Automobile Wertschöpfung 2030/2050

Study on behalf of the Federal Ministry for Economic Affairs and Energy

Executive Summary

IPE Institut für PolitikEvaluation
ika INSTITUT FÜR KRAFTFAHRZEUGE RWTH AACHEN UNIVERSITY
fka
Roland Berger

Overall responsibility

Universität des Saarlandes

Univ.-Prof. Dr. Ashok Kaul

Authors

IPE Institut für Politikevaluation GmbH

Univ.-Prof. Dr. Marcus Hagedorn
Sandra Hartmann
Dr. Daniela Heilert

fka GmbH

Christian Harter
Ingo Olschewski

Institut für Kraftfahrzeuge, RWTH Aachen University

Univ.-Prof. Dr.-Ing. Lutz Eckstein

Roland Berger GmbH

Markus Baum
Dr. Torsten Henzelmann
Dr. Thomas Schlick

In collaboration with Manuel Seid and Manuel Yoon.

Current as of:

December 2019

Executive Summary

The automotive industry is facing two major changes: Firstly, conventional vehicle powertrains are gradually being replaced by electric ones. Secondly, completely different modes of transport are going to be used in the future: automated driving functions, networked mobility and new intermodal mobility services are driving this development. Overall, the structural change to this sector is going to significantly change Germany as an industrial location, particularly as the automotive industry is the country's strongest economic sector. The automotive industry secures 2.2 million jobs, which accounts for seven per cent of all jobs in Germany. In addition, companies in the automotive industry make more than one third of Germany's investment into research and development (R&D). This makes the automotive industry the sector with the highest research activity in Germany.

On behalf of the Federal Ministry for Economic Affairs and Energy (BMWi), the study "Automobile Wertschöpfung 2030/2050" (Automobile Value Added 2030/2050) examines the current challenges and the consequences of structural change to the automotive industry. The analysis is used to derive economic policy recommendations with the aim of maintaining the automotive industry's importance for Germany as a location for innovation and industry. This is the only way to safeguard value creation and competitive jobs in the long run.

In order to adequately take into account the uncertainty of future developments, we look at four scenarios. The core assumptions that these scenarios are based on presuppose different technological and regulatory developments and consequently also different penetration rates for electric mobility and automated driving functions in the examined periods leading up to 2030, 2040 and beyond.

Irrespective of the scenario examined, electric mobility and automated driving functions change the composition of a vehicle—but to different extents: While electric mobility is primarily based on a substantially altered powertrain, automated driving is mainly based on technological innovations in the areas of electrics and electronics as well as software control. For the latter, for example, the sensors of the vehicles must be fundamentally adapted to enable environment sensing functions. These technical adjustments could have some serious consequences for manufacturing, value creation and employment in Germany. In addition, electrification of the powertrain and automated driving will place completely new demands on the skill sets of employees in the automotive industry.

The following key findings can be drawn from the analysis:

The number of jobs in the German automotive industry will initially decline as a result of the switch to electric mobility. In the longer run, the advance of shared mobility and driverless mobility services will lead to a further significant decline in the number of jobs.

Electric mobility is being driven forward in particular by the regulation on carbon emissions for the European passenger car fleet. At the same time, the efficiency of internal combustion engines will be further optimised and until at least 2030 these engines are expected to be installed in the majority of all new passenger cars. In the following decade, however, electric vehicles will gain the upper hand and, depending on the scenario, will account for 70% to 85% of all new passenger car registrations in Germany by 2040. As for manufacturing, the shift towards electric mobility means that not only the components installed in the passenger cars will change, but that their number will also be significantly reduced. As a result, the

share of the powertrain (without battery) in the value added of a passenger car will decrease significantly. This development is particularly detrimental to German suppliers who are currently the global market leaders in the manufacturing of the components concerned. These suppliers must adapt their business models and product portfolios accordingly, which requires substantial investments in R&D, the conversion of existing production lines and the retraining of employees.

For automated driving and shared mobility concepts, the creation of a regulatory framework and the expansion of the digital road and mobile communications infrastructure will be a key driver of structural change. New shared mobility concepts will enable a more efficient use of vehicles which in turn will lead to lower demand for vehicles. Driverless mobility services are likely to lead to a further decrease in vehicle demand. Automobile manufacturers and suppliers will therefore try to find solutions to counter the impending decline in vehicle sales due to changes in use through new business models.

In any case, the electrification of the passenger car market, automated driving and new shared mobility services will fundamentally change the automotive industry.

In both the automotive industry and the automotive trade and aftermarket sector respectively up to 300,000 jobs will be at risk by 2040. This corresponds to about one third of employees in the automotive industry and about half of the employees in the automotive trade and aftermarket in 2017.

By 2040, depending on the scenario, between 130,000 and 300,000 of the 920,000 jobs in 2017—based on data from the Federal Employment Agency—will be lost in the German automotive industry. In the automotive trade and aftermarket sector, between 250,000 and 300,000 of the total of 640,000 jobs are at risk. In addition, there may be a further decline of 40,000 to 70,000 jobs by 2030 in industries closely linked to the automotive industry, such as metal products or rubber and plastic goods.

The decline in employment is driven by various factors. Part of it is caused by labour-saving technical progress that makes jobs redundant and is further intensified by electric mobility. Another reason for the job cuts is a decline in demand for passenger cars in Germany and Western Europe, which is the most important export market for the German automotive industry. Even a global increase in demand for passenger cars cannot compensate for these losses. This is because passenger car production and value added in Germany only profit to a limited extent from an increase in global demand, which means that the market share of German exports in global demand will gradually decrease. Even though there will be an overall increase in automotive production, the above factors will have a negative impact on employment.

If forward-looking measures are taken, the consequences of the transition to electric mobility can be mitigated. The switch to electric mobility alone will then only slightly weaken Germany as a location for automotive manufacturing and innovation.

The good news is that both the changes in value added and the job losses from the transition to electric mobility are relatively easy to predict up to 2030 and even beyond. This allows companies to plan accordingly. The reason for this predictability is the fact that the development of electric mobility is easy to forecast because of the stringent emission regulations. The timing of the structural change is relatively favourable and coincides with the demographic decline in the working population in Germany. A large part of job losses will therefore be absorbed by the decline in in the number of skilled workers. In addition, the

development and maintenance of the charging infrastructure for electric mobility will create a significant number of jobs.

Automated driving and shared mobility pose major challenges for the automotive industry and Germany as an industrial location.

In contrast to electric mobility, the effects of new shared mobility services are highly uncertain. This applies to both the timing and the speed of the transformation process in the mobility sector as a whole and in the automotive industry in particular.

Despite these uncertainties, the present analysis concludes that a delayed structural change would be associated with severe risks for Germany's future as an industrial location. For there is a lot at stake for the German automotive industry: If, supported by goal-orientated regulation, it takes the lead in the development of automated driving and thus accelerates the transformation process, Germany will remain attractive as an industrial location in the long term. If, on the other hand, it delays structural change and leaves innovation, technology and market leadership to international competitors, Germany's future as an automotive country as a whole could be put at risk.

The automotive industry in Germany can continue to play an important role as a driver of innovation and job security. Through targeted, systematic and coordinated measures, policy makers in cooperation with companies and social partners can create the necessary conditions.

The successful transformation of the automotive industry requires a holistic approach. This means that government, research and industry must seek to develop a common approach. Policy makers must guide and support the transformation process of the automotive industry. Appropriate, coordinated measures can secure future-proof jobs and strengthen Germany as an industrial location. The primary objective must be the creation of technology-neutral, innovation-friendly and competitive framework conditions. One example is the legislative framework for testing automated driving functions. Economic decision-makers, researchers and the social partners can help implement economic policy measures by means of organisational activities. In addition, companies and research institutions can make an important contribution by focusing their research activities.

Targeted economic policy measures should focus on the following three key areas:

1. Developing a technology-neutral climate protection policy that takes into account all technologies for decarbonising the transport sector and promotes them in an appropriate manner can benefit Germany's economy as a whole.

A key driver of electric mobility is the development of charging infrastructure in the private sector, as this is where the majority of charging processes will take place. Tailor-made funding programmes should be designed to accommodate these requirements. Given the substantial impact the development of charging infrastructure will have on the electricity market, we also recommend drawing up a plan that reflects the future development of electric mobility and documents the corresponding effects on the electricity grid. On this basis, measures needed to reinforce and expand the grid for electric vehicles can be incorporated in grid development plans at an early stage (and, if necessary, also as a precaution). In the short and medium term, grid bottlenecks can be addressed by the use of charging facilities that can be controlled as required by the grid. Vehicle-to-grid solutions should therefore be promoted and regulated in a useful manner. Such solutions make it possible, for example, to feed the electricity stored in the vehicle battery back into the grid

at times of increased energy demand, thus contributing to grid stabilisation. R&D in this area should therefore be supported. It must also be examined whether it is necessary to make legislative changes, for example with regard to liability issues.

Both the next-generation batteries and water electrolysis are general-purpose technologies, i.e. key enabling technologies that affect several economic sectors. Hence, they are able to significantly promote economic growth. We therefore recommend that R&D funding is made available for both technologies.

The use of synthetic fuels in the existing fleet of passenger cars, and especially in other areas of the transport sector such as commercial vehicles or shipping, can contribute towards achieving climate goals. R&D support for synthetic fuels should be provided accordingly. This can make an effective contribution to reducing manufacturing costs.

Overall, it makes sense to promote pilot applications for all three technologies so that companies in Germany can analyse the entire value chain and bring it to market. The more parts of the value chain are covered locally, the easier it is to initiate cooperation in research. This is a major advantage of closed value chains. However, the provision of funding for large-scale production of the three technologies should be avoided, as such production in the long term is also possible under market conditions. This is because supply-side and demand-side instruments already have a supportive effect. For example, electric mobility (including fuel-cell passenger cars) is promoted on the demand side by means of a purchase subsidy or company car taxation. The EU's fleet-wide emission targets provide supply-side impetus for all three technologies, as does the Renewable Energy Directive II (RED II): Synthetic fuels and hydrogen can now also be classified as renewable energy sources. This should be transposed into national law as soon as possible.

We also recommend promoting R&D in fuel cell technology and drawing up a roadmap for expanding the hydrogen filling station network in Germany, similar to Japan's pioneering system of hydrogen filling stations.

2. By creating a favourable policy environment that fosters the testing and market introduction of automated driving functions in Germany, German companies can become leading providers in this field and thereby keep value added in the country.

A fundamental prerequisite for safeguarding Germany as an industrial location and securing German value added is the development and testing of new technologies. Opportunities to do this could be provided by so-called regulatory sandboxes ("Reallabore") which enable innovations to be tested under real-life conditions for a limited period of time and within a limited area. The main aim is to improve the general policy conditions for innovative forms of mobility. In Germany, however, there are obstacles to doing this in practice: The German Road Traffic Licensing Regulations (StVZO) make it possible to grant operating licences for individual vehicles, but they refer to the respective district governments. However, the specific requirements for each vehicle and vehicle operation are not congruent at municipal, state and federal level. We therefore recommend the introduction of a nationwide, innovation-friendly approval process for testing automated driving functions in the area of connected and automated driving.

In addition, it is important to develop a better understanding of the impact of shared mobility on consumer behaviour. It is still largely unknown to what extent the demand and willingness to pay for traditional mobility services, such as taxis or local public transport, will change as a result of new, especially driverless, mobility services. Large-scale field experiments can

provide answers to this question. The involvement of local authorities also plays an important role in the introduction of new mobility concepts and must be pursued accordingly.

New business models in the area of connected driving and shared mobility can only develop their full potential if important issues regarding data usage have been clarified. These include, for example, standards for the exchange or processing of vehicle and environmental data as well as data security in general. It is therefore important to clarify open questions in this area as quickly as possible and to advance the expansion of the data economy.

3. Even in regions that are particularly dependent on the automotive industry, the risks of structural change can be significantly reduced by anticipatory measures. This requires systematic retraining of employees, far-sighted policy instruments at regional level and support for SMEs.

The importance of the automotive industry varies considerably from region to region. It is a particularly important pillar of the economy in Baden-Württemberg, Bavaria, Bremen, Lower Saxony and the Saarland. In these federal states almost one in twenty employees works in the automotive industry. In contrast, the automotive industry plays practically no role in five federal states that are located in the north/northeast of Germany. The following figure also shows how strongly the automotive industry is concentrated: In 2018, around two thirds of the 940,000 employees in the German automotive industry were employed in only three federal states—Bavaria, Baden-Württemberg and Lower Saxony.

There is no doubt that the current transformation of the automotive industry will lead to a new planning and relocation of production facilities. If plant closings lead to a correspondingly massive reduction in jobs, the absorption capacity of the regional labour market may be (temporarily) exceeded. Therefore, our recommendations for action primarily focus on measures and instruments that secure the jobs and skills of employees in a forward-looking manner and eliminate or mitigate labour market frictions during the transformation process.

In particular, we recommend the development and implementation of new, forward-looking regional policy instruments. These should be based on the regional, state or district-specific allocation of funds using forward-looking early indicators for structural change. In this way, regional structural weaknesses can be prevented instead of being remedied after serious problems have already arisen. In addition, a preventive labour market policy should be developed to make it possible for employees to acquire additional vocational or job-specific qualifications if structural change leads to unavoidable reductions in working hours ("short-time work"). The targeted and systematic recruitment of highly qualified skilled specialists from abroad should also be initiated, because in highly innovative fields, such as automated driving, there is only a limited domestic supply of such experts.

In order to establish new business models, companies must develop completely new competencies, for example in the areas of battery technology or artificial intelligence. Many automotive industry suppliers are small companies that often have little financial leeway and are highly specialised. Both make restructuring more difficult and can be a competitive disadvantage in the transformation of the industry. Promoting small and medium-sized enterprises (SMEs) is therefore important for successfully coping with the challenges of regional labour market transformation. This includes the harmonisation of applications for funding assistance and the expansion of the advisory services for SMEs. We also recommend expanding support programmes for so-called "mid-range companies", i.e. larger enterprises that no longer fall under the definition of SMEs but nevertheless have similar

structures. In addition, the funding instruments for start-ups should be expanded in order to support innovations, especially in the area of new mobility concepts.

The automotive industry is faced with the challenge of securing value creation in the long term despite structural change. Policy makers can create the necessary framework conditions for this so that the automotive industry, which in some cases is deeply rooted in a particular region, and Germany as a location for business and industry will remain competitive in the future. There is no doubt that the necessary scope for creating better framework conditions is there. It is now up to government and industry to use it in a joint and coordinated effort.