the electrification of the new models, battery purchasing will play a very important role for *BMW* in the future, as this is also a very demanding product in terms of business management and technology. The in-house high-voltage battery production plays a very important role in this respect. *BMW* wants to ensure that their vehicles meet the internal 100% premium standard. In the process chain, raw material hedging, and the resulting price stability also play a very important role. However, *BMW* is not aiming for its own cell production. For the production of the batteries and cells, *BMW* has concluded a long-term contract with *CATL*.[239] Here *BMW* was interested in the location where the batteries will be produced in the future. *CATL* is one of the major Asian manufacturers of lithium-ion cells and is currently investing in a new factory in Germany on the former site of the *SolarWorld* factory in Arnstadt (Thuringia) the company is planning an investment of 1.8 billion euros. *BMW* has already given a commitment to purchase batteries worth 4 billion euros from *CATL* until 2023.[240]

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[238] *Bayerische Motoren Werke Aktiengesellschaft* (2020); https://www.press.bmwgroup.com/deutschland/article/detail/T0304404DE/bmw-group-erzielt-2019-bei-auslieferungen-bestmarke-und-bestaetigt-position-als-weltweit-fuehrender-premiumhersteller [11.01.2020].

[239] *Volk*, Automobil Produktion Ed. 01/2019, https://www.automobil-produktion.de/files/content/_heftarchiv/apr/2019/01/index.html#32, pp. 33, 34 [14.01.2019].

[240] *Preuss* (2019); https://www.faz.net/aktuell/wirtschaft/auto-verkehr/bosch-bandelt-mit-zell-lieferant-catl-an-16369679.html [14.01.2020].

4. 2019 Statistics of the *European Automobile Manufacturers Association*

According to the *European Automobile Manufacturers Association*[241] the EU passenger car fleet grew by 8% with the number of cars on the road rising from 248 million in 2014 to 268 million in 2018.

On average, the cars are 10,8 years old in the EU with 6,4 years in Luxembourg and 8,0 years in the UK, the newest car fleets are found there. In comparison the oldest vehicles with more than 16 years on average are found in Estonia, Lithuania and Romania.[242]

Looking at the group of vans, 33,2 million vans are circulating throughout the EU. With 6.2 million vans, France has the largest fleet in Europe, followed by 4.6 million from Spain, 4.4 million vehicles in the United Kingdom and 4.2 million in Italy. There are around 6,6million trucks on the European roads and with 1,1 million Poland have the biggest amount of registered trucks. Followed by Germany with 946,541 and the Italy with 904,308.[243]

From around 770,000 buses in Europe, the largest numbers of operating buses found in Poland with 106,057 vehicles and Italy with 97,914. These two countries together own around 30% of the total busses in Europe. There is a big difference in the age of buses comparing the different European countries; like in Austria, the average age for a bus is 5,4 years compared the oldest bus fleet with an average of 20,4 years in Greece. The overall average in Europe for a bus is 11,4 years. Also, for light and heavy commercial vehicles Greece have the oldest average age of almost 19 years on light commercial vehicles and 20,9 on heavy commercial vehicles, when the average in Europe is only 10,9 years for light and 12,4 years for heavy duty vehicles.[244]

On the truck side, looking at the six major markets in Europe, Spain having with 14,4 years, 567,000 vehicles, and Italy with 14,0 years and 904,308 on average the oldest trucks in their fleets. Followed by 1,108,975 vehicles in Poland with 13,2 years,

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241 *"ACEA"*.

242 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].

243 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].

244 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].

Germany with 522,061 and 9,5 years, 605,393 in United Kingdom with 7,4 years and 563,906 trucks in France with 7,2 years.[245]

Although there has been an increase in registrations in recent years, passenger cars with alternative drive systems represent only 3.8% of the total vehicle fleet. 0.7% of all cars on our roads are hybrid electric drives, 0.2% are pure battery electric driven, and plug-in hybrids make up only 0.1% of the total. In Europe 98,3% of all trucks run on diesel while only 1% run on gasoline. Light commercial vehicles run to 91% on Diesel engines. Of 1,000 inhabitants, 531 cars are counted in the European Union. The highest density is in Luxembourg with 690 cars per 1,000 people, Latvia with 329 have the lowest density. Around 31% of the French households own two cars, while in Latvia 48,8% have no car in the household.[246]

Looking on commercial vehicles, the numbers look a bit different. In general, since 2014 all countries in the European Union have growing numbers per 1,000 inhabitants in commercial vehicles. Only in Denmark, the number was going down since 2014 from 80 to 76 per 1,000 inhabitants. The top five countries are Portugal with 123, Spain with 113, Greece with 107, France with 103 and Poland with 102 commercial vehicles per 1,000 inhabitants.[247]

Looking into the vehicle's ownership, the average kilometer driven with a private passenger car in Denmark are 15,882. Overall, there are big differences between driven kilometers with petrol and diesel engines, in the case of Denmark it is in average of 13,365 kilometers with petrol and 22,002 kilometers with diesel engine vehicles. In the Netherlands, in the year 2017 it was on average 10,529 kilometers with petrol and 23,240 with diesel engines.[248]

The *ACEA* describes the key facts of the automotive industry as follows: In 2018, the automotive industry in the EU generated a GDP of over 7%. Furthermore, they generated a trade surplus of 84.4 billion euros for the EU. In taxes for the EU15

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245 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].
246 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].
247 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].
248 *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, pp. 2 – 19 [20.11.2019].

countries, the motor vehicles account for 428 billion Euro in taxes alone. The annual industry investments in R&D are with 57,4 billion Euro the largest private contribution to innovation, accounting for 28% of total EU spending. 6,1% of all European are in the automotive industry, these jobs are direct and indirect related to the industry, that means in numbers 13,8million jobs. 3,5 million of them are manufacturing jobs in the automotive sector, 11,4% of all existing EU manufacturing jobs. [249]

5. *IHS Markit* Automotive Industry Outlook

IHS Markit is a company that provides data and information services for the automotive industry, among others. Its analysts also see the challenges mentioned from an objective perspective.

IHS Markit sees a risk for the global automotive industry, especially for the car manufactures regarding their longer-term planning. This is related to market and product uncertainties in the powertrains. Furthermore, they also see a risk of broad retreat from globalization. Here especially they name the trade war between China and the USA and the Brexit in the Eurozone. New disruptive business models are increasing the risk and breaking the forecasts.[250]

For 2019, they expected world GDP to grow 2,9%. The world GDP growth outlook for 2020 is lower than the year before. They estimate a recovery only in 2021-2026 with a small growth. With a view into the different countries, you can see similarities but also major differences between the countries. Like the global growth, they see Japan and the Eurozone with a small downtrend in 2020 but recovery in 2021-2026. They see Brazil on the same level like in 2019 with a big jump in 2021-2026. China and India are following the trend of the United States and are going down in their economic growth rate each year from 2020 until 2026. [251]

The average growth rate in annual light vehicle sales from the year 2002 until 2016 was 3,6% with around 92 million units sold in 2016. In the years of 2017 and 2018 the

[249] *ACEA* (2019); https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf, p. 20 [20.11.2019].
[250] *Wall* (2019), https://www.cargroup.org/wp-content/uploads/2019/02/Wall.pdf, pp. 2 - 3 [28.10.2019].
[251] *Wall* (2019), https://www.cargroup.org/wp-content/uploads/2019/02/Wall.pdf, pp. 2 - 3 [28.10.2019].

sales were stabile with around 94 million cars sold. *IHS* expects a slower growth related to the mobility dynamics in the long term, they see a growth to 110 million cars sold annually until 2026. That means, volatility has an influence on the short-term outlook and the mobility dynamics drive a slower growth in the long term. In the view of light vehicles production in 2019, *IHS* sees the outlook for vehicles produced in 2019 only with a slight plus of 0.4% worldwide. The main driver of this growth is China, with 422,000 vehicles more produced than in 2018, while South Asia and South America are also helping to boost global production with an increase of more than 200,000 vehicles each compared to 2018.[252]

Looking a bit deeper into the different areas in the world, the *IHS* outlook shows that the emerging markets are the key to growth and the mature markets potential is limited. Their study indicates that there was a high market growth of light vehicle sales in the mature markets (US, Canada, Japan, South Korea, Australia, New Zealand and Western Europe) from the year 2012-2015 of 13%. From 2015 to 2018 the growth was only 3%. For the time of 2018 until 2026 a minus of 3% is expected. Looking into China, the growth from 2012 to 2015 was 31%, from 2015 until 2018 a growth of 11% is predicted and they expect a growth of 26% for the years between 2018 and 2026. In the emerging markets, there was a minus 10% from 2012 until 2015, from 2015 to 2018 a growth of 7% took place and from 2018 to 2026 a high growth of 45% is expected.[253]

According to the forecast by *IHS*, the worldwide yearly market production will grow from 95 million vehicles to 110 million by 2026. That would state a plus of 15 million vehicle production in just 6 years. China and South East Asia will have the largest growth rates with 6.6 million produced units in China and 4.7 million plus in South East Asia. They also expect growth of 1.7 million produced vehicles in Europe and 1.3 million vehicle units produced in South America. They see smaller increases of unit production in North America with only a plus of 600,000 vehicles, a plus of 800,000 vehicles in the Middle East/ Africa and a decline in Japan and Korea of 400,000 vehicles by 2026.

[252] *Wall* (2019), https://www.cargroup.org/wp-content/uploads/2019/02/Wall.pdf, p 4 [28.10.2019].
[253] *Wall* (2019), https://www.cargroup.org/wp-content/uploads/2019/02/Wall.pdf, p 5 [28.10.2019].

IV. Trends, Outlook and Prospects

The automotive industry is facing probably the greatest transformation in its history. The Volkswagen Group is likely to be in the public eye once again, with the company increasingly attempting to assume a leading role in e-mobility as well. *Volkswagen* has launched the largest e-offensive in the automotive industry. The Group is investing some 33 billion euros. By 2029, *Volkswagen* will launch up to 75 pure E-models across the Group. By 2025, the *Volkswagen* brand aims to sell more than one million electric cars worldwide each year.[254]

In 20 years, *VW* could sell its last cars with petrol and diesel engines. The new generation of electric vehicles should also help to make the diesel affair forgotten as quickly as possible. To this end, car sellers and car dealership employees have already been trained since the beginning of 2019.[255]

It remains to be seen whether the company will succeed with ID.3, the first real battery-powered mass product from German production and if it can even come close to assuming a similar role as the *VW Beetle* and the *VW Golf*. From June 2020 the new e-model is to be sold and before 2021 more than 100,000 copies of the ID.3 will be brought to the end customer.[256]

The probable merger of the two major manufacturers *PSA* and *Fiat Chrysler* will create another 100-billion-euro car company, which will undoubtedly be in the global premier league of producers. If the economy should weaken even more and losses are imminent, the pressure can become so strong that others also seek rescue in a major merger. The winners from the auto crisis will probably be those who are financially strong and have a particularly large number of qualified workers and engineers like *VW Group* and *Toyota*.

China has also repositioned itself in terms of e-mobility. At the IAA 2019, for example, new products from numerous Chinese companies could be seen, which are no longer

[254] *Volkswagen AG* (2019) https://www.volkswagen-newsroom.com/de/e-mobilitaet-3921 [29.12.2019].
[255] *Menzel* (2019) https://www.handelsblatt.com/unternehmen/industrie/neue-e-autos-volkswagen-bereitet-seine-haendler-auf-das-elektro-zeitalter-vor/23978140.html?ticket=ST-46644744-5COIjgPZmfBHKxFC4jth-ap4 [29.12.2019].
[256] *Pieper* (2019) https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [29.12.2019].

just on the sidelines of the big show. The very strong orientation of Chinese economic policy towards e-mobility is visibly beginning to bear fruit. It is to be expected that Chinese companies will have to deal with the established competition in the 2020s. This may affect German premium brands even less at first, but very probably the mass brands.[257]

1. Automotive Industry – Quo Vadis?

Autonomous driving promises a change in the field of mobility and is sometimes even considered a disruptive technology. New concepts such as so-called shared mobility also have an impact on urban structures and urban space concepts. In addition, the new technology promises to minimize road accidents and make driving easier. However, this technology also involves dangers. Hacker attacks could control the vehicle and overwrite the current driving process. Organized crime can also make use of this technology by means of unmanned transport in autonomous vehicles and use them, for example, to transport illegal goods or to carry out terrorist attacks. To prevent autonomous vehicles from becoming a legal vacuum, they must be accessible, and subject to government controls.[258]

It has also not yet been conclusively clarified to what extent German criminal law is ready for automated vehicles – namely what criminal law consequences arise under current law from the traffic accidents that can be expected when operating, in particular, fully automated vehicles.[259]

a. Who's winning the Race?

The German automotive industry and its suppliers reacted to this development at an early stage. This is also shown by the numbers of patent applications for autonomous driving: According to a study conducted by the *Institute of the German Economy* at the beginning of 2016, German manufacturers account for 58% of the patents on autonomous driving registered worldwide. The USA and Japan are the other two major innovation countries. Germany even accounts for 82% of the patents filed by suppliers.

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[257] *Of* (2019) https://www.auto-motor-und-sport.de/neuheiten/china-neuheiten-iaa-2019/; *Pieper* (2019) https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [29.12.2019].
[258] *Steege*, NZV 2019, 459.
[259] *Sander/Hollering*, NStZ 2017, 193

Among the 10 largest patent applicants are 6 German companies: 4 manufacturers (*Audi*, *VW*, *Daimler*, *BMW*) and 2 suppliers - in first place (*Bosch*) and third (*Conti*). Among the challengers, *Google* stands out in 5th place. Due to the combination of technical and non-technical expertise and high capital strength, the *Institute of the German Economy* sees *Google* as a very serious competitor.[260]

A large part of the willingness to pay for cars in the past was caused by mechanics. Powerful drives and chassis combined with high-quality design have shaped the premium brands that are becoming increasingly important.[261]

Over the next 20 years, it is expected that the premium class will be newly defined. Networking, autonomous driving experience and digital services will play an important role in this development. Nevertheless, this technology is not currently offered by the car companies. Rather *Google*, *Apple* and other software companies deliver digital customer experiences. Connected cars and autonomous driving are two essential aspects of driving. The customer relationship could be lost by the car manufacturers to the software companies. As things currently stand, *Google*'s software programs are superior to the carmakers' programs for autonomous driving. The development in this area remains open, especially regarding whether the car manufacturers can catch up with the software companies and perhaps even surpass them.[262] It has been apparent for some time that with the advance of electric vehicles, electronics companies are also entering the car business. This was all expected from *Apple*, but the company is currently focusing on robot car technology.[263]

An example of this development is *Sony*. The software company surprised visitors at the *CES* technology fair in Las Vegas with the presentation of an electric car. *Sony* itself is actually known for camera sensors, which are used in many smartphones, for example. But this time, *Sony* developed a car. They worked together with a number of partners like *Magna Steyr* from Austria, but also the three major German suppliers

[260] *Lange*, NZV 2017, 345, 347; *Institut der Deutschen Wirtschaft* (2016), Press Release NR. 32, https://www.iwkoeln.de/presse/pressemitteilungen/beitrag/autonomes-fahren-deutsche-starten-von-guter-basis-286200.html [26.12.2019].
[261] *Dudenhöffer* (2019) 458.
[262] *Dudenhöffer* (2019) 458.
[263] *Focus* (2020), https://www.focus.de/auto/elektroauto/ces-auftakt-sony-ueberrascht-mit-elektroauto-auch-deutsche-konzerne-sind-im-boot_id_11524551.html [18.01.2020].

Bosch, *Continental* and *ZF*. The newly developed electric platform is also suitable for driving other types of vehicles such as SUVs, as Sony claims.[264]

Strategy&, a *PwC* network business, came to the conclusion that companies who invest their R&D budget in software solutions are already showing stronger growth than their competitors.[265] Small wonder, the software companies are ahead here.

World's 1000 largest publicly listed corporate R&D spenders (2018)

Rank	Company Name	Country	Industry group	R&D Expenditures ($US Billions)		Revenue ($US Billions)		R&D Intensity	
				2017	2018	2017	2018	2017	2018
3	*Volkswagen AG*	Germany	Automobiles and Components	13.8	15.8	260.9	277.0	5.3%	5.7%
11	*Toyota Motor Corporation*	Japan	Automobiles and Components	9.8	10.0	267.4	259.8	3.7%	3.9%
13	*Ford Motor Company*	USA	Automobiles and Components	7.3	8.0	151.8	156.8	4.8%	5.1%
17	*Daimler AG*	Germany	Automobiles and Components	7.8	7.1	184.0	197.3	4.2%	3.6%
25	*Bayerische Motoren Werke AG*	Germany	Automobiles and Components	5.2	5.9	113.1	118.5	4.6%	5.0%
7	*Apple Inc.*	USA	Technology Hardware and Software	10.0	11.0	215.6	229.2	4.7%	5.1%
1	*Amazon.com Inc.*	USA	Retailing	16.1	22.6	136.0	177.9	11.8%	12.7%
2	*Alphabet Inc. (incl. Google)*	USA	Software and Services	13.9	16.2	90.3	110.9	15.5%	14.6%

Source: *Strategy&* (2016)[266]

Table 13: World's 1000 largest publicly listed corporate R&D spenders (2018)

[264] *Focus* (2020), https://www.focus.de/auto/elektroauto/ces-auftakt-sony-ueberrascht-mit-elektroauto-auch-deutsche-konzerne-sind-im-boot_id_11524551.html [18.01.2020].
[265] *Strategy&* (2016) https://www.strategyand.pwc.com/innovation1000 [29.12.2019]; *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 11 [29.12.2019].
[266] *Strategy&* (2016), https://www.strategyand.pwc.com/gx/en/insights/innovation1000.html#VisualTabs1 [29.12.2019].

Table 14 shows that both automotive and technology groups occupy the top positions in the Top 1000 statistics. Here, for example, are *Amazon*, which uses technologies such as Alexa, as well as *Apple* and *Alphabet* (*Google*).

But in this area, the race will intensify in the coming years, as car manufacturers have focused more on their product range in the past than on developing new technologies for the future. It is possible that joint ventures or mergers will be set up to create a stronger combination of automotive and technology and thus an unbeatable team. Progress would certainly be faster if these companies were at least partially cooperating.

The hopeful message is that the core competence of German car companies is not only engine construction, but also high-quality mass production and an understanding of the complex regulation in the highly sensitive area of road safety. Car companies are unlikely to lose these advantages if they switch to electric drive systems. In other areas such as product design and the further development of the interior, German carmakers continue to lead the way. Despite the challenges that are emerging, these reasons suggest that German car manufacturers will probably largely defend their market share for the time being. In the long term, however, the car market will tend to shrink and lose its overall economic significance.[267]

b. Which Cars will be driven in the Future?

It can be stated that the automotive future is electrified, autonomous, shared, connected and yearly updated. It is predicted that the future mobility of the users will be easier, a lot more flexible and individual. The vehicles will be used on demand with shared ownership.[268]

There are indications that by 2030, over 55% of all new car sales will be fully electrified. It is even possible that 40% of the kilometers travelled in Europe will already be covered by autonomous vehicles in 2030. So, more people will travel more kilometers than at present. This will open mobility for groups of the population that were previously excluded from driving. This especially affects physically disabled,

[267] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[268] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 5, 10 [30.12.2019].

low income, those without a driver's license and elderly people. According to *PWC* projections personal mileage in Europe could rise by 23% by 2030 to 5.88 trillion kilometers. Forecasts even predict an increase of 24% in the US and 183% in China.[269]

This means that the cars of the future will be subjected to much more intensive use. In terms of capacity shared-autonomous vehicles will be much more efficiently utilized than traditional vehicle in use today. This will have the consequence of a dramatical rise in annual mileage. Cars will have to be replaced at shorter intervals even though their active lifetime mileage will go up. Despite this, a rise in vehicle sales it is to be expected despite the falling inventory. *PWC* predicts a rise of new car sales by 34% across Europe from around 18 million to just over 24 million units. For the US, they assume a growth of 20% and 22 million new car sold in the year 2030. *PWC* predicts a rise of sold units by over 30% to 35 million for the Chinese market.[270]

This development is also confirmed by figures from the Car-Sharing sector. The importance of car sharing is also growing steadily. According to the *Car-Sharing Association*, there were more than 2.46 million Car-Sharing customers in Germany at the beginning of 2019, with just 20,200 Car-Sharing vehicles. According to the Federal Motor Transport Authority (KBA), 47.1 million passenger cars are on German roads; accordingly, the share of car-sharing vehicles is just 0.04% of all passenger cars.[271]

The direction that manufacturers and suppliers need to take is still questionable. Tesla the only automotive company ranked in the top 10 of the most innovative companies in the world. That's surprising because the company with the highest R&D expenditure is a German automaker. In total, the R&D spent in the automobile industry decreased by 4% between 2015 and 2016.[272]

But the car manufacturers are facing a difficult time of transition. This transformation, especially between 2020 and 2025, reveals the dilemma that manufacturers and suppliers will be facing sinking margins. At the same heavy investments in customer-

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[269] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 9, 27 [30.12.2019].

[270] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 10, 27 [30.12.2019].

[271] *Bundesverband CarSharing* (2019) https://www.carsharing.de/presse/pressemitteilungen/carsharing-statistic-2019-carsharing-germany-is-still-on-a-growing-path [26.12.2019].

[272] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 11 [30.12.2019].

oriented innovations will be necessary. Despite declining sales figures, investments are necessary in order not to lose their core business in the future. This does not only concern investments in R&D, but also production capacities for new vehicles and vehicle parts. At the same time, the concepts must be stable, flexible and scalable. Otherwise they will not play an active role after 2025.[273]

It is therefore essential to introduce innovative business models in order to be able to cope with changes in the long term. This is the next internal challenge. Corporate structures must be adapted from the ground up. This will prove difficult in the case of rigid, traditional corporations, as proven concepts have built up the success to date. In the future, the target group will not only be the end customer as a buyer, but all users of the product. Therefore, new user preferences and completely new mobility users have to be researched.[274]

This raises the question of what the future driver will look like. For the next few years it is predicted that the significant group of young, technically savvy drivers will be looking for more sustainable and convenient mobility solutions. The state of mind of said people will also change the attitudes and behavior of successive generations towards sustainability. In contrary, middle aged people tend to view the development of new mobility solutions more skeptical. It is still to be expected, that here will be a shift in the percentage towards a more modern orientation worldwide.[275]

2. *Tesla* as Pioneer?

Tesla Motors was founded in 2003 by the two software developers *Martin Eberhard* and *Marc Tarpenning* with the aim of building attractive electric cars. They wanted to prove that electric vehicles do not mean a compromise, but can offer more power, acceleration and driving pleasure than gasoline engines. The Tesla Roadster was the first product and based on a Lotus Elise, equipped with laptop batteries.[276]

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[273] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 11 [30.12.2019].
[274] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 11, 12 [30.12.2019].
[275] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 16 [30.12.2019].
[276] *Lang* (2019) https://www.auto-motor-und-sport.de/verkehr/tesla-hintergrund-elon-musk-gruender/ [30.12.2019].

Already in 2016, *Tesla Motor*s ranks 4th on the list of the Top 10 most innovative companies, with an R&D expenditure of 0.7 billion US dollars. *Tesla* is the only car manufacturer represented in this list. This makes it clear that it is not the size of the company that is decisive, but the type of concrete investment.[277]

This shows that the traditional car manufacturers have an enormous amount of catching up to do. It is also interesting in this context that VW did not make it into the top 10 in its high position in the R&D ranking. It is possible that the company is too stuck in traditional structures or has not yet discovered the right direction.

Manufacturers and suppliers require a redistribution of their budgets quickly and in a targeted manner to be able to catch up. Research and development need to focus on software and services. Also, the software needs to be focused on, while the services and products need to offer the customers an additional functionality and improved ease of use. And said software must be implemented into the hardware. Only by this, the offer of customers a pleasant and future-proof overall product will be possible.[278]

However, the race for the market with electric cars has long since begun. The German market for electric cars grew rapidly in the first half of the year. In the first six months alone, 31,000 new electric cars were registered in Germany, 80 % more than in the same period last year. This makes Germany the third largest electric car market in the world.

State subsidies have led to a rise of sales of e-cars in recent years. However, this upward trend is likely to strengthen in the coming years. The major manufacturers are now increasingly entering this market. And the politics want the electric drive.[279]

With their product range, *Tesla* is currently the leading brand for purely electric cars in Germany. Between the beginning of the year and 31 October 2019, 9301 new *Tesla* electric cars were registered. This represents a market share of 17.6 %. In second place comes *Renault* with 8330 pure electric cars, followed by *BMW* with 7957, *VW* (6208) and *Smart* (5862). Nevertheless, the most frequently newly registered electric car

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[277] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 40 [30.12.2019].
[278] *PwC* (2017-2018) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf, P. 40 [30.12.2019].
[279] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].

model in Germany is the *Renault Zoe*, to which the entire 8330 newly registered electric cars.[280]

Newly registered electric cars in Germany by brand since January of 2019[281]

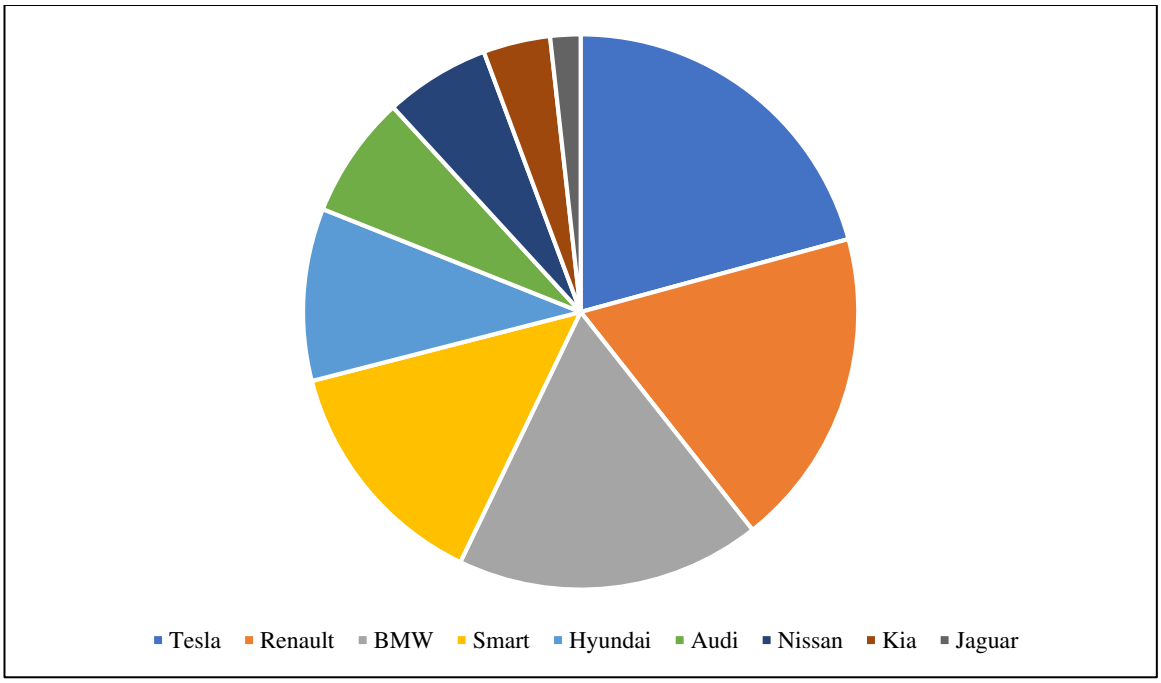

Figure 2: Newly registered electric cars in Germany by brand since January of 2019

Tesla is planning the first European "gigafactory" in Germany. The plant will be placed near the major airport BER. The factory will manufacture batteries, drive trains and the new Model Y sports utility vehicle. An engineering and design center is also to be built in Berlin. In total, up to 7000 jobs could be created. Production in Germany is planned to start as early as the end of 2021. *Tesla* is also currently the market leader in Germany for all-electric vehicles. Alternatively, England was considered as a new location, but this was rejected because of the Brexit.[282]

The qualification of the German engineers and developers is excellent. With the planned factory in the geographical center of Europe, *Tesla* also has logistical

[280] *Die Zeit* (2019) https://www.zeit.de/news/2019-11/13/tesla-marktfuehrer-bei-e-autos-in-deutschland [30.12.2019].
[281] *KBA* (2019) F 10, https://www.kba.de/DE/Statistik/Fahrzeuge/Neuzulassungen/Monatliche Neuzulassungen/monatl_neuzulassungen_node.html [30.12.2019].
[282] *Kranz* (2019), https://www.morgenpost.de/wirtschaft/article227642309/Tesla-baut-Fabrik-in-Deutschland-Alles-was-man-wissen-muss.html [08.01.2020].

advantages. This development actually goes against the trend. While other manufacturers are shifting their vehicle and component production to cheaper Eastern Europe, *Tesla* is moving to the high-wage country Germany. This may be due to the presence of green power, which fits the *Tesla* concept.[283]

Tesla is the first settlement of a foreign car manufacturer in Germany for decades. Should it be possible to attract other manufacturers in the e-mobility industry to the region, this would be a positive signal for the German industry. It is to be expected, however, that the competition in the e-mobility market will intensify due to *Tesla*. This will encourage German car manufacturers to bring vehicles with alternative drive systems onto the market. At the same time, e-mobility is likely to experience a further surge in popularity.[284]

But the announcement is also accompanied by protests from environmentalists. The planned factory in Grünheide is to be built on an industrial site near the A 10 freeway, where there is currently still forest. The administrative approval procedure is also extensive. There are extensive emission control and environmental standards that must be considered. The involved parties are faced with the challenge of balancing climate protection and the creation of wealth and jobs.[285]

Large amounts of energy are necessary for the battery cell production. This process therefore determines whether electric cars are really more climate-friendly than gasoline cars. Electricity from coal-fired power plants has a negative impact on the emissions balance. *Tesla* has already put solar modules on the roof of its factory in Tilburg which cover an area of the size of about three soccer fields with a production capacity of 3400 kilowatts. This does not cover the power requirement by a long way. In total, *Tesla* currently states its direct CO2 emissions at around 70,000 tons per year. In the long term, the company has set itself the goal of covering its entire energy requirements from renewable sources.[286]

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[283] *Pankow* (2019), https://www.produktion.de/themen/mobilitaet-zukunft/warum-deutschland-sich-ueber-das-neue-tesla-werk-freuen-sollte-352.html [08.01.2020].
[284] *Kranz* (2019), https://www.morgenpost.de/wirtschaft/article227642309/Tesla-baut-Fabrik-in-Deutschland-Alles-was-man-wissen-muss.html [08.01.2020].
[285] *Focus* (2019), https://www.focus.de/finanzen/boerse/elon-musk-plant-tesla-werk-proteste-von-naturschuetzern-kommen-ihm-fauna-und-flora-in-die-quere_id_11384358.html [08.01.2020].
[286] *Berke*l (2019), https://www.spiegel.de/auto/aktuell/tesla-fabrik-bei-berlin-alles-was-man-zur-gigafactory-wissen-muss-a-1296499.html [08.01.2020].

Germany is a clear latecomer compared with its position in engine construction in battery production. Asian manufacturers in particular are far ahead in this respect. The high value-added share of raw materials such as lithium in batteries probably makes them more likely to be purchased from the cheapest supplier rather than produced in-house.[287]

The arrival of *Tesla* has already had an impact on German battery cell research. In Germany investments of around one billion euros in lithium-ion production are planned. Also a battery research factory is scheduled in North Rhine-Westphalia. It is essential for the future competitiveness of German automotive products that the company develops its own expertise in this field. It remains questionable, whether German industry will be able to catch up with the technological gap in this area.[288] Germany's chances of distinguishing itself as a location for electro mobility have therefore certainly increased.[289]

3. Alternatives for the Commercial Vehicle Sector?

Emissions, fuel consumption and fine dust pollution are issues that also concern the commercial vehicle industry. For ports and airports, for example, to be able to meet their overall emissions balance in future, they would have to use only zero-emission vehicles in their internal logistics.[290] Trucks are responsible for about 5 % of Europe-wide CO 2 emissions. Emissions from trucks are particularly high because of their diesel engines. In addition, they slow down traffic in large cities and significantly increase noise pollution.[291]

That's why the electric motor also finds its way into trucks. An electric fleet could significantly reduce these expenses for fuel and maintenance. In addition, the German government subsidizes electric vehicles, so that the acquisition costs for new trucks are lower. The e-trucks also enjoy tax advantages, as the government will subsidize

[287] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[288] *Kranz* (2019), https://www.morgenpost.de/wirtschaft/article227642309/Tesla-baut-Fabrik-in-Deutschland-Alles-was-man-wissen-muss.html [08.01.2020].
[289] *Pankow* (2019), https://www.produktion.de/themen/mobilitaet-zukunft/warum-deutschland-sich-ueber-das-neue-tesla-werk-freuen-sollte-352.html [08.01.2020].
[290] *Pieper* (2019) https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [29.12.2019].
[291] *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].

electric vehicles purchased until the end of 2019 and exempt them from vehicle tax for ten years.[292]

All major manufacturers have an electric truck at the start this year. The *FL Electric* is the first fully electric powered truck of the Swedish car manufacturer *Volvo*, which has been built and sold since early 2019. It is mainly used for inner-city deliveries and waste management. The electric truck is low noise, has no emissions and also enables the transport of goods at night. The heavy electric trucks for construction and regional distribution will initially be produced in small quantities for selected customers.[293]

The *Z.E.* (Zero Emission) series is already the second generation of electric trucks from the French car manufacturer *Renault*. The series comprises three models and is used in urban traffic, for delivering goods and for waste disposal. The *Renault Master Z.E.*, *Renault Trucks D Z.E.* and *Renault Trucks D Wide Z* have been available since 2019. The *MAN eTruck* and *Mercedes eActros* models are still in the test phase but are not yet in production. In the medium-duty truck segment, *Daimler Trucks* has already been driving electrically with its *FUSO eCanter* in Asia for several years.[294]

In the USA, manufacturers are also trying to introduce innovation into the truck market. *Tesla* has brought a commercial vehicle onto the market with the *Semi-Truck*. According to the manufacturer, it is supposed to be able to drive up to 800 kilometers with a full load of 40 tons of weight and a battery that is 10 times as powerful as a conventional car battery. *Navistar* will enter the market at the end of 2019 or early 2020 with a short distance electric truck. *VW Truck & Bus* is involved with this. *Thor Trucks* is making people sit up and take notice with the *ET-One*, which has a range of up to 480 kilometers. The models *One* and *Two* by *Nikola* run on hydrogen which is said to last up to 2,000 km. The model *Newton* of the *Smith Electric Vehicles* brand is a light truck, which according to the manufacturer is the best-selling electric truck in

[292] *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].
[293] *Schäfer* (2019), https://www.springerprofessional.de/nutzfahrzeuge/batterie/volvo-trucks-stellt-zwei-schwere-elektro-lkw-vor/17494068 [19.01.2020]; *Butter* (2019), https://efahrer.chip.de/e-wissen/e-lastwagen-2020-hersteller-modelle-von-elektro-lkw_10378 [19.01.2020].
[294] *Butter* (2019), https://efahrer.chip.de/e-wissen/e-lastwagen-2020-hersteller-modelle-von-elektro-lkw_10378 [19.01.2020]; *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].

the world. With a range of 160 kilometers, the vehicle offers enough range to deliver parcels for a day, for example.[295]

The Dutch company *EMOSS* offers E-Trucks and E-Buses. The trucks can be operated intuitively and drive up to 250 km. *DAF* from the Netherlands will enter the market with the *CF Electric Innovation Truck*, which can travel up to 100 km and recharge in quick charge mode in just 30 minutes. It is suitable for urban distribution transport with higher payload and load volume. The electric truck of the Dutch manufacturer *VDL* weighs 37 tons and has a range of 100 km. *Scania* has developed a hybrid truck, available as hybrid and plug-in hybrid. Since 2016, *Deutsche Post* and its subsidiary *StreetScooter* have been producing fully electric light trucks, which are also available on the open market. There are three models: *Work* with a 900 kg load capacity, *Work L* for 1190 kg and *Work XL* for up to 1,275 kg load.[296]

Electric trucks promise to solve the dilemma with the emissions and other problems of conventional diesel trucks. Some logistics companies and freight forwarders rely on a modern, electric solution. The biggest hurdle is the high energy consumption and long distances. Today's batteries are not designed for these long distances and the weight of these commercial vehicles. A diesel truck can cover thousands of kilometers and be refueled in a short time, while an electric truck has a much shorter range. The infrastructure for regularly charging the batteries is also not yet available in large parts of Europe, which also makes international transport difficult. The purchase price is often much higher than for diesel vehicles despite government subsidies. Since there are only a few electric trucks in circulation, even used vehicles are expensive to buy.[297]

However, with loads of over 20 tons and distances that can be thousands of kilometers long, it will probably take a little longer for the electric truck to become standard on long-distance routes. So today it is only possible to replace inner-city freight transport with electric alternatives or for airports. For automotive suppliers, the concept is

[295] *Butter* (2019), https://efahrer.chip.de/e-wissen/e-lastwagen-2020-hersteller-modelle-von-elektro-lkw_10378 [19.01.2020]; *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].
[296] *Butter* (2019), https://efahrer.chip.de/e-wissen/e-lastwagen-2020-hersteller-modelle-von-elektro-lkw_10378 [19.01.2020]; *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].
[297] *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].

probably not yet a solution. Now, these innovations can only be described as prestige projects, which are intended to improve the image of the manufacturers.[298]

a. Commercial E-Trailers – Dreams of the Future?

A change to electrical products is also becoming apparent in trailer mobility. For example, the trailer axle manufacturer *SAF-Holland* has introduced its new *SAF TRAKr* and *SAF TRAKe* electric axles. These use energy recovery to reduce emissions and fuel consumption of the entire train. In cooperation with *SAF-Holland*, *Lohr Industrie* intends to hybridize its own trailers for car transport. Fuel savings of up to 15 % should also be possible by installing the newly developed e-axle.[299]

The *SAF TRAKr* uses a high-voltage generator module for electrical recuperation. The new e-axle is primarily used in refrigerated vehicles: This allows refrigeration units to be operated fully electrically for a certain period of time. It avoids or reduces noise and exhaust emissions and also extends the service life of the cooling unit components.

SAF-Holland: TRAKe Axle System[300]

Figure 3: SAF-Holland TRAKe Axle System

[298] *Brecht* (2019), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [19.01.2020].
[299] *Schachtner/ Buchholz* (2019) https://transport-online.de/news/saf-holland-hybridisiert-lohr-transporter-14695.html [29.12.2019].
[300] *SAF-Holland* (2018), http://iaa.safholland.org/files/pdf/SAF_TRAKe_DE.pdf [18.01.2020].

The *SAF TRAKe*, the trailer axle with electric auxiliary drive (maximum 147 kW), supports the main drive of the tractor on gradients and on difficult ground in addition to recuperation. The essential feature is a high-voltage generator module, which converts kinetic energy into electrical energy. The generator module is driven by the wheel heads via two axle shafts with integrated wheel caps. It generates electrical energy in various driving conditions, for example during deceleration or braking, which can be used to operate electrical consumers in the trailer. The energy generated is temporarily stored in a lithium-ion battery. These new developments can reduce noise and exhaust emissions and help the axle innovations to meet the legal requirements of tomorrow. This also applies to the requirements that inner-city delivery traffic makes on refrigerated transport at night, for example.[301]

Alexander Geis, CEO of *SAF-Holland Group*, commented on the development strategy in the area of electric mobility: "We are striving to contribute to the reduction of the total cost of ownership and support our customers in complying with the increasingly stringent limits for noise and emissions".[302]

It cannot be denied that this development is still in its infancy. What can be stated, though, is that the electrification of trailers is an inexpensive and simple system to enable transport companies to enter the world of electric mobility.

b. Combined Freight Transport as a Solution?

Opportunities exist in the design of a transport chain involving several means of transport. In this way, the specific strengths of each mode are exploited. Combined or intermodal transport involves the transport of goods using two or more modes of transport without a swap container. However, this requires special considerations to simplify cargo handling when changing modes of transport. This system is known as "combined freight transport", which combines the strengths of, for example, trucks (area service) and railways (low-cost block train transport, fast regular service).[303] As already noted, the trend is to transport more cargo by rail in the future. Here too,

[301] *Pieper* (2019) https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [29.12.2019].
[302] *Schachtner/ Buchholz* (2019) https://transport-online.de/news/saf-holland-hybridisiert-lohr-transporter-14695.html [29.12.2019].
[303] *Ihme* (2006), p. 154.

literally everything can be put in the way by taking this trend into account and anticipating it when purchasing new trailers.

Transport with containers is a simple solution here. Because they can be easily loaded onto trains. But these are only used for international shipping. In everyday life on the roads they are not practical. That's why curtain siders are mostly used for road transport. These can be loaded flexibly from the sides. However, this system makes it difficult to enter rail traffic. Alternatively, there are also box systems, in which cases are loaded with the compartment. But even these can only be loaded and unloaded by driving in with a forklift and are therefore not very suitable for everyday use or flexible. Especially for the transport of vehicles both systems are not a good solution.

Cross-sectional Profiles of Railway Control Clearance and Trucks[304]

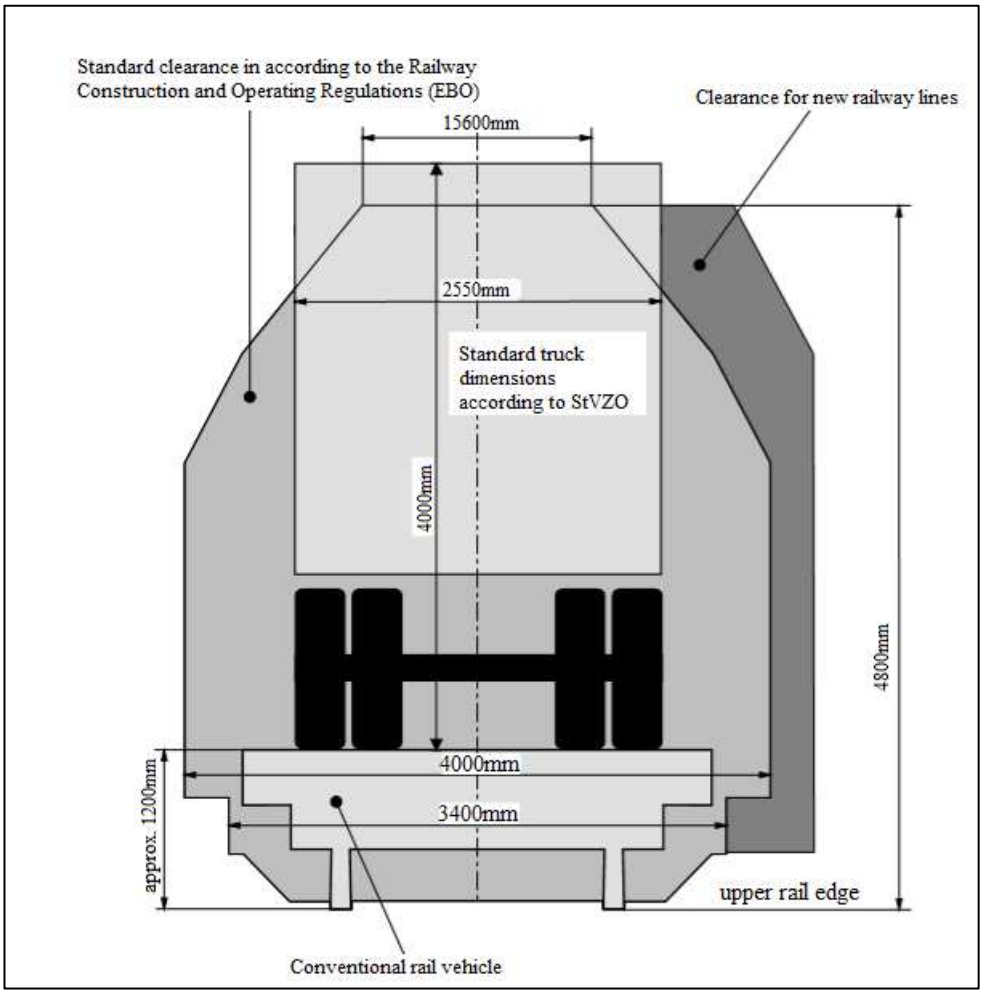

Figure 4: Cross-sectional Profiles of Railway Control Clearance and Trucks

[304] *Ihme* (2006), p. 155.

This picture shows that a standard trailer exceeds the maximum values for train traffic, because the corners extend significantly beyond the clearance area.

There are alternative solutions to this issue. In order to make a trailer usable for road as well as rail traffic, there are systems that allow the entire trailer to be loaded onto a rail wagon. For example, loaded trailers are loaded onto a train in Italy and driven to Rostock or Scandinavia. There, a tractor is connected, and the transport is transferred to the road. In this way, a longer distance can be covered in a cost and time efficient manner. In an ordinary axle system, the air bellows is firmly connected to the trailing arm of the axle and the frame. This system is not suitable for rail loading, as the force applied when lifting the trailer would damage the air bellows. The force and thus the weight of the trailer is concentrated on certain points, which would cause damage and cracks.

But it must be noted that Trucks according to the German Road Traffic Licensing Regulations (StVZO)[305] cannot be transported on conventional rail vehicles because they exceed the vehicle boundary profile. For the transport of ISO and inland containers, swap bodies and platforms, there are two and four-axle carrying wagons and articulated wagons. The transshipment is carried out by means of forklifts or cranes.[306]

It must therefore be ensured that newly purchased trucks and trailers meet the relevant requirements. There is still a need for adjustment regarding the regulations. Here, the legislator must set the course to enable the transport companies to actually implement the legal requirements.

However, this transport system can be realized with low acquisition costs for the carriers, so that a start can be made at short notice.

The company *SAF-Holland* can serve as an example here as well. With the new SAF UP rail loading system (air bag 2619 UP) they offer the possibility of rail loading for the air suspension system without additional accessories. When rail loading, the axle

[305] §§ 32 (2), 22 StVZO.
[306] *Ihme* (2006), p. 154.

sinks down and is held by the shock absorber with a bump stop. When the trailer is set down again, the bellows and support brackets are joined again automatically.[307]

SAF-Holland UP: Rail Loading System – Driving Operation[308]

Figure 5: SAF-Holland Rail Loading System – Driving Operation

SAF-Holland UP: Rail Loading System – Loading Mode[309]

Figure 6: SAF-Holland Rail Loading System – Loading Mode

When riding, optimum power transmission between the air bag and the handlebars is ensured by the specially shaped contact surfaces at the interfaces. During rail loading, the axle sinks down and is held by the shock absorber with stop. When the trailer is set

307 *SAF-Holland* (2017) http://literature1.safholland.com/sites/damedit/literature/SalesLit_TSS_SAF_UP_de-DE.pdf, p. 2 [18.01.2020].
308 *SAF-Holland* (2017) http://literature1.safholland.com/sites/damedit/literature/SalesLit_TSS_SAF_UP_de-DE.pdf, p. 2 [18.01.2020].
309 *SAF-Holland* (2017) http://literature1.safholland.com/sites/damedit/literature/SalesLit_TSS_SAF_UP_de-DE.pdf, p. 2 [18.01.2020].

down, the bellows and the support frame are automatically rejoined without wrinkles.[310]

It can therefore be seen that manufacturers are already thinking about how existing vehicles can be adapted to the new conditions and how new vehicles can be produced as flexibly and adaptably as possible.

4. Rome was not electrified in one Day[311]

The automotive industry is undergoing change. The transition from internal combustion engines to electric drive systems will be a slow process that will probably last for many years. Furthermore, heavy trucks will continue to rely on the combustion engine in the long term. In addition, problems with the infrastructure are becoming apparent. In the public debate, the time and investment required to upgrade the electricity grid sometimes seems to be underestimated. The development of the necessary grid infrastructure will probably be delayed for a long time in western industrialized countries due to lengthy legal planning and approval processes.[312]

Although the future of mobility cannot be predicted, enormous investments will still be necessary in the changing market conditions. Global investment in the market for electromobility of small vehicles is expected to amount to around 300 billion US dollars over the next five to ten years.[313]

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[310] *SAF-Holland* (2017) http://literature1.safholland.com/sites/damedit/literature/SalesLit_TSS_SAF_UP_de-DE.pdf, p. 2 [18.01.2020].
[311] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[312] *Wagner* (2020), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [18.01.2020].
[313] *Atradius* (2019), https://atradius.de/publikation/market-monitor-automotive-deutschland-2019.html [19.01.2020].

V. Results and Conclusions

Investments should be done but done wisely with awareness of markets, clients, risks and governmental restrictions.

1. Evaluation of the above-mentioned risks

The “Dieselgate” scandal has shaken up the market considerably. It is not predictable when this will finally end. The example of *Daimler* shows that automobile manufacturers are still expecting high compensation payments and are therefore creating gigantic reserves. Especially with the long duration of legal disputes, it could take several more years before the industry has left this scandal completely behind.

Regarding Brexit, there are many uncertainties which affect car manufacturers and freight companies in a very concrete way. On the one hand, many legal questions are still open, which concern transport but also corporate law. On the other hand, it remains to be seen how logistics will cope with the new EU external border.

International trade wars and conflicts are also a problem for the entire supply chain. All vehicle manufacturers see this as a factor that strongly influences the purchase of materials, supplier strategies and at the end the sales of vehicles. The "America First" policy of the USA as well as the difficult situation with Turkey should be mentioned here.

At the same time, there may also be an advantage from the ECB's low interest rate policy, as financing has become less costly. But this can also lead to collapse, as this situation is legally controversial and can be harmful to small businesses.

It is also evident that individual customer wishes are becoming more important. Environmentally friendly vehicles and model variations are more in demand than ever. For the transport company, this means that transport should be as climate neutral as possible in order not to further burden the CO2 balance of the vehicles themselves.

A look at the statements of the German car manufacturers show that all of them see the risks described and also rate them as high. They are all aware how fragile the automotive industry for the moment is. They all mention, for example, the difficult situation with Turkey, and all take a critical view of the trade war between China and the USA. The questions about Brexit are also raised by everyone.

However, it is incredibly difficult to obtain concrete figures. With regard to more specific statements on sales figures, car manufacturers tend to keep a low profile, only general statements are made and rough figures are given. Here, only conclusions can be drawn from *KBA* statistics and registration figures. If one compares the production figures with the sales figures, a vigilant observer will notice discrepancies. The sales figures are recorded as high, but at the same time the production figures are strongly declining.

2. Recommendations to Transport Companies

For a transport company, which up to now has mainly specialized in the transport of supplier parts for the automotive industry, the following recommendations result from an assessment of the market situation described above:

1. ***In the short term, transport volumes outside the automotive industry should be found especially for the next one to two years. Apart from that, calm should be maintained, and no rash panicky decisions should be made. Contacts with automobile manufacturers and suppliers should be maintained and further contracts concluded, to be already in the starting blocks for the emerging upswing stated by big companies like PWC.***

   The general transport volume continues to grow. Even if a decline in automobile logistics can be observed, the signs are pointing towards growth overall. A distinction should be made between the current state of the market for German car manufacturers and the forecasts for the overall market for mobility solutions. It becomes apparent that a massive increase is to be expected between 2021 and 2026. The annual light vehicle sales over all is expected to be back up to 110 million in the year of 2026. Here, the connection must not be missed due to the short-term stagnation.

   These contracts should include securities for the transporter. They should include purchase quantities, transport volumes and special penalties for non-compliance. Ideally, exclusive contracts can be negotiated.

2. ***As the figures presented above show production figures will continue to increase due to further growth in alternative drive solutions and private household vehicles.***

   It is obvious that the trend is turning away from the combustion engine. At the same time, it is clear that new investments are being made, also in Germany as a business location. This includes not only the planned Tesla plant, but also research and production of batteries. These should be identified, and transport solutions offered early on. Here it is essential to be one step ahead of the other transport providers.

3. ***If transport is only carried out for certain vehicle manufacturers, it should be evaluated individually which model pallets are built in the plants to be supplied and for which markets. An analysis of the supply chain, which can differ significantly, is useful. This is the only way to discover opportunities and offer individual transport solutions.***

   This information should be obtained and identified independently of the vehicle manufacturer, as manufacturers also report slight declines in their quarterly reports, but do not go into the details of the overall market problem. So all contacts should be used to stay on track. It is noticeable that especially vehicles built in Europe for the European market are declining. Many vehicle manufacturers are geared to the emerging markets. The interim reports deal with these specifically. Opportunities could be seen in vehicle transport from the factory to the port.

4. ***Therefore, one should not wait until the last moment to adapt to the new circumstances. As long as the figures are still reasonably good, wise investments should be made.***

   Due to the current downtrend, an increase in insolvencies is expected. Companies should therefore position themselves broadly so that they do not lose their entire customer base in one fell swoop. The financial situation of contractors should therefore always be investigated. In particular, claims for repayment under

bankruptcy law are to be feared if the business relationship with a financially struggling company is maintained. It makes sense to have potential bad debt losses insured.

5. ***Invest in legal advice for good contracts with your employees and prevent the departure of drivers.***

   Wise contracts should also be concluded with the employees. If the freight is lower, reductions in the number of employees may be necessary. It is essential, however, to have enough drivers in the back, since a shortage of drivers is clearly evident. However, since an upswing is emerging in the coming years due to new forms of mobility, there should be enough workers to fall back on. Instead of quitting in case of emergency, freelancers or short-time work could be used. A sensible approach to employees is essential in these times.

6. ***It still makes sense to invest in vehicles. The low interest rate policy in the EU also allows vehicles to be financed where necessary.***

   As already mentioned, there are already signs of an upturn. Therefore, enough vehicles should be available for the increase of transports and they should also be in good condition. As long as no new vehicles are to be purchased, the existing fleet can be upgraded with flexible systems. In this way trailers can be chosen that can be driven on the road as well as loaded on rails. This allows a higher variety in different routes and transport goods.

7. ***Be prepared for regulations and environmental restrictions.***

   It is also to be expected that there will be further regulation in the area of CO2 emissions as the policy moves towards e-mobility. There could be regulations regarding entering cities. But there could also be restrictions on the vehicle fleet, for example that only a certain amount may be emitted per vehicle fleet. The fleet manager should be involved at an early stage, so that he/she becomes familiar with alternative solutions at an early stage.

8. ***If the decision is made to purchase new vehicles and trailers, care should be taken to ensure that the products are as flexible as possible. Environmentally friendly products should also be considered.***

This can also attract customers who want or have to conform with regulations to produce in a climate-neutral way and therefore want to save CO2 emissions during transport. This is much more than just a point of prestige. The current state of the art does not yet allow a complete conversion to e-mobility for long distance transport. The necessary infrastructure is also not yet available. Therefore, a change to e-trucks is still not advisable, as they are not economically viable at present. However, there are already innovations to make the transport of goods more sensible from an environmental point of view. Here, for example, axles should be considered that allow the transport of trailers by train or recuperate part of the used energy.

VI. References

Atradius	"Market Monitor Automotive 2019", published 10.09.2019 (online), https://atradius.de/publikation/market-monitor-automotive-deutschland-2019.html [accessed on 19.01.2020].
Bayerische Motoren Werke Aktiengesellschaft	"Quartalsmitteilung", published 30.09.2019 (online), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/q3/Q3_2019_BMW_Group_DE_Online.pdf [accessed on 29.12.2019].
Bayerische Motoren Werke Aktiengesellschaft	"Geschäftsbericht 2018", published 20.03.2019 (online), https://www.bmwgroup.com/content/dam/grpw/websites/bmwgroup_com/ir/downloads/de/2019/gb/BMW-GB18_de_Finanzbericht_190315_ONLINE.pdf [accessed on 15.11.2019].
Bayerische Motoren Werke Aktiengesellschaft	"BMW Group erzielt 2019 bei Auslieferungen Bestmarke und bestätigt Position als weltweit führender Premiumhersteller", Press Release published 10.01.2020 (online), https://www.press.bmwgroup.com/deutschland/article/detail/T0304404DE/bmw-group-erzielt-2019-bei-auslieferungen-bestmarke-und-bestaetigt-position-als-weltweit-fuehrender-premiumhersteller [accessed on 11.01.2020].
Belke, Ansgar	"Negativzins: Marktverzerrung und Systemwechsel"; Burghof, Hans-Peter et al.; Negativzinsen bei Geschäftsbanken: Welche Effekte sind zu erwarten? ifo Schnelldienst 2/2015, Volume 68., 29.01.2015, pp. 14-17.
Berkel, Manuel	"Tesla-Fabrik bei Berlin Giga oder Gaga?", published 14.11.2019 (online), https://www.spiegel.de/auto/aktuell/tesla-fabrik-bei-berlin-alles-was-man-zur-gigafactory-wissen-muss-a-1296499.html [accessed on 08.01.2020].
Böhler, Tino	"Automobilzulieferer JD Norman Germany ist insolvent", published 07.10.2019 (online), https://www.automobil-produktion.de/zulieferer/automobilzulieferer-jd-norman-germany-insolvent-329.html [accessed on 19.01.2020].
Brecht, Michael	"Revolution in der Logistikbranche – Was kann der E-Lkw?", published 14.11.2019 (online), https://emobilitaetblog.de/elektrofahrzeuge/nutzfahrzeuge/lkws/ [accessed on 19.01.2020].
Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)	"Umweltbewusstsein in Deutschland", published 26.07.2019 (online), https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/gesellschaft-erfolgreich-veraendern/umweltbewusstsein-in-deutschland [accessed on 08.01.2020].

Bundesministeriums für Verkehr und digitale Infrastruktur (BMVI) "Verkehr in Zahlen 2018/2019", VIZ, 47th Ed., Flensburg (2018).

Bundesverband CarSharing "CarSharing-Statistik 2019: CarSharing in Deutschland weiter auf Wachstumskurs", published 20.02.2019 (online) https://www.carsharing.de/presse/pressemitteilungen/carsharing-statistic-2019-carsharing-germany-is-still-on-a-growing-path [accessed on 26.12.2019].

Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA) "BDA-Kommission „Zukunft der Sozialversicherung – Dauerhafte Begrenzung der Beitragsbelastung“ hat ihre Arbeit aufgenommen", published 2019 (online), https://arbeitgeber.de/www/arbeitgeber.nsf/id/DE_Arbeitskosten [accessed on 19.01.2020].

Butter, Irmgard "Elektro-LKW 2020: Hersteller & Modelle von Elektro-Transporter", published 09.01.2020 (online), https://efahrer.chip.de/e-wissen/e-lastwagen-2020-hersteller-modelle-von-elektro-lkw_10378 [accessed on 19.01.2020].

CNBC "2. Uber; 2. Faring better in the post-Travis era", published 22.05.2018 (online), https://www.cnbc.com/2018/05/22/uber-2018-disruptor-50.html [accessed on 07.01.2020].

Daimler AG "Zwischenbericht Q3 2019", published 24.10.2019 (online), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-zwischenbericht-q3-2019.pdf [accessed on 28.12.2019].

Daimler AG "Fact Sheet for Q3 and January-September 2019", published 24.10.2019 (online), https://www.daimler.com/dokumente/investoren/berichte/zwischenberichte/q3/daimler-ir-factsheet-q3-2019.pdf [accessed on 02.11.2019].

Deka "Makro Research; Emerging Markets Trends" published 13.11.2019 (online) https://www.deka.de/site/dekade_deka-gruppe_site/get/documents/dekade/Publikationen/2019/Emerging%20Markets/Trends/20191113_Emerging_Markets_Trends.pdf [accessed on 16.01.2020].

Die Zeit "Tesla Marktführer bei E-Autos in Deutschland" published 13.11.2019 (online) https://www.zeit.de/news/2019-11/13/tesla-marktfuehrer-bei-e-autos-in-deutschland [accessed on 30.12.2019].

Dudenhöffer, Ferdinand "Die Autobranche wird umgepolt", ZBW – Leibniz-Informationszentrum Wirtschaft; Wirtschaftsdienst, Volume 7 (2019) 451-146; DOI 10.1007/s10273-019-2475-z.

Eckl-Dorna, Wilfried — "Deutsche Autoproduktion sinkt auf 22-Jahres-Tief", published 16.12.2019 (online) https://www.manager-magazin.de/unternehmen/autoindustrie/auto-produktion-deutschland-22-jahres-tief-mit-4-67-mio-gebauten-pkw-a-1301539.html [accessed on 26.12.2019].

European Automobile Manufacturers Association (ACEA) — "ACEA Report: Vehicles in use Europe 2019", published 2019 (online), https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf [accessed on 20.12.2019].

Fischer, Christian — "Umweltkatastrophen beeinträchtigen massiv Lieferketten", publsihed 20.05.2016 (online), https://www.kloepfel-consulting.com/supply-chain-news/supply-chain/umweltkatastrophen-beeintraechtigen-massiv-lieferketten-18682/ [accessed on 31.12.2019].

Flemming, Corinna — "Logistik-Newsflash: Ende der Wehrpflicht führt zu Fahrermangel | Digitalisierungswerkzeuge für die Zukunft | FedEx-Wettbewerb für KMUs | DPD eröffnet vollelektrisches Depot", published 25.11.2018 (online), https://www.logistik-watchblog.de/neuheiten/1769-logistik-newsflash-ende-wehrpflicht-fahrermangel-digitalisierungswerkzeugen-zukuft-fedex-wettbewerb-kmus-dpd-vollelektrisches-depot.html [accessed on 19.01.2020].

Flossbach, Bert — "Wer sich Gretas Botschaft näher anschaut, entdeckt einen großen Irrtum", published 29.12.2019 (online), https://www.focus.de/finanzen/boerse/experten/fridays-for-future-wer-sich-gretas-botschaft-naeher-anschaut-entdeckt-grossen-irrtum_id_11385231.html [accessed on 08.01.2020].

Focus — "Sony überrascht mit Elektroauto – diese deutschen Konzerne sind an Prototyp beteiligt", published 07.01.2020 (online), https://www.focus.de/auto/elektroauto/ces-auftakt-sony-ueberrascht-mit-elektroauto-auch-deutsche-konzerne-sind-im-boot_id_11524551.html [accessed on 18.01.2020].

Focus Online — "Große Pläne in Brandenburg; Proteste von Naturschützern: Kommen Fauna und Flora dem Tesla-Werk in die Quere?", published 26.11.2019 (online), https://www.focus.de/finanzen/boerse/elon-musk-plant-tesla-werk-proteste-von-naturschuetzern-kommen-ihm-fauna-und-flora-in-die-quere_id_11384358.html [accessed on 08.01.2020].

Frankfurter Allgemeine Zeitung — "Handelskrieg trifft deutsche Wirtschaft hart", published 01.10.2019 [online] https://www.faz.net/aktuell/wirtschaft/der-handelsstreit/handelskrieg-zwischen-usa-und-china-trifft-deutsche-wirtschaft-16411476.html [accessed on 26.12.2019].

Gaouette, Nicole "As Trump threatens to destroy Turkey's economy and Kurds die, many wonder if penalties will have teeth", published 15.10.2019 (online), https://edition.cnn.com/2019/10/14/politics/trump-turkey-sanctions-skepticism/index.html [accessed on 08.01.2020].

Goette, Wulf/ Habersack, Mathias/ Kalss, Susanne (Publisher) Münchener Kommentar zum Aktiengesetz, Volume 7, Europäisches Aktienrecht, 4th Edition, Munich 2017.

Göpfert, Ingrid/ Schulz, Matthias/ Wellbrock, Wanja "Trends in der Automobillogistik", in "Göpfert, Ingrid/ Braun, David/ Schulz, Matthias (Publisher), Automobillogistik", 3rd Ed., Wiesbaden (2017), DOI 10.1007/978-3-658-11103-8, pp. 2-26.

Handelsblatt "Deutsche Exporte in die Türkei sinken um ein Drittel", published 09.11.2019 (online), https://www.handelsblatt.com/politik/konjunktur/nachrichten/aussenhandel-deutsche-exporte-in-die-tuerkei-sinken-um-ein-drittel/23601356.html?ticket=ST-54313015-0LdVhB7jPJCaMpOgei4h-ap5 [accessed on 08.01.2020].

Harke, Dirk "Herstellerhaftung im Abgasskandal", in: VuR 2017, 83.

Hartel, Dirk „Einordnung und Grundlagen des Projektmanagements in der Logistik“, in „Projektmanagement in der Logistik, Praxisleitfaden mit Beispielen aus Industrie, Handel und Dienstleistung“, 2nd Ed., (2019) DOI 10.1007/978-3-540-78405-0.

HAUTE INNOVATION "EDAG Light Car Sharing Car-Sharing Konzepte befördern Elektromobilität", published 11/2011 (online), http://www.haute-innovation.com/de/de/magazin/mobilitaet/edag-light-car-sharing.html [accessed on 07.01.2020].

Helms, Hinrich/ Pehnt, Martin/ Lambrecht, Udo/ Liebich, Axel "Electric vehicle and plug-in hybrid energy efficiency and life cycle emissions", 18th International Symposium Transport and Air Pollution, Session 3: Electro and Hybrid Vehicles, Symposium- Proceedings, Dübendorf (2010), pp. 113-124.

Hingst, Kai-Michael/ Neumann, Karl-Alexander "Negative Zinsen – Die zivilrechtliche Einordnung eines nur scheinbar neuen geldpolitischen Phänomens", in: BKR 2016, 95.

Hommer, Jörg/ Gräfe, Julian "Standort Deutschland – Ist die Wettbewerbsfähigkeit in Gefahr?", published 08.11.2019 (online), https://www.daserste.de/information/wirtschaft-boerse/plusminus/sendung/standort-deutschland-100.html [accessed on 19.01.2020].

Hubik, Franz "Daimler macht nach Milliardenverlust wieder Gewinn – doch Källenius hat einige Probleme", published 24.10.2019 (online), https://www.handelsblatt.com/unternehmen/industrie/mercedes-hersteller-daimler-macht-nach-milliardenverlust-wieder-gewinn-doch-kaellenius-hat-einige-probleme/25149438.html?ticket=ST-46695437-3dhA0QPGIcTFjF6o5PE9-ap4 [accessed on 29.12.2019].

Hubik, Franz "Nächste Daimler-Sparte schwächelt: Aufträge der Truck-Sparte brechen ein", published 17.12.2019 (online), https://www.handelsblatt.com/unternehmen/industrie/lkw-und-busse-naechste-daimler-sparte-schwaechelt-auftraege-der-truck-sparte-brechen-ein/25339116.html?ticket=ST-46977493-y1bJbeu0hcGXEm9qugLM-ap4 [accessed on 29.12.2019].

Hübner, Janis "Libanon: Politische Destabilisierung könnte zu Finanzkrise führen", in: "Deka, Makro Research, Emerging Markets Trends", published 13.11.2019 (online), https://www.deka.de/site/dekade_deka-gruppe_site/get/documents/dekade/Publikationen/2019/Emerging%20Markets/Trends/20191113_Emerging_Markets_Trends.pdf, pp. 6 - 7 [accessed on 28.12.2019].

Hütter, Andrea "Verkehr auf einen Blick", Statistisches Bundesamt (Publisher), Wiesbaden (2013).

Ihme, Joachim "Logistik imAutomobilbau", Munich Vienna 2006.

Informationsdienst des Institut der deutschen Wirtschaft "Handelskrieg: Am Ende verlieren alle", published 25.10.2019, (online) https://www.iwd.de/artikel/handelskrieg-am-ende-verlieren-alle-447505/ [accessed on 23.12.2019].

Informationsdienst des Institut der deutschen Wirtschaft "Standort Deutschland – hohe Qualität, hohe Kosten; M+E-Strukturbericht (Teil 5)", published 05.01.2018 (online), https://www.iwd.de/artikel/standort-deutschland-hohe-qualitaet-hohe-kosten-372443/ [accessed on 19.01.2020].

Institut der Deutschen Wirtschaft "Deutsche starten von guter Basis", Press Release Nr. 32 f. 06.06.2016, https://www.iwkoeln.de/presse/pressemitteilungen/beitrag/autonomes-fahren-deutsche-starten-von-guter-basis-286200.html [accessed on 26.12.2019].

Jannsen, Nils "Zur Bedeutung der Automobilindustrie für die deutsche Wirtschaft", ZBW – Leibniz-Informationszentrum Wirtschaft; Wirtschaftsdienst, Vol. 7 (2019) 451-146; DOI 10.1007/s10273-019-2475-z.

Keller, Sarah Transportaufkommen in Deutschland im Jahresvergleich 2017 zu 2018 nach Transportweg/Transportmittel (in Millionen Tonnen)', published 15.11.2019, [online] https://de.statista.com/statistik/daten/studie/171383/umfrage/guterverkehr-in-deutschland-nach-transportweg-transportmittel/ [accessed on 28.12.2019].

Kerridge, Martin The Impact of Brexit on the Transport Industry, International College of Logistics and Transport in Wrocław, (2018) Vol. 40, No. 4, 35-42. DOI 10.26411/83-1734-2015-4-40-5-18.

Kettenbach, Maximilian/ Strobl, Richard /Neumann, Marion "Türkei in Syrien: Trumps USA verhängt neue Sanktionen - Grüne fordern Strafen für Erdogan", published 22.12.2019 (online), https://www.merkur.de/politik/tuerkei-einmarsch-syrien-usa-trump-gruene-sanktionen-erdogan-zr-13166601.html [accessed on 08.01.2020].

Knupfer, Gabriel "Lehren aus Japan: Wenn ein Land in der Tiefzins-Falle steckt", 19.09.2019, [online] https://www.handelszeitung.ch/invest/lehren-aus-japan-wenn-ein-land-der-tiefzins-falle-steckt [accessed on 27.12.2019].

Kohlmann, Thomas "America first gegen China first", published 26.12.2019 (online) https://www.dw.com/de/america-first-gegen-china-first/a-51635373 [accessed on 26.12.2019].

Kraftfahrtbundesamt (KBA) "Neuzulassungen von Personenkraftwagen nach Marken und Modellreihen im November 2019 (FZ 10)" (online) https://www.kba.de/DE/Statistik/Fahrzeuge/Neuzulassungen/MonatlicheNeuzulassungen/monatl_neuzulassungen_node.html [accessed on 30.12.2019].

Kranz, Beate "Tesla baut Fabrik in Deutschland: Alles was man wissen muss", published 13.11.2019 (online), https://www.morgenpost.de/wirtschaft/article227642309/Tesla-baut-Fabrik-in-Deutschland-Alles-was-man-wissen-muss.html [accessed on 08.01.2020].

Krog, Ernst-Hermann/Statkevich, Katsiaryna "Kundenorientierung und Integrationsfunktion der Logistik in der Supply Chain der Automobilindustrie", in: "Baumgarten (Publisher): Das Beste der Logistik (2008)" Berlin/ Heidelberg, pp. 185-195; DOI 978-3-540-78405-0_16.

Kulikowska - Wielgus, Agnieszka "Akuter Fahrermangel beunruhigt deutsche Transportbranche", published 19.06.2018 (online), https://trans.info/de/akuter-fahrermangel-beunruhigt-deutsche-transportbranche-97254 [accessed on 19.01.2020].

Lang, Patrick "Wer sind die wahren Tesla-Köpfe?" published 03.05.2019 (online) https://www.auto-motor-und-sport.de/verkehr/tesla-hintergrund-elon-musk-gruender/ [accessed on 30.12.2019].

Lange, Ulrich "Automatisiertes und autonomes Fahren – eine verkehrs-, wirtschafts- und rechtspolitische Einordnung", in: NZV 2017, 345.

Legner, Sarah "Deliktische Schadensersatzansprüche gegen den Fahrzeughersteller im VW-Abgasskandal", in: VuR 2018, 251.

Lutz, Harald "Die automobile Zukunft liegt in den Schwellenländern", published 08.04.2016 (online), https://www.vdi-nachrichten.com/technik/die-automobile-zukunft-liegt-in-den-schwellenlaendern/ [accessed on 07.01.2020].

Maliszewski, Adam "Türkisches Wachstum überrascht - „technisch“ verlässt Erdogans Wirtschaft die Rezession", published 02.09.2019 (online), https://www.focus.de/finanzen/boerse/weg-aus-der-talsohle-tuerkisches-wachstum-ueberrascht-technisch-verlaesst-erdogans-wirtschaft-die-rezession_id_11097381.html [accessed on 08.01.2020].

Menzel, Stefan "Volkswagen bereitet seine Händler auf das Elektro-Zeitalter vor" published 12.02.2019 (online) https://www.handelsblatt.com/unternehmen/industrie/neue-e-autos-volkswagen-bereitet-seine-haendler-auf-das-elektro-zeitalter-vor/23978140.html?ticket=ST-46644744-5COIjgPZmfBHKxFC4jth-ap4 [accessed on 29.12.2019].

Mitteldeutscher Rundfunk (MDR) "Der Abgasskandal von VW - Eine Chronologie" [online] https://www.mdr.de/nachrichten/wirtschaft/vw-diesel-skandal-chronik-100.html [accessed on 27.12.2019].

Neuhaus, Carla/ Güsten, Susanne/ Rövekamp, Marie/ Sirleschtov, Antje "Spannungen mit der Türkei; Deutsche Unternehmen zeigen sich besorgt", published 14.03.2019 (online), https://www.tagesspiegel.de/wirtschaft/spannungen-mit-der-tuerkei-deutsche-unternehmen-zeigen-sich-besorgt/24098642.html [accessed on 08.01.2020].

nfz-messe.com (Redaktion) "SAF-HOLLAND: Rekuperation und Traktion" published 25.09.2019 (online), https://www.nfz-messe.com/de/fachmagazin/fachartikel/fokus-elektromobilitaetalternative-antriebe-saf-holland-energie-rueckgewinnung-saf-holland-rekuperation-und-traktion-1995.html [accessed on 29.12.2019].

Nieß, Franziska "Der Rückgang von Auszubildenden im Bereich Berufskraftfahrer bereitet dem Landesverband Bayerischer Spediteure (LBS) Sorgen", 29.08.2018 [online], https://www.eurotransport.de/artikel/ausbildungsstart-2018-lbs-beklagt-mangel-an-fahrer-nachwuchs-10392641.html [accessed on 27.12.2019].

Of, Andreas "CHINESISCHE HERSTELLER AUF DER IAA 2019, Elektro-SUV aus China ab 35.000 Euro" published 13.09.2019 (online) https://www.auto-motor-und-sport.de/neuheiten/china-neuheiten-iaa-2019/ [accessed on 29.12.2019].

Ofner, Nicolay "Negativzinsen – Was bedeutet das für mein Unternehmen?", 04.09.2019 [online] https://fincompare.de/negativzinsen, [accessed on 27.12.2019].

Orlova, Daria "Russland: Wachstumsbeschleunigung im dritten Quartal", in: "Deka, Makro Research, Emerging Markets Trends", published 13.11.2019 (online), https://www.deka.de/site/dekade_deka-gruppe_site/get/documents/dekade/Publikationen/2019/Emerging%20Markets/Trends/20191113_Emerging_Markets_Trends.pdf, pp. 4-5 [accessed on 28.12.2019].

Otte, Max "Negativzinsen: Der Marsch in den Kontrollstaat", Burghof, Hans-Peter et al.; Negativzinsen bei Geschäftsbanken: Welche Effekte sind zu erwarten? ifo Schnelldienst 2/2015, Vol. 68., 29.01.2015, pp. 8-10.

Otto, Frank "Automobilzulieferer in der Abwärtsspirale", published 27.09.2019 (online), https://www.viadelcredere.de/blog/automobilzulieferer-in-der-abwaertsspirale/ [accessed on 19.01.2020].

Pankow, Gabriel "Warum Deutschland sich über das neue Tesla-Werk freuen sollte", published 27.11.2019 (online), https://www.produktion.de/themen/mobilitaet-zukunft/warum-deutschland-sich-ueber-das-neue-tesla-werk-freuen-sollte-352.html [accessed on 08.01.2020].

Passarge, Gudrun "Autozulieferer aus der Spur", published 14.01.2020 (online), https://www.sueddeutsche.de/muenchen/landkreismuenchen/aschheim-schlemmer-group-insolvenz-1.4757137 [accessed on 19.01.2020].

Pieper, Juergen "Jobs gehen verloren: Aber finanzstarke Konzerne wie VW schaffen die Wende", published 29.12.2019 (online) https://www.focus.de/die-welt-2020/the-world-in-2020-jobs-gehen-verloren_id_11423219.html [accessed on 29.12.2019].

Poppe, Melchior "330.000 Jobs zusätzlich weg: Kahlschlag durch E-Mobilität viel schlimmer als gedacht", published 13.01.2020 (online) https://www.focus.de/finanzen/news/arbeitsmarkt/studie-ergibt-schreckensszenario-fuer-2030-330-000-job-fallen-zusaetzlich-weg-kahlschlag-durch-e-mobilitaet-schlimmer-als-gedacht_id_11545267.html [accessed on 18.01.2020].

Preuss, Susanne "Bosch bandelt mit Zell-Lieferant CATL an", published 05.09.2019 (online), https://www.faz.net/aktuell/wirtschaft/auto-verkehr/bosch-bandelt-mit-zell-lieferant-catl-an-16369679.html [accessed on 14.01.2020].

PWC "eascy – Five trends transforming the Automotive Industry" (2019) (online) https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf [accessed on 30.12.2019].

Randelhoff, Martin "Europaweite Beeinträchtigungen im Luftverkehr durch Vulkanasche – Überblick (Liveblog)", published 19.04.2010 (online), https://www.zukunft-mobilitaet.net/688/analyse/europaweite-beeintraechtigungen-im-luftverkehr-durch-vulkanasche-ueberblick-liveblog/688/ [accessed on 31.12.2019].

Redaktion beck-aktuell "BGH: Erste Diesel-Verhandlung im Mai 2020" published 19.12.2019 (online) becklink 2015062 [accessed on 26.12.2019].

Redaktion beck-aktuell "Diesel-Skandal: Führende Volkswagen-Manager wegen Marktmanipulation angeklagt" published 24.09.2019 (online) becklink 2014216 [accessed on 26.12.2019].

Rosevear, John "Diesel-Sorgen: Große Verluste für Mercedes-Benz' Muttergesellschaft Daimler AG", published 09.08.2019 (online), https://www.fool.de/2019/08/09/diesel-sorgen-grosse-verluste-fuer-mercedes-benz-muttergesellschaft-daimler-ag/ [29.12.2019].

Säcker, Franz Jürgen/ Oetker, Hartmut/ Limperg, Bettina (Publisher) Münchener Kommentar zum Bürgerlichen Gesetzbuch, Volume 12, Internationales Handels- und Gesellschaftsrecht [Kaufleute, Juristische Personen und Gesellschaften], 7th Edition, Munich 2017.

SAF-Holland GmbH „SAF UP Bahnverladungssystem", published 2017 (online), http://literature1.safholland.com/sites/damedit/literature/SalesLit_TSS_SAF_UP_de-DE.pdf [accessed on 18.01.2020].

SAF-Holland GmbH „Trailerachse mit elektrischem Antrieb für die Rekuperation und Traktionsunterstützung", published 2018 (online), http://iaa.safholland.org/files/pdf/SAF_TRAKe_DE.pdf [accessed on 18.01.2020].

Sander, Günther /Hollering, Jörg "Strafrechtliche Verantwortlichkeit im Zusammenhang mit automatisiertem Fahren", in: NStZ 2017, 193.

Sauer, Heiko "Die Grundfreiheiten des Unionsrechts", in: JuS 2017, 310ff.

Schäfer, Patrick "Volvo Trucks stellt zwei schwere Elektro-Lkw vor", published 12.12.2019 (online), https://www.springerprofessional.de/nutzfahrzeuge/batterie/volvo-trucks-stellt-zwei-schwere-elektro-lkw-vor/17494068 [accessed on 19.01.2020].

Schiereck, Dirk/ Kiesel, Florian/ Kolaric, Sascha Brexit: (Not) another Lehman moment for banks?, Elsevier Finance Research Letters (2016), pp. 291-297, DOI 10.1016/j.frl.2016.09.003.

Schlautmann, Christoph "Der neue Nationalismus bringt die Lieferketten in Gefahr", published 22.12.2018 (online), https://www.handelsblatt.com/unternehmen/handel-konsumgueter/logistik-der-neue-nationalismus-bringt-die-lieferketten-in-gefahr/23711316.html?ticket=ST-50803442-hVGWXv2ybmGeke6lyD5G-ap5 [accessed on 31.12.2019].

Senz, Karin "Ein türkischer Traum", published 28.12.2019 (online), https://www.tagesschau.de/wirtschaft/tuerkei-e-auto-101.html [accessed on 08.01.2020].

Smith, Craig "110 Amazing Uber Stats and Facts (2019)/ By the Numbers", as of January 2020 (online), https://expandedramblings.com/index.php/uber-statistics/ [accessed on 07.01.2020].

Spiegel "So wichtig ist die Türkei für die deutsche Wirtschaft", published 08.08.2016 (online), https://www.spiegel.de/wirtschaft/soziales/deutschland-so-wichtig-ist-die-tuerkei-als-handelspartner-a-1106113.html [accessed on 08.01.2020].

Statistisches Bundesamt (Destatis) "Automobilindustrie: Deutschlands wichtigster Industriezweig mit Produktionsrückgang um 7,1 % im 2. Halbjahr 2018", Press release No. 139 of 9 April 2019 [online]; https://www.destatis.de/DE/Presse/Pressemitteilungen/2019/04/PD19_139_811.html [accessed on 27.12.2019].

Steege, Hans "Autonomes Fahren und die staatliche Durchsetzung des Verbots der Rechtswidrigkeit", in: NZV 2019, 459.

Steininger, Marina "Die Globalisierung stagniert – nicht nur wegen Trump", published 16.12.2019 (online) https://www.xing.com/news/klartext/die-globalisierung-stagniert-nicht-nur-wegen-trump-3576 [accessed on 26.12.2019].

Strategy& "The 2018 Global Innovation 1000 study, Investigating trends at the world's 1000 largest corporate R&D spenders" (2018) (online) https://www.strategyand.pwc.com/gx/en/insights/innovation1000.html [accessed on 29.12.2019].

Strünkelnberg, Thomas "Die Last mit den „Dieselgate"-Klagen - setzt VW auf Vergleiche?" published 30.08.2018 (online), becklink 2010808 [accessed on 26.12.2019].

Sueddeutsche Zeitung Der Abgasskandal - ein Debakel für die gesamte Autoindustrie', 22. April 2016 [online] https://www.sueddeutsche.de/wirtschaft/abgasaffaere-die-abgasaffaere-ein-debakel-fuer-die-gesamte-autoindustrie-1.2961703 [accessed on 27.12.2019].

SZ (Süddeutsche Zeitung) "Türkei rutscht in die Rezession", published 11.03.2019 (online), https://www.sueddeutsche.de/wirtschaft/tuerkei-rezession-inflation-1.4362581 [accessed on 08.01.2020].

Tesla "Über Tesla" (2019) (online) https://www.tesla.com/de_DE/about [accessed on 30.12.2019]

Tielmann, Artur /Schiereck, Dirk Arising borders and the value of logistic companies: evidence from the Brexit referendum in Great Britain, Finance Research Letters, Finance Research Letters Volume 20, (2017), Pages 22-28, DOI 10.1016/j.frl.2016.08.006.

Transportlogistic Messe München "LKW-Fahrermangel & Laderaumknappheit: Mögliche Lösungsansätze für die Logistikbranche", published 2018 (online), https://www.transportlogistic.de/de/messe/industry-insights/lkw-fahrermangel/ [accessed on 19.01.2020].

United States Environmental Protection Agency (EPA) "September 18, 2015 Notice of Violation to Volkswagen AG, Volkswagen Group of America, Inc., and Audi AG" (2015) [online] https://www.epa.gov/sites/production/files/2015-10/documents/vw-nov-caa-09-18-15.pdf [accessed on 28.12.2019].

Via Delcredere GmbH "Kurzarbeit, Entlassungen und weniger Stellenausschreibungen: Die Rezession erreicht die Bevölkerung", published 04.09.2019 (online), https://www.viadelcredere.de/blog/kurzarbeit-entlassungen-und-weniger-stellenausschreibungen-die-rezession-erreicht-die-bevoelkerung/ [accessed on 19.01.2020].

Volk, Frank "Wir hoffen, dass es zu keiner Eskalation kommt; Interview mit Andreas Wendt, Vorstand für Einkauf und Lieferantennetzwerk, BMW Group", published in Automobil Produktion Ed. 01/2019 (online) https://www.automobil-produktion.de/files/content/_heftarchiv/apr/2019/01/index.html#32, pp. 32 - 35 [accessed on 14.01.2019].

Volkswagen AG "Volkswagen Newsroom: E-Mobilität" (2019) (online) https://www.volkswagen-newsroom.com/de/e-mobilitaet-3921 [accessed on 29.12.2019].

Volkswagen AG "Zwischenbericht, Januar - September 2019" (online), https://www.volkswagenag.com/presence/investorrelation/publications/interim-reports/2019/volkswagen/Q3_2019_d.pdf [accessed on 28.12.2019].

Wagner, Marco "Autobranche droht der Stromschlag - doch den deutschen Firmen bleibt ein großer Trumpf", published 17.01.2020 (online), https://www.focus.de/finanzen/boerse/experten/zukunft-der-mobilitaet-droht-der-autobranche-ein-stromschlag_id_11563088.html [accessed on 18.01.2020].

Wall, Mike "IHS Markit: Automotive Industry, Outlook: Managing Volatility and Leveraging Opportunities in a Dynamic Market Environment", published February 2019 (online), https://www.cargroup.org/wp-content/uploads/2019/02/Wall.pdf [accessed on 28.10.2019].

Walter, Andreas/ Zipse, Enno "Dieselgate aus Sicht der Bank", in: BKR 2018, 18

Wäschenbach, Julia "Wie ein Vulkan Europas Luftverkehr lahmlegte", published 14.04.2015 (online), https://www.n-tv.de/panorama/Wie-ein-Vulkan-Europas-Luftverkehr-lahmlegte-article14890046.html [accessed on 31.12.2019].

Wilhelm, Harald "Daimler AG: Capital Market Presentation Q3 and January-September 2019", publsihed 24.10.2019 (online), https://www.daimler.com/dokumente/investoren/praesentationen/daimler-ir-capitalmarketpresentation-q3-2019.pdf [accessed on 02.11.2019].

WirtschaftsWoche "Rezession beendet – Türkische Wirtschaft wächst wieder", published 02.12.2019 (online), https://www.wiwo.de/konjunktur-rezession-beendet-tuerkische-wirtschaft-waechst-wieder/25291192.html [accessed on 08.01.2020].

Wyman, Oliver "Was taugt das Modell Auto-Abo?", published 25.02.2019 (online), https://www.oliverwyman.de/media-center/2019/feb/Was-taugt-das-Modell-Auto-Abo.html [accessed on 23.01.2020].

Zeit Online "Studie: Mehr große Insolvenzen in Deutschland", published 29.11.2019 (online), https://www.zeit.de/news/2019-11/29/studie-mehr-grosse-insolvenzen-in-deutschland [accessed on 19.01.2020].

Zühlke, Karin "Lieferketten durch Erdbeben in Japan massiv beeinträchtigt", published 17.05.2016 (online), https://www.elektroniknet.de/markt-technik/elektronikfertigung/lieferketten-durch-erdbeben-in-japan-massiv-beeintraechtigt-130378.html [accessed on 31.10.2019].

Zwirlein, Susanne/ Großerichter, Helge/ Gätsch, Andreas "Exit before Brexit - Handlungsoptionen für Gesellschaften englischen Rechts in Deutschland unter besonderer Berücksichtigung der LLP", in: NZG 2017, 1041ff.

VII. Abbreviations

ACEA	European Automobile Manufacturers Association
AUD	Australian Dollar
BDA	Bundesvereinigung der Deutschen Arbeitgeberverbände, Confederation of German Employers' Association
BGH	Bundesgerichtshof, Federal High Court of Justice of Germany
BRIC	Brazil, Russia, India and China
Brexit	means the withdrawal of the United Kingdom from the European Union
CKD	completely knocked down
D. f.	Decision from
DAX	Deutscher Aktien-Index 30: a share index in 30 leading German companies on the Frankfurt stock market
DIHK	Association of German Chambers of Industry and Commerce
EBIT	earnings before interest and taxes
ECB	European Central Bank
EStG	Einkommensteuergesetz, German Income Tax Act
EU	European Union
GbR	Gesellschaft bürgerlichen Rechts
GDP	Gross Domestic Product
i.e.	id est; that is
LBS	Bavarian Freight Forwarders' Association
LG	Landgericht, District Court
LPG	Liquefied Petroleum Gas
MVPs	Multi-Purpose Vehicles
O. f.	Order from
oHG	offene Handelsgesellschaft
R&D	research and development
StVZO	Straßenverkehrs-Zulassungs-Ordnung, German Road Traffic Licensing Regulations
SUVs	Sports Utility Vehicles
TIR	Transports Internationaux Routiers
UK	United Kingdom
US	United States
USA	United States of America
VAT	value added tax
WLTP	Worldwide harmonized Light vehicles Test Procedure

VIII. List of Tables

IX. List of figures