WISO DISKURS

19/2015

René Bormann, Philipp Fink, Frank Iwer, Wolfgang Schade

LIKE A PHOENIX FROM THE ASHES?

On the Future of the Automotive Industry in Germany

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1

INTRODUCTION[1]

"The automotive industry in crisis" (FAZ 2005) or "Heading for a Crash" (Becker 2005) read the headlines about the German and international automotive industry in 2005. The tone became even shriller after the start of the 2008/2009 financial crisis: Handelsblatt called 2009 the "Year of Horror" for the automotive industry (Handelsblatt 2008); according to the German Association of the Automotive Industry (VDA) 2009 was "the worst crisis in the automotive industry since 1945" (VDA 2009).

Today the picture is utterly different: the German automotive industry has recovered from the crisis like a phoenix from the ashes. VW recorded record sales of more than nine million cars in 2012; Audi, BMW and Daimler also reported record sales in the first half of 2013. These successes were driven primarily by Asia, in particular China, and North America, whereas sales in Europe stagnated, and in some places even declined. As studies show (e.g. Becker 2010, Diez 2012 and Schade et al. 2012), the reasons for these success stories lie in technological leadership (including in efficiency and lightweight design technologies), the broad, customer-focused range of products, the established national/German-language R&D and production clusters, global dominance of the premium segment and German carmakers' successful entry into the Asian growth markets. The studies confirm that today the German automotive industry is very well positioned globally and more competitive than at any time in its 125-year history.

But does this also hold for the future of the automotive industry in Germany? To answer this question we need to examine two profound developments more closely. On the one hand, owing to the ongoing economic crisis European markets will continue to stagnate or even shrink further, while at the same time European plants outside Germany are already experiencing chronic overcapacity. On the other hand, the trend among German manufacturers is to increasingly supply China, India and the Americas from local plants. Already three quarters of the production of Germany's car plants are destined for export. Both developments constitute a threat to jobs in Germany. If the growth markets fail to live up to expectations, the outlook for jobs and value creation in Germany will deteriorate dramatically.

To prepare for such a scenario, this discussion paper seeks to highlight not only potential developments and dangers, but also options for alternative courses of action and recommendations for the automotive sector and government policy. Bearing this in mind, the paper first analyses in detail the determinants of the current upheaval in the automotive market. Part Two summarises the most important aspects of the German automotive industry in figures: What share of German GDP does automotive production account for? How do global shifts impact on Germany as a manufacturing centre. Part Three outlines the challenges that the automotive industry needs to be ready to handle in the future if it is to remain successful. They include climate policy, demographic change and changes in consumer behaviour. Part Four looks more closely at fields that hold potential for new, sustainable concepts and models that can keep Germany competitive and compensate for possible declines in growth. Innovative concepts of mobility and services, alternative drive systems and the integration of new forms of IT technology are all potential sources of opportunity for the automotive industry. This analysis serves as the basis for developing four different scenarios in Part Five for the future of the automotive sector in Germany. Which developments are possible and which factors do they depend on? After the probabilities of these scenarios have been weighed up, Part Six will present strategy recommendations for different actions that corporate and political actors can take in different fields.

1 We are grateful to Professor Helmut Holzapfel, University of Kassel, and Dr Volker Schott, VDA, for their valuable suggestions and comments.

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THE GERMAN AUTOMOTIVE INDUSTRY TODAY

The automotive industry is one of the leading sectors of the German economy with revenues of EUR 357 billion in 2012, about one fifth of the total revenues of German manufacturing.[2] Almost two thirds (EUR 229 billion) are produced abroad, accounting for approximately 30 percent of the total foreign production of the German manufacturing industry. The German automotive industry employed 761,000 people in 2012, which is equal to almost 13 percent of all employment in the manufacturing industry. Other sectors that produce inputs for carmakers employ up to a million more workers, who are effectively also employed in the automotive industry (Kinkel/Zander 2007). With expenditures of around EUR 16 billion on in-house research in 2012 and around EUR 6 billion on external sources in the field of R&D in 2011, the German automotive industry spends more on R&D than any other sector in Germany by a wide margin (German Association of the Automotive Industry [VDA] 2013).

In an overall view of the German automotive industry, regional distribution around the globe is impacted by three employment-related factors: research and development, premium segment production and other production. Further differentiation from the point of view of employment includes separate consideration of the role of suppliers and of conditions in the labour market. The status quo and future change of each of these five aspects will be briefly presented in the following chapters.

2.1 CHANGES IN MARKET RELATIONSHIPS

Since 2005 domestic sales of the German automotive industry have stagnated. As a result of the 2008/2009 financial crisis, global passenger car sales in important established markets collapsed (by more than a third in the USA, for example). Since then sales have only partially recovered (as in the USA) or even continued to fall (as in other European countries). That said, in 2011 and 2012 the German automotive industry experienced strong sales growth in particular in Asian, but also in South American markets and in the USA, resulting in a noticeable increase in sales. 2001 was a particularly good year with growth of 11 percent (VDA 2012).

Differences in market development have driven shifts in the geographic distribution of production and sales between the different regions of the world. Figure 1 shows that of the 10.8 million cars produced by German manufacturers in 2008 about half, 5.5 million, were actually produced in Germany. By 2012 the ratio of domestic to foreign production had shifted dramatically. In 2012 German original equipment manufacturers (OEMs) produced approx. the same number of cars in Germany, 5.4 million, as in 2008. By contrast, they had increased foreign production by three million to 8.3 million cars, i.e. more than 60 percent of their total car output was produced abroad. Thus, the share of foreign sales rose from 82 percent in 2008 to more than 85 percent in 2012. In 2012 Germany exported 60 percent of its car production to the EU, so that sales of cars made in Germany still depend substantially on European markets.

2.2 PREMIUM SEGMENT

The Audi, BMW, Daimler and Porsche brands have established the reputation of the German automotive industry as a leader in technology and a manufacturer of premium cars. In the meantime, at the global level VW is also viewed as a premium brand. Of the 6.5 million premium cars sold around the world in 202, 80 percent were German brands (VDA). German production accounted for almost 100 percent of executive and luxury cars (Diez 2012).

Accordingly, the premium segment is important for employment in Germany. As many German OEMs enjoy market shares in excess of 80 percent, this segment is dominated by German manufacturers. Today, the concept of the premium segment no longer only refers to executive, luxury and upper-medium cars, but can refer to all segments and their

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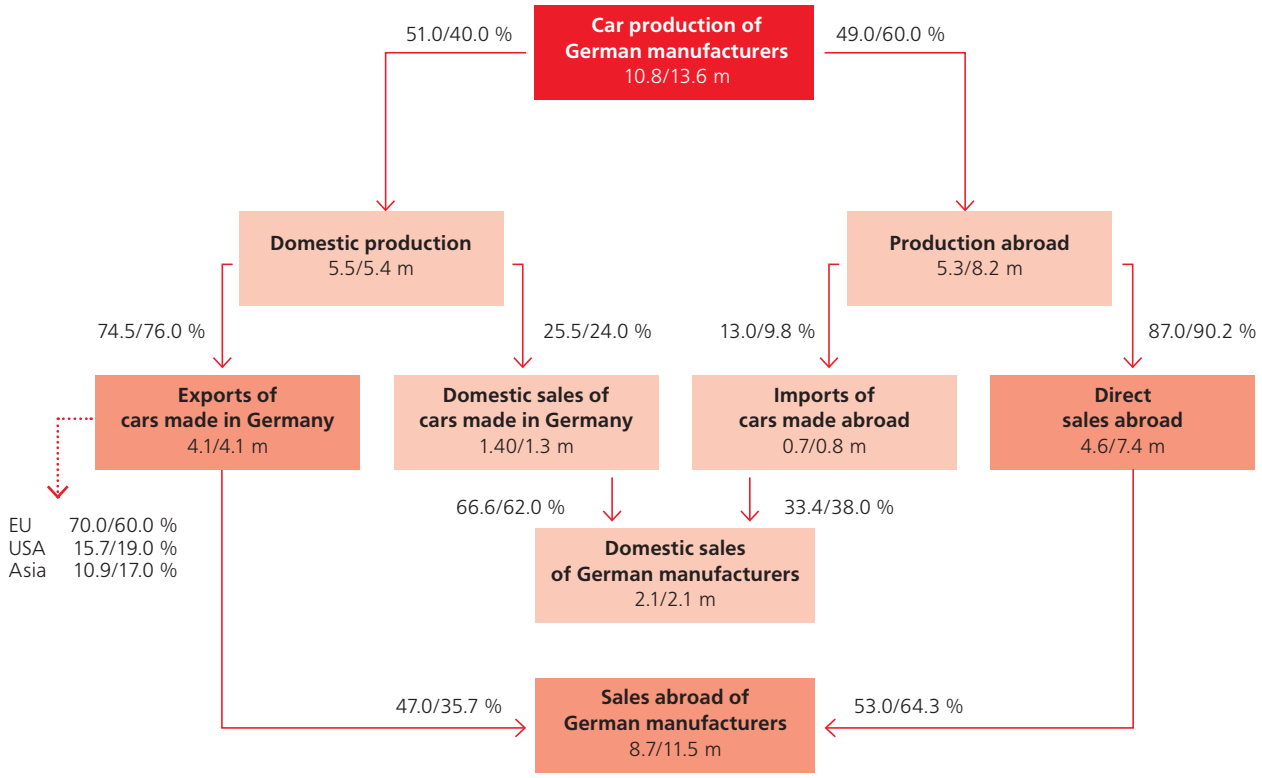
2 Data of the manufacturing industry refers to the German Classification for Economic Activities, 2008 edition (WZ 2008), and cover sections B "Mining and quarrying" and C "Manufacturing". The figures for the German automotive industry refer to Class WZ08-29 "Manufacture of motor vehicles, trailers and semi-trailers".

Figure 1
Regional distribution of manufacturing and sales of German automotive companies 2008/2012, in units



Source: VDA 2013, Kraftfahrt-Bundesamt (Federal Motor Vehicle Transport Authority – KBA); calculations based on Barthel et al. 2010.

leading models with state-of-the art technology and exclusive appointments.

Hence, from a global perspective cars such as a BMW Mini, an Audi A1 or a VW Golf with high-quality appointments enjoy the status of premium vehicles.

According to Oliver Wyman (2012), more than two thirds of the added value in the premium segment is created in Europe. Schade et al. (2012) report that in 2010 Germany's share of executive and luxury car production was 68.3 percent, NAFTA's 14.5 percent, China's 9.2 percent and the rest of Europe's 6.3 percent (see Figure 2).

The premium segment also plays a pre-eminent role in employment in Germany. More than three fifths of workers in German OEMs are employed in the production of premium vehicles (Gottschalk 2012).

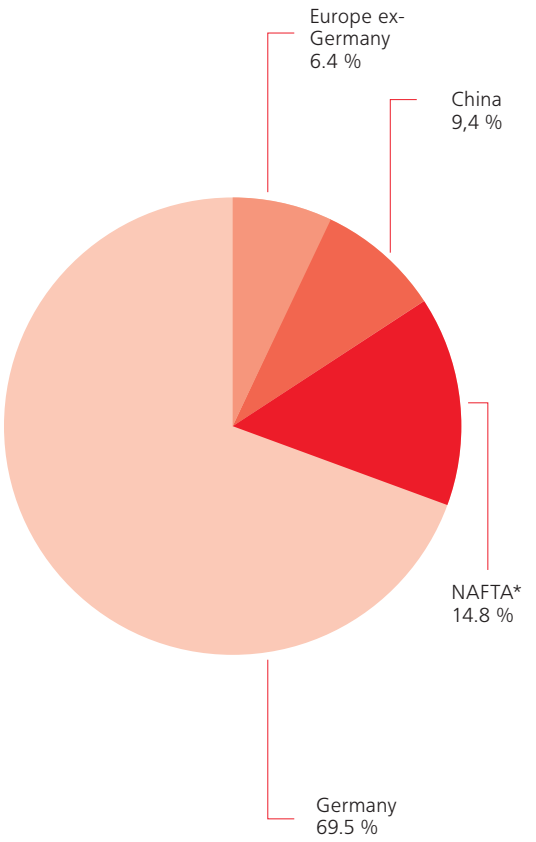
Although more than two thirds of the premium cars are still produced in Germany, a very high share, premium cars of German OEMs are already being manufactured in other regions. For example, the BMW sports activity vehicles are produced in Spartanburg in the USA and the Audi SUV in Changchun, China. In 2013 Audi opened its Research and Development Center for Asia in Beijing to study product requirements of Asian customers and adapt cars accordingly.

The commercial success of German OEMs in the premium segment is important for several reasons. First, the premium segment offers the greatest margins. As these revenues fund stable, high levels of R&D spending, they are one of the cornerstones of innovation in the automotive industry. Second, as economic development in the emerging markets surges, the high and highest income groups in the population are growing disproportionately, so that growth in the global market for premium cars is likely to be more stable than in other market segments. Third, the positive brand image of premium cars provides a moat for German manufacturers against stiff price competition. Fourth, the cars that are still made in Germany are those of the executive and luxury segments, which preserve automotive jobs in Germany.

2.3 HIGH-VOLUME SEGMENT

In the high-volume segment German carmakers face far stiffer competition, much of it based on price. To simplify, in 2012 the value added in the high-volume segment was spread more or less evenly across Europe, North America, Japan/South Korea and China, with negligible contributions

Figure 2
Regional distribution of luxury car production 2010,
shares in percent



Source: Schade et al. 2012, *USA, Canada and Mexico.

from India and the rest of Asia. In 2012 China and India already dominated the small car segment. Although viewed as a high-growth segment on account of the forecast growth of cities and the expanding middle class in emerging markets, it is a challenging market environment for German producers and suppliers.

According to data from the VDA, in 2012 German OEMs still produced almost half of all their medium cars in Germany. In 2008, the figure was about 70 percent. The production of compact cars fell from 46 percent in 2008 to 35 percent in 2012 and that of small cars from 32 percent to a little less than 23 percent. The relative decline in production is primarily a consequence of the expansion of production abroad. Domestic output remained more or less constant.

2.4 SUPPLIERS

German suppliers are more focused on the German market than OEMs. With the exception of the major system suppliers, they supply the OEMs' German production facilities and possibly other European plants from factories located for the most part in Germany. In 2010, suppliers recorded two thirds of their sales in Germany, and 85 percent of the total in Europe. There is evidence of a moderate trend on the part of suppliers to establish productive capacity outside Germany. In a survey conducted by Fraunhofer ISI, 23 percent of all suppliers stated that they had productive capacity in Eastern Europe, 21 percent in the NAFTA region and 21 percent in China (Schade et al. 2012).

In 2012 the supplier industry in the narrow sense accounted for 19 percent of revenues (EUR 68 billion) of the overall German automotive industry (EUR 357 billion). In terms of employment, the share is much higher at 39 percent (291,800 employees) (VDA 2013). The inclusion of intermediate goods from other sectors (e.g. electronics, steel and iron) increases the number of additional jobs accounted for by suppliers by almost a million (Schade et al. 2012).

The supplier industry in Germany is heavily concentrated in a few regions. In general, supplier clusters are found near the locations of the major OEMs or even directly on the plant sites of the OEMs. Grouping suppliers on the basis of the statistical classification (WZ 34.2 and WZ 34.3) reveals that three quarters of all German suppliers are found in four regional clusters. Baden-Württemberg (23 percent) has the biggest share, followed by North Rhine-Westphalia (18 percent), Bavaria (17 percent) and the cluster in Saxony/Thuringia (14 percent) (Stahlecker et al. 2011).

In other words, OEM manufacturing locations or regional clusters are the favoured locations for successful suppliers. The growing trend among OEMs to relocate production to their global growth markets poses particular challenges for suppliers in Germany as over time new, regional suppliers will establish themselves at the OEMs' new locations. In some countries this process is reinforced by minimum local content requirements for vehicles. One of these is China, an increasingly important production location. OEMs also try to include their regional suppliers to fulfil minimum local content requirements. In such cases German suppliers have the choice between building up a regional location or losing their markets. However, many SMEs cannot afford to establish other locations or do not have the personnel.

For these reasons, the outlook for German suppliers is a below-average share of global market growth as the relocation of growth centres away from Europe will make it more difficult to supply these markets from Germany.

Suppliers face two challenges: first the possibility that OEMs will relocate production to the growth markets and, second, the replacement of the fossil fuel-powered internal combustion engine by electricity, natural gas, wind, biofuels or hydrogen, with the concomitant elimination of the corresponding drive train components (see also Chapter 4.1 and Barthel et al. 2010).

2.5 PROBLEM CHILD EUROPE

Currently, these structural considerations all come together in the market and locations in Europe ex-Germany. Current car sales of 11.5 million units are about 25 percent below the pre-crisis level. Given sluggish overall economic growth, a rapid and sustainable recovery is not in sight. At the same time, new manufacturing locations were and are being built

particularly in Eastern Europe, by both OEMs and, increasingly, suppliers. On account of the global local-to-local orientation, these facilities are producing less and less for export outside of Europe, with the result that the already existing overcapacity is increasing dramatically. Already today prices of components are falling rapidly, production capacity is being reduced in particular in south-western Europe (above all Spain, France and Italy) and plants are closing. But German supplier factories are also feeling the pressure. Investment is being reduced at one European site after another, or put on ice. These developments could quickly lead to disruptions and structural changes with negative consequences for the stability and innovativeness of the value chain.

2.6 RESEARCH AND DEVELOPMENT

According to the VDA, the German automotive industry spent EUR 16 billion on in-house R&D and about EUR 6 billion on external research in 2011. This is by far the largest R&D budget of all economic sectors in Germany and accounts for about one third of total R&D spending in the German economy. The R&D ratio, i.e. the R&D spending relative to sales, is about 6%, which is in the upper range for German industry.

In a global comparison R&D spending by the German automotive industry is high. In 2012 the triad of Europe, North America and Japan/South Korea accounted for four fifths of the global value added by R&D, of which Europe accounted for half (Oliver Wyman 2012).

As it is expected that in 2025 Europe's share of R&D added value will still be around its current level of 36 percent, we can assume that in the future, too, Europe will by far account for the largest share of R&D added value. Factors supporting this assumption are the established R&D clusters, the high standards of education, and the communication skills that will make it possible to develop the systems innovations of tomorrow. That said, part of the R&D is conducted at production sites that are moving in particular to China, which means that China is likely to noticeably increase its share of global R&D activities. Together with India, China could expand its share of R&D added value from 13 percent today to 21 percent in 2025 (Oliver Wyman 2012). These R&D activities will probably go beyond just adapting existing products to local markets. Some degree of independent R&D is also probable; in some cases R&D activities at the foreign location may well provide access to state-of-the-art know-how (ZEW/NIW 2009).

2.7 LABOUR MARKET

Besides competitiveness and innovation, the regulations governing the German labour market are an important success factor in the German automotive industry. After the outbreak of the 2008/2009 financial crisis, sales of the German automotive industry plunged by more than 20 percent in a single year. But the workforce shrank by only little more than three percent. Crucial factors that enabled OEMs to retain their core workforce were the short-time regulation and the agreement to reduce work time accounts and extended plant holidays, a reflection of the successful social partnership between employees and employers in Germany.

For years the dual system of vocational training involving school, studies and on-the-job training has ensured a skilled, professional workforce for the automotive industry. On account of demographic change and the associated decline in the working population, greater efforts will have to be made to maintain this level of qualifications in the coming years. A particular challenge will be the need to continually improve the qualifications of older workers so that they can work longer, e.g. by tailoring working conditions to their specific needs.

One of the most significant determinants of the success of the German automotive industry is the creation of regional clusters, which network R&D and the output of different supplier sectors with the automotive industry. Becker (2010) lists 31 institutionalised clusters in Germany. Other R&D and production networks mirror OEMs' supplier pyramids down to component and spare parts suppliers (Bopp 2012). In some regions of Germany, in particular in the vicinity of the headquarters of German OEMs, the automotive industry plays a prominent role, and in some cases is the focal point of marked regional dependence. In Baden-Württemberg, for example, more than ten percent of the working population is employed in the automotive industry. Hence, the jobs market in these regions depends significantly on the success of the automotive industry in Germany.

That said, developments in Europe could have very negative effects, in particular on suppliers in these cluster regions. The question that will have to be answered in the medium term is how much production is necessary in a region for a cluster to remain innovative and viable in the future as well. Hence, in addition to the major topic of demography, it will become increasingly urgent for clusters heavily focused on the European product markets to explore the topic of structural change in their operations. Given the global competition for locations and innovations, these clusters will be able to maintain their position only if the technologies and processes are industrialised at their current core locations. Stabilising and coordinated European industrial and labour market policies developing new industrial foci would have a supportive impact. Moreover, as production moves offshore and German locations concentrate on R&D, a massive shift in the qualification and skills structures will take place. Even if employment figures remain constant, industrial policy will have to take up the issue of developing labour market perspectives for workers currently employed in manufacturing.

3

CHALLENGES

The German automotive industry faces challenges from changes both in the market and in the general framework. Both changes are picking up in momentum. The chapters in Part Three describe five major challenges and potential risks for the future development of the industry.

3.1 CHANGING MARKETS

During the crisis years of 2008/2009, sales in the established markets of the triad collapsed. Massive state intervention could do no more than mitigate the effects. At the same time, car production doubled in China from about five million cars in 2008 to just under ten million in 2010. Sales grew at a similar pace. On account of this divergence between developments in the triad and China, in 2010 China became the largest car market in the world, although the US regained this position, at least temporarily, in 2012. Many studies conclude that car sales in China will double again to more than 20 million by 2020. In 2012 German carmakers sold almost three million cars in China, making China the largest single market for German producers.

Strong growth in the future is also forecasted for other emerging markets. These include Brazil and other South American countries, India and other countries in Asia. However, it is difficult to estimate the risks and, hence, market slowdowns in the latter countries, e.g. in response to rising oil prices. Thus, for the foreseeable future China will remain the biggest and most important growth market for the automotive industry.

In the global car market the number of OEMs has been falling for decades. Successful OEMs usually grow by acquiring their competitors. Whereas in 1960 there were still 62 carmakers selling under their own brand names, by 2010 only 13 survived (Becker 2010). However, at the brand level the picture is very different. Between 2001 and 2011 the number of brands has risen from 129 to 155. In Europe and the USA the number has actually fallen slightly. The increase in brands is almost exclusively a Chinese phenomenon: the number of manufactured brands has risen from 26 to 60 (Oliver Wyman 2012). From today's perspective it is difficult to say whether these brands will also be successful in markets outside China. However, they are another source of uncertainty as regards the outlook for sales both in China and in other Asian countries.

3.2 DEMOGRAPHIC CHANGE

The decline and the ageing of the population in Germany present another challenge for the German automotive industry. The German population has been shrinking since 2003. The current 12th coordinated population projection of the Federal Statistical Office confirms that this trend will continue in the coming years. A plausible variant, which assumes a more or less unchanged birth rate, a stable, positive migration balance and rising life expectancy, forecasts a decline of about two million by 2020 and of almost five million by 2030 compared to 2008. At the same time, the number of people over the age of 60 will increase by 3.5 million and 7.5 million, respectively, and the 60+ age group will account for almost 37 percent of the population by 2030. In contrast, the number of people under the age of 20 will fall to around 2.5 million, equal to a little under 17 percent.

In recent years the average age of new car buyers in Germany has risen steadily, reaching 52 years in 2013. Almost a third of new car buyers were over the age of 60. Carmakers take the significance of older car buyers into account, e.g. in car design and in assistance systems. An interesting question is whether this adjustment will result in only the right cars being offered for sale in the used car market in the future, and whether this will have a dampening effect on sales of new cars over the long term.

In the past the number of seniors with a driver's licence rose with each generation. This process has almost run its course in Germany and is unlikely to drive any noteworthy growth in car ownership and sales. At the same time, as the pension level falls, there is the risk that future pensioners will not be able to spend as much on new cars.

Other European countries as well as Japan and China also exhibit this demographic phenomenon of a rapidly ageing population. As a result, the trend observed in Germany could

also become relevant in other and bigger markets. In China, however, motorisation will continue to dominate for a while as the level of car use rises.

The second aspect of demographic change has already been touched on above. In the future it is likely to become more difficult to find young people to train as specialists and skilled technicians. This will make it more important to retain older employees in the company and offer them appropriate options and opportunities for work and qualifications.

3.3 RE-URBANISATION, ICT AND NEW CONSUMER PREFERENCES

For decades rising noise and air pollution, the loss of green spaces and declining quality of urban life drove inhabitants of cities to move to surrounding areas. Today this trend has reversed in many places. Air and noise pollution have been curbed, green spaces created and attractive public spaces and communication areas such as pedestrian precincts designed. There is a diverse range of urban recreational and cultural activities and medical care facilities, while at the same time the decline in the offering in the surrounding areas and traffic jams on commuter routes are reinforcing the re-urbanisation trend. People in Germany are moving back into attractive cities. In other parts of the world such as Asia, the desire for a job and a share of the growing prosperity are motivating people to move to the cities. In both cases the result is urbanisation – at different levels – and a different demand for mobility than in the country.

"Shareconomy – Sharing rather than owning" is the theme of CeBIT 2013. CeBIT picked one of the most relevant topics today, also in the field of mobility. Everything can be shared: flats, drills, knowledge, and also cars and rides. This is possible thanks to new information and communication technologies (ICT) on the one hand – smartphones and apps, which have drastically cut the cost of sharing – and social media on the other, which provide the necessary basis of trust for facilitating (mutual) assessment by user and/or provider. New offers are emerging in the field of mobility, e.g. carsharing, bikesharing, ridesharing, intermodal networking and the possibility of private sharing, for instance of cars.

The result is falling demand for cars as the move from the surrounding areas back into the cities reduces the need for autonomous private mobility, as does the changed behaviour of sharing cars or using an eco-mobility network with integrated carsharing.

3.4 CLIMATE POLICY – REDUCING CO_2

Under the leadership of the G8 and G20, the community of states has agreed to limit global warming to a maximum of 2° C compared to the pre-industrial level. This means that by 2050 global emissions of greenhouse gases (GHG) will have to be halved compared to 1990; for the developed countries this means a reduction of 80 to 95 percent also by 2050 compared to 1990. The 2010 energy concept of the federal government has accepted the 2050 target for climate protection and the reduction in GHG and defined interim targets for 2020 (reduction of 40 percent), 2030 (reduction of 55 percent) and 2040 (reduction of 30 percent).

For the first 15 years of global climate policy no specific climate protection targets were set for the field of transport. In 2008 the European Commission defined its first transport-related target, namely a reduction of ten percent in GHG emissions from transport by 2020 compared to 2005 (Schade 2011). The German government passed its own energy concept in 2010 that set the target for reducing energy consumption in transport by ten percent by 2020 compared to 2005 and by a further 30 percent by 2050. For the transport sector the European Commission's new White Book for Transport defined a target for GHG reduction of at least 60 percent by 2050 compared to 1990 (European Commission 2011). In the short to medium term the most effective means of achieving this target is setting CO_2 emission standards for road vehicles (as e.g. in EU Regulation 443/2009 for passenger cars). In the long-term the most important measure is the complete changeover to alternative, low-carbon or carbon-free sources of energy (Fiorello et al. 2012). Both strategies require the automotive industry to make substantial, ongoing investments in innovation and technological improvements. Setting long-term targets gives industry the necessary time to plan changes in its strategic objectives and provides investment certainty. In short, by increasing the share of innovative and, thus, high-value future technologies, climate policy is likely to increase revenues of the automotive industry.

3.5 FOSSIL FUELS

The International Energy Agency (IEA) points out that to meet the climate protection target by 2050 consumption of fossil fuels will have to be limited to only about a third of known reserves (IEA 2012). At the same time, in 2012 the agency was a little more optimistic about the availability of crude oil up to 2035 than it was in previous reports on the global energy outlook (World Energy Outlook). Thanks to the oil sands in the USA and Canada, deep water drilling off the coast of Brazil and expected production in Iraq, the IEA views as possible a production level of a little less than 100 million barrels a day in 2035 at a price of USD 125 per barrel in real values of 2011 (USD 215 in nominal terms).[3]

Currently, global transport uses oil for about 95 percent of its fuel needs and already accounts for more than half the oil produced, a figure that is growing exponentially as the number of cars is forecast to double by 2030. Hence, the geophysical scenarios of the future availability of oil published by the Energy Watch Group (EWG) should be taken very seriously (EWG 2013). The EWG points out that the production of tar sand oils at many sites has already exceeded its maximum capacity and is confronted with much higher declines

3 In addition, the new production methods (e.g. oil sands, fracking and deep sea drilling) involve considerable environmental risks, which, however, are not the subject of this discussion.

in extraction rates than conventional oil production.[4] Furthermore, new sources in Brazil and Canada are not as large as the huge fields tapped in the past. New sources that came into production after 2000 are already entering the phase of production decline (e.g. in Angola and Kazakhstan). The EWG concludes that already today we have reached peak production and in the next few years global production will start to decline.

Hence, the transport sector in Germany and Europe will have to start rethinking reducing its oil consumption in good time. This means that investment in fuel-efficient technologies and alternative drive systems in transport is necessary, can quickly become economic at the microlevel and provide a boost to the economy in the short term through an increase in investment and in the longer term by reducing imports of oil and transport costs (Lovins et al. 2006, Schade et al. 2008).

3.6 RISKS FACING GLOBAL DEVELOPMENT

As an interim conclusion, in terms of both technology and market strategy the German automotive industry is in solid shape to serve the expanding global car market. Through its executive and luxury cars the industry is participating in the economic success of rapidly developing regions in Asia and South America.

However, this picture can change dramatically if the demand for cars fails to grow as rapidly as forecasted. This would be the case in particular if the expectations of prosperity and growth in the emerging markets of Asia and South America were not fulfilled. As a market with expected sales of 30 to 35 million cars in 2030, equal to about half of total current global car sales, China plays a particularly significant role. A number of factors could trigger a collapse in economic development, either globally or in individual countries. For instance, many countries do not have other options to offset a rise in the oil price in the near future, as their investments in alternative sources of energy, particularly for transport, have either started too late or are inadequate. This effect is compounded in states in which the government subsidises low oil prices, especially if they do not produce oil themselves and, thus, depend on imports (e.g. India). This could put enormous pressure on public finances. Sharp increases in energy prices often mean higher food prices, which in some countries can lead to supply bottlenecks (FTD 2007) and trigger social unrest.

In response to the financial crisis, some emerging markets seek to create their own competitive automotive industry, which raises the risk of greater protectionism in the form of new or higher trade barriers or tougher local content requirements. Thus, even though these countries fulfil the markets' general growth forecasts, it could become far more difficult to sell cars made in Germany, in which case the anticipated increase in production and sales would not materialise.

The most recent scenarios drawn up by Shell deal with the question of possible future risk in great detail.[5] They point out numerous previously ignored individual risks and even the nexus of risks. On the topic of prosperity the study notes that "globalisation has tended to reduce the income disparities between nations, but increase them within countries" (Shell 2013: 10). At the same time it addresses the paradox of unlimited growth and limited resources. Decision-making in this field is a contest between on the one hand politicians focused on the short term and international companies pursuing their own interests and on the other a globally networked society with the corresponding, but here, too, unequally distributed possibilities of influence (Shell 2013).

To summarise, the assessment of future developments is a very uncertain business. One risk that should not be underestimated is the possibility of no growth in some growth markets when risks materialise, so that instead of growth the result is stagnation or even regression. For companies in the automotive industry this means that they have to develop flexible strategies that can be adapted with moderate effort and expense to take account of developments that deviate from the strategy assumptions.

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4 The decline in production refers to each individual source. When a well is tapped, production is initially small. Production is increased by the drilling of additional wells and improving technology until a maximum, or peak level of production is reached. After that production steadily declines for reasons of geology and physics and cannot be increased with current technologies. This is called production decline. For conventional oil wells the average rate of decline is around six percent a year. In the oil sands it appears that the annual rate of decline after peaking could be much higher, up to 30 percent. Overlaying the production curves of all the sources in a country or in all countries provides an overall picture of the expected decline in production.

5 Shell is an actor whose entrepreneurial activities require it to invest in long-lasting capital goods. As a result, it has years of experience and competence in drawing up complex, long-term scenarios, which it also publishes.

4

PROSPECTS FOR THE GERMAN AUTOMOTIVE INDUSTRY

The long-term development in demand in the various regional car markets was discussed at the beginning of this paper. Stagnant sales in the triad (Europe, North America and Japan/South Korea) contrast with rapidly expanding markets in the emerging markets of Asia and South America. In each society, car sales depend on the overall political, economic and socio-demographic conditions. After staying relatively constant for decades, these general conditions have started to shift, thereby changing the buying behaviour of car users. The development of alternative drive trains and new brands are further factors that could impact the market shares of the German OEMs. This raises two crucial questions for the future of the German automotive industry: What can the automotive industry in Germany do to maintain employment and productivity in Germany? What new products and services can be produced in Germany?

4.1 DEVELOPMENT AND REFINEMENT OF THE PRODUCT PORTFOLIO

Product portfolios prove one answer. Their goal is to increase the value of cars from the customer's point of view. Three fields of development are interesting in this regard: (1) increasing the efficiency of cars with internal combustion drive trains in response to the aforementioned climate protection requirements and to rising prices for fossil fuels; (2) developing alternative drive systems that contribute to climate protection and energy supply security in transport in the form of electromobility, vehicles driven by hydrogen fuel cells or biofuel/wind turbine drive trains; and (3) installing IT equipment in cars that includes driver assistance systems and vehicular communications systems for various transport and traffic communications channels, e.g. vehicle-to-vehicle or vehicle-to-infrastructure.

All these cases have the potential to increase the intrinsic value of vehicles and, thus, also the added value, which will have a positive impact on manufacturing and employment in Germany. Improvements in the production process offer further potential, e.g. innovative lightweight construction using carbon fibre, which reduces vehicle weight, thereby enhancing the vehicle's efficiency on the one hand and simplifying and speeding up production on the other.

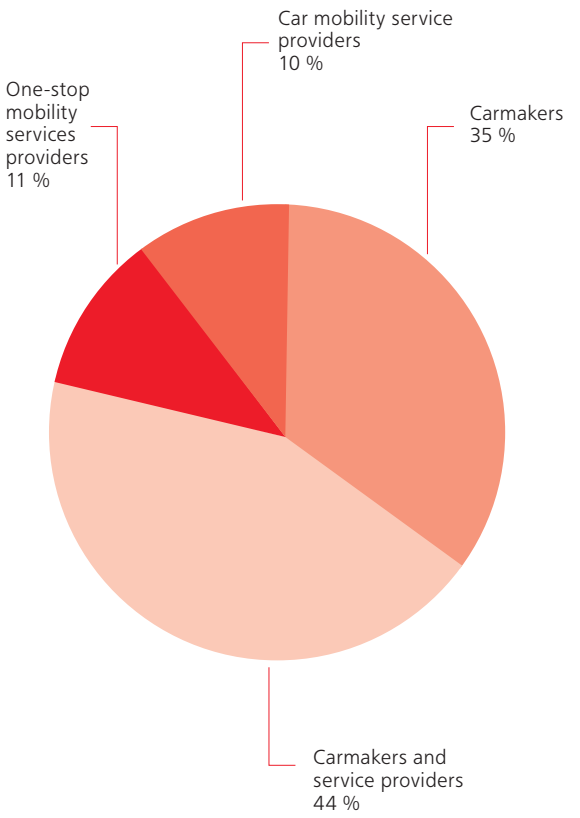
However, the on-going development of the product portfolio can also harbour risks. The shift from drive trains powered by an internal combustion engine via a hybrid power train involving one of various combinations of internal combustion and electric power (hybrid, plug-in hybrid, range extender) to a pure battery or fuel cell-powered car will mean drastic changes in today's supplier structure. Internal combustion engines, exhaust systems and fuel tanks will be successively scaled down or replaced by electric-powered engines, batteries, energy recovery systems and control electronics suppliers of classic components for cars powered by internal combustion engines will gradually lose their markets if they do not make a timely change to new drive train energies and their components. Most scenarios forecast a technological breakthrough by 2030. Cars with only an internal combustion engine will have a market share of 40 to 50 percent, equal to about half their current share; hybrid drives that include an internal combustion engine will also have a substantial market share (Schade et al. 2012, IAO et al. 2012).

Alternative drive systems also create opportunities for new competitors to enter the premium segment of the market. For example, the Model S Tesla sold 4,750 cars in the USA in the first quarter of 2013, more that the conventionally powered premium cars in the EUR 70,000–90,000 price range produced by Audi, BMW, Lexus and Mercedes, which each had sales of between 1,500 and 3,000 cars (GMB 2013).

4.2 DEVELOPMENT OF NEW SERVICES

The development of new services as part of new mobility concepts is a huge opportunity for the automotive industry. Changing values, urbanisation, climate protection and rising energy prices will change the mobility of the future. The range of mobility services will make car ownership unattractive and superfluous for a number of the current owners of private cars. One-stop multimodal mobility services provided by an integrated mobility services provider via smartphone

Figure 3
Global (auto-)mobility market 2020, market shares in percent



Source: Based on Arthur D. Little 2011.

(or future communication tools such as a smartwatch or Google Glass) will offer full information, booking, access, ticketing and payment for the various mobility options, including local public transport, taxi, carsharing, bikesharing and ridesharing. As a result, cost-efficient, environmentally friendly and low-energy transport options will be selected more often (Schade et al. 2011a, Huber et al. 2011).

Figure 3 provides an estimate of the market shares of mobility providers and car sales in 2020. Today, the carmaker and carmaker/service provider business models, based on the sale and ownership of private cars, together have a market share of 100 percent. By 2020 it is expected that about one fifth of the global market for mobility services will be provided by services that exclude private car ownership. Of this fifth, about half will be accounted for by the business model of car mobility service solutions. This will be pitched primarily at cost-conscious customers who see carsharing as a more cost-effective form of mobility than owning and maintaining a car. The other half will be accounted for by one-stop, all-round mobility services providers that offer convenient full coverage that integrates all mobility options and services – and is not limited to cars.

ALL SERVICES RELATED TO CAR OWNERSHIP

Even without any change in mobility behaviour the range of car-related services – both fee-based and free – will expand in the future. Under the heading "Connected Car" the car is being progressively networked with its environment: vehicle-to-vehicle and vehicle-to-infrastructure communication as well as communication with other actors, e.g. pedestrians' smartphones to increase their safety in street traffic. Some services are already in pilot testing, such as the service to reserve parking spaces (e.g. ParkNow in San Francisco). Other services analysing willingness to pay are also conducting pilot tests. Analyses of this kind enabled the road safety project simTD to establish that there was a high willingness to pay for end-of-traffic-jam alerts, remaining red time at traffic lights and phased traffic lights (green wave) (Winterhagen 2013).

NETWORKED, MULTIMODAL MOBILITY SERVICES

Change in (urban) mobility behaviour has been a subject of discussion for almost two decades, and no more intensively than in the scholarly publications of the Social Science Research Center Berlin (WZB). With the rise in energy prices in recent years, the availability of smartphones and apps and an expanding generation of digital natives, a new mobility behaviour is developing based on mobility services such as carsharing, bikesharing and ridesharing and their networking with each other and with local public transport. This is the emergence of a convenient, flexible comprehensive mobility solution that cuts out the autonomous private car. One-stop-shop (Rammler/Sauter-Servaes 2013), fifth mode (Schade/Rothengatter 2011, Schade et al. 2012) and generation rental car (Adler 2011) are all concepts used to discuss and develop such concepts and also make first moves to implement them (e.g. in Project BeMobility of the German Railways and Daimler's moovel project).

Unlike the spectacular success of the Velib' system in Paris, the development of bikesharing in Germany has generally taken place under the radar. In contrast, many other European cities such as Brussels, Barcelona and Milan are successfully installing large systems in a blaze of publicity for both local inhabitants and tourists. In Germany carsharing has attracted more attention since Daimler as first OEM launched its Car2Go carsharing system in 2008. Since then a number of station-based (e.g. Stadtmobil, cambio, Flinkster oder Mobility in Switzerland) and free-floating systems have existed alongside each other. The entry of other OEMs such as BMW (Drive Now), Volkswagen (Quicar) and Peugeot (Mu) has led to rapid growth in competition and awareness of carsharing in Germany. At the beginning of 2013 ten carshare providers were operating in Berlin. In 2012 the number of active carshare users in Germany increased by 50 percent and by early 2013 had already reached the 500,000 mark.

A debate has long been raging about whether sharing is a new philosophy of consumption, whether it helps to reduce material consumption and whether organised sharing will expand beyond cities. The evidence appears to show that carsharing does reduce consumption. Surveys of carshar-

ers show that one carsharing vehicle replaces between four and eight private cars. Accordingly, a massive expansion of carsharing would reduce the total car fleet and lower sales of new cars, even if the individual carsharing car had a higher mileage than a private car and correspondingly had to be replaced sooner.

This pertains to existing carsharing schemes. The impact of one-stop-shop and fifth mode mobility solutions is still impossible to assess today, but in the light of their convenience and flexibility, these systems are likely to differ so strongly from existing approaches that current insights and knowledge cannot simply be transferred.

4.3 OUTLOOK FOR EMPLOYMENT

Apart from value added, labour productivity trends play a crucial role in any assessment of future employment. Using forecasts that sales will grow from 70 million cars today to 125 million in 2030 (e.g. Schade et al. 2012) and assuming that average annual sales growth remains the same produces a figure of almost three percent. Broadly speaking, this would ensure that employment in the automotive industry in Germany remains constant, assuming that productivity also continues to grow by three percent a year on average until 2030. If it rises more slowly, employment will increase, and if it rises faster, fewer workers would be needed.

Hild (2005) established that worker productivity remained almost constant in the automotive industry between 1994 and 2003. An analysis of data of the Federal Statistical Office produces a growth rate for labour productivity of about 2.5 percent a year between 2005 and 2011 (Schade et al. 2012). This is also noticeably higher than the average hourly change in labour productivity in Germany over the same time span, a figure that was a little under one percent (DeStatis 2012). This is borne out by the much improved performance of the German automotive industry in recent years.

Assuming productivity growth of 2.5 percent, growth in sales and value added of three percent and the same choice of manufacturing sites, i.e. the German share remains the same, the result would be marginal growth in employment, as value creation would grow faster than productivity.

It is unclear today just how much of what kind of employment could emerge from a sharing economy in the field of mobility services. An initial hypothesis holds that the new jobs in the service sector would require lower qualifications and, hence, lower income than the existing jobs in carmaking. On the other hand these services require a mix of jobs ranging from administration and vehicle maintenance and repair to business management and the creation of a complex IT infrastructure, which makes a clear statement on the basis of current knowledge impossible.

At the beginning of 2013 Car2Go reported that services for 275,000 users had resulted in the creation of 250 jobs at Car2Go. The 2014 revenue target of Daimler Mobility Services is EUR 100 million (Daimler 2013).

Scenario calculations yielded some results for the relationships and possible impact on employment. Ignoring market trends and the relocation effect, i.e. looking only at the production of the drive train and its components, the spread of alternative drive trains through the market would produce an increase in employment of about 15 percent up to 2015 compared to the exclusive production of cars with internal combustion engines in 2010 IAO et al. 2012). This agrees with conclusions of other studies on the increase in a car's added value as a result of installing an alternative drive train (Schade et al. 2011b). However, if the strong competitive position of the German automotive industry in the field of internal combustion engines, global market trends and the relocation of production plants are taken into account, the scenario that yields the highest value creation and employment in the German automotive industry is a conservative development model absolutely dominated by the internal combustion engine through to 2030. In contrast, assuming stronger penetration of alternative drive systems, high productivity growth and a corresponding shift in value creation as well as a high share of imports among the components relevant for electric mobility, employment in Germany would fall down to 2030 (Schade et al. 2012). The decline would hit current manufacturers of components of drive trains for internal combustion engines particularly hard.

5

FUTURE SCENARIOS

5.1 DESCRIPTION OF THE SCENARIOS

To help to clarify possible trends in the German automotive industry in the next two decades, this chapter will describe four scenarios that take into account the product and service innovations and global product structures discussed above to reach very different conclusions about the level of employment in Germany. These scenarios should help to determine policy options and recommendations with particular regard to employment in the German automotive industry up to 2030. The four crucial areas of the automotive industry discussed above – production locations, mobility services, innovation and technological leadership – provide the following parameters that serve to distinguish the scenarios.

1. Localisation of production: Is production located in Germany or in the regional sales markets?
2. The manufacturer's function: Do OEMs also function as mobility services providers or do they concentrate on their core business of developing, producing and selling vehicles?
3. Success in new markets: Can German carmakers successfully take the leadership in alternative drive systems or will they lag behind their Asian competitors?

Combining the different considerations creates a large number of possible scenarios. We have simplified the choice by assuming for all globally successful scenarios that German OEMs manage to accomplish the technological transformation and the transformation to mobility services providers. It is difficult to imagine any OEM achieving global success without these two factors. The starting point of all scenarios is continued global economic expansion along with economic fluctuations, without, however, a severe economic crisis, such as could be triggered by excessive government debt in the USA or Japan, by an early oil price shock or if China's role as an engine of global growth abruptly ceased.

SCENARIO I: GLOBALLY SUCCESSFUL – ROOTED IN GERMANY

The German automotive industry continues to successfully market its vehicles all over the world, but retains its R&D and production locations, in particular for cars of the high-value premium and upper-medium segments, in Germany. Compact and small cars, on the other hand, are increasingly manufactured in the emerging markets of Asia and South America. The industry as a whole focuses on innovation in the field of efficiency technologies, lightweight construction, alternative drive systems and the connected car. Parallel to this the carmakers open up new markets by offering mobility services and services around high-performance ICT car equipment. On this basis it is possible to increase employment in the automotive industry in Germany. The "technological breakthrough" and "mobility concepts" scenarios (Schade et al. 2012) quantify employment in such development models. These scenarios trend toward slightly higher employment in Germany, in each case depending on the circumstances surrounding the import of cars made in Germany, deliveries of cars produced abroad by German OEMs and the German share of components in the production of electrically powered cars and, finally, the success of mobility concepts. The uncertainties and impact of the spatial structure on supply relationships are underscored by the range of projections for employment figures. For 2030 these lie between a gain of 267,000 jobs and a loss of 401,000 jobs in extreme scenarios. Both figures include gains in jobs generated by mobility service solutions are included.

SCENARIO II: GLOBALLY SUCCESSFUL – REGIONALLY BASED

In this scenario, too, the German automotive industry succeeds in marketing its products globally and maintaining its pace of innovation in efficiency and alternative drive train technologies. Similarly, it successfully enters the market for new mobility service solutions (e.g. carsharing). However, most production shifts to the OEMs leading markets, including some production of premium and upper-medium segment cars and parts of R&D. This means that further sectors

of German OEM manufacturing move out of Germany and Europe. New relationships to regional suppliers in the target markets are developed. Employment in facilities in Germany declines sharply, but is partly offset by success in the market for mobility services. Regarding production, Diez summarises this development as follows: "The longer-term trend in employment in the German automotive industry is downwards. This holds for both automotive manufacturers and automotive suppliers" (Diez 2012).

The quantification by Oliver Wyman (2012) of this scenario of regional added value focused on carmaking excludes the compensating effect of new mobility concepts. According to him, the triad will lose much of its importance and by 2025 China will be the largest production location in the global automotive industry with a market share of 25 percent. In particular China will succeed in more than doubling production in the premium segment – the most important segment for employment in Germany – largely at the expense of production in Europe, i.e. primarily Germany.

SCENARIO III: PRODUCTION TOPS – SERVICE FLOPS

This scenario differs from the previous two in that the OEMs fail to break into the new mobility concepts. Either their concepts fail completely or they are realised by competitors in the mobility market and new entrants from the ICT sector. Hence, the OEMs would not have new potential added value from mobility services solutions to offset possible losses in value creation and employment in carmaking. Although in this scenario the OEMs successfully market new efficiency and drive train technologies, employment in Germany would decline sharply.

SCENARIO IV: MISSED THE BOAT! THE INNOVATORS ARE ELSEWHERE

In this scenario Germany is not the source of crucial innovations. The automotive associations successfully block measures to stimulate innovation, such as the European CO_2 legislation for vehicles. As a result, the industry lacks important impulses to drive technological change. Competitors from Asia (Japan, South Korea and China) overtake German OEMs in the fields of innovative technologies such as plug-in hybrids, pure battery-powered vehicles, fuel-cell vehicles and the connected car. Sales of German OEMs decline. With their out-dated products they cannot offer attractively packaged mobility services, either. Employment in the automotive industry in Germany plunges.

5.2 SCENARIO APPRAISAL

The global automotive industry faces enormous challenges: thanks to efficiency technologies, alternative drives, shifts in growth markets, a global environment full of wild cards, regional-specific customer behaviour and changing mobility habits, strategic decisions have to be taken in a multilayered space. Yet, employment in Germany is largely influenced by these decisions.

If one starts with the accurate observation that the German automotive industry is currently more competitive than it has ever been, the industry is obviously well positioned to shape the next two decades. If none of the possible global risks materialise, it is realistic to expect a development along the lines of one of the scenarios "globally successful – rooted in Germany" and "globally successful – regionally based". The German car industry's technological know-how, its R&D competence in the regional clusters and the evidence that it is already entering the market for mobility and expanded ICT services (connected car) reduce the likelihood of the last two scenarios. Nonetheless, they are a useful reminder of what could happen if some of the above-mentioned risks became manifest.

If these events do not materialise, there are still a number of crucial questions about the future of value creation and employment in the automotive industry in Germany. To what extent will the OEMs relocate production to their regional markets? Will they succeed in keeping production in Germany, in particular luxury and medium class cars or the premium segment? What must be done to keep this production in Germany?

The suppliers in turn face complementary questions: Whether and how SME suppliers can supply production in the Asian growth markets. Is it inevitable that these production locations will be supplied by regional suppliers, with the result that German suppliers are excluded from these growth markets?

The globally expanding car market and Germany's outstanding position in the market for premium products provide a solid foundation, so that with the right strategies Germany will be able to provide stable employment in the automotive industry market in the future. That said, without corresponding political measures it seems more likely that the "globally successful – regionally based" scenario will occur and that value creation and employment in Germany will decline noticeably as production relocates to the growth markets outside Europe. Hence, the following recommendations are intended to strengthen the German automotive industry on the one hand and to reinforce the position of Germany as a manufacturing location and to secure employment in Germany on the other hand.

6

RECOMMENDATIONS TO KEEP CARMAKING IN GERMANY

Today the German automotive industry is in a very strong position. However, it cannot rest on its laurels for three reasons: First, even if particular risks do not materialise, the most likely scenario involves a substantial relocation of OEM production sites to regional growth markets. The consequence would be a loss of added value and employment in Germany. Second, SME suppliers often do not have the necessary resources at their disposal to develop the alternative technologies that will be demanded in the future. Moreover, if OEMs do relocate, these suppliers will be replaced by regional suppliers in the OEMs' future production locations. Third, owing to various global risks, other very different scenarios not predicated on sales growth could become reality. To counter these risks, the companies must integrate flexible adjustment possibilities into their strategic decision-making.

However, a successful German automotive industry does not necessarily mean jobs in Germany in the future. Depending on how much production and R&D is relocated to plants outside Europe, the success of German OEMs could contribute a lot to growth at their destinations – and very little to Germany. This is the point at which political actors need to take steps to better emphasise the advantages of Germany as a location for manufacturing and R&D. This certainly includes Germany's solid knowledge base and innovativeness. This is guaranteed by the excellent educational system for engineers, specialist technicians and scientists and the organisation and structure of the regional clusters in the automotive industry, which ensure the networking of the actors in the OEMs and the electronic, metal, plastics and other supplier industries. Mention should also be made of extensive support and funding for research, the institutionalisation of change and the networks in organisations such as the National Electric Mobility Platform (NPE) and the National Organisation Hydrogen and Fuel Cell Technology (NOW). Over and above this, there is the question of whether the threat of a manufacturing exodus could not be countered by a specifically targeted industrial policy and how policy can attract or support other industrial production so as to mitigate the impact on employees made redundant by the relocation of car production.

Political actors should also take a firm stand on the demand side to ensure that the label "Made in Germany" and the concept of "a masterpiece of engineering" retain a global presence and are used consistently. On the other hand, the image of these brands is predicated on the fact that a substantial part of the development and manufacture of motorcars with this label, in particular those in the premium segment, is indeed German workmanship. The production of champagne is not threatened by relocation as it is tied to a regional label. Following this logic, international awareness of the "a masterpiece of engineering" and "Made in Germany" labels should be reinforced to increase the attractiveness of retaining R&D and manufacturing locations in Germany.

In view of the global risks another advantage of Germany should not be underestimated: its stability. Germany is free of many risks that exist elsewhere, such as the extreme level of national debt in the USA and Japan, political and social uncertainties as in China, and the high dependence of social stability on cheap oil as in India and some African states. Germany has adopted appropriate strategies to deal with other risks such as climate change and the scarcity of fossil resources (e.g. energy transition). Thus, in relative terms, Germany is better equipped than most to meet these global risks to growth. It cannot be denied that, owing to networking, stability problems in strategically important countries would negatively impact Germany and that the structural problems of the Eurozone are also specific problems of Germany and Europe.

Therefore, it is all the more important that Germany should push on with its conversion policy in the fields of climate protection, in transport, in energy transition, in resource and recycling strategies and the move towards renewable energies and the development of service-oriented business models for mobility.

The aforementioned arguments provide a suitable basis to draw up measures to retain value creation and employment in different fields that can help to make Germany a more attractive and secure location for automotive manufacturing. They are presented in the following as a list of key concepts.

FIELD OF ACTION: TECHNOLOGY AND SALES

- Promote innovation in the passenger vehicle sector, where necessary provide incentives to encourage market entry – taking into account the interest in maintaining public transport. The relevant topics of innovation are energy efficiency, lightweight construction and e-mobility. Important options for instruments include standards for CO_2 and efficiency, public procurement, taxing of company cars, depreciation and amortisation rules for commercial/business use and car tax.
- Provide specific support for research into high-performance battery cells as core components of electric mobility (and as a component of H2 mobility) with a view to achieving production in Germany. This requires basic research today and application research in the future. Basic research also includes materials research and research into alternative energy storage systems.
- Adopt a targeted industrial policy to attract or retain production facilities to offset relocated automotive manufacturing.
- Improve mobility between production and R&D for employees within companies.
- Foster the promotion of regional automotive clusters to address regional weaknesses (e.g. drive train conversion, lightweight construction). One potential focus is upgrading SME suppliers. Furthermore, the risk of a monocausal economic structure in regions that are almost completely dependent on carmaking must also be taken into account.

FIELD OF ACTION: GLOBAL VISION

- In general, promote the "Made in Germany" label abroad and establish and reinforce the concept of "a masterpiece of engineering".
- To protect the positive image of "Made in Germany", the label must be reserved for products that fulfil a minimum requirement for content made in Germany.
- Stage the International Motor Show (IAA) on the same scale as more prominent shows so as to link production in Germany with the positive image of the label.

FIELD OF ACTION: CORPORATE STRATEGY

- Encourage corporate leadership with a strategic vision and the ability to define long-term, stable goals today.
- Integrate flexibility and adaptability into corporate decision-making as a means of cushioning risks. One option that offers significant flexibility is the possibility of producing one type of car in different plants so as to iron out, if necessary, fluctuations in the capacity of different plants or address regional risks.
- Hold on to employees' know-how, in particular by integrating and supporting older colleagues.
- Improve mobility between production and development. The targeted promotion and advanced training of employees is one way to retain them and offer them a perspective in the company.
- Sensitise companies about the changes coming with alternative drive systems and help the impacted SMEs to obtain the necessary qualifications and skills.
- Push companies in the automotive industry to implement the energy transition policy.
- Draw up a raw materials and recycling strategy for companies.

FIELD OF ACTION: TRANSPORT AND TAX POLICIES

- In addition to making greater use of the principle of guiding via tax, put the transport system on a stable financial basis. Implement plausible (counter) measures to finance the deployed instruments, e.g. unite bonus-malus systems to promote the purchase of efficient or alternative technologies: combine positive buying incentives with the necessary counterfinancing through higher premiums for inefficient vehicles.
- Sensitise the public about peak oil and implement a state-regulated, defined annual fuel price increase. This will enhance the attractiveness of efficient cars not powered by fossil fuels and combat the deceptive expectation of falling oil prices. In turn this will increase certainty and defuse the consequences of peak oil.
- Support the market development of new mobility concepts so as to guarantee affordable mobility also for low-income groups. This also includes solving the parking problems of carsharing and roaming between different mobility services providers.
- The federal government needs to expand its mobility and fuel strategy from a pure fuel strategy to a mobility strategy.

By adopting technical innovations and providing innovative services, the German automotive industry can continue to be successful also in the future. Combined with a national strategy to promote products "Made in Germany" as "a masterpiece of engineering", this success will also serve as a source of well-paying jobs and value creation in Germany and its regions.

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