# Economic effects of E-mobility scenarios – Intermediate interrelations and consumption

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**Abstract:**
The development of a strong domestic market for e-mobility is given a high priority and it is counted as an impulse for the transformation towards a Green Economy in Germany. Replacing the combustion engine by alternative drives can trigger a variety of macroeconomic effects. The paper presents the results of a model-based analysis. In particular, effects on the value chain of the automotive industry and the demand for consumer goods were explicitly modelled. An e-mobility scenario that meets the policy objectives by 2030 is compared with a reference scenario. Assuming a substitution of inputs within the auto-motive industry by inputs from the power engineering sector, negative effects in vehicle are offset by positive effects in energy technology production. For the macroeconomic effects and thus for employment, the development of imports and exports in the respective product groups is crucial. In the scenario comparison presented here, short to medium term employment effects are slightly positive. The lower employment in the e-mobility scenario in the conventional auto-mobile sector, petrol stations and in metal production is offset by additional employment in other sectors.
***Keywords:*** *E-mobility, Germany, Economic Effects*

## 1. Introduction

In Germany E-mobility is pushed not only to gain or maintain the automotive industry's shares in the global market but also to use potentials for a greener mobility [1]. The aim is to stronger diversify the energy base in the transport sector and to develop potentials for the use of renewable energies. The number of passenger cars with electric drives in Germany has nearly quadrupled in the last three years. Even though electric vehicles (EV) still hold less than 1 percent of the registrations, expectations are high for the future. E-mobility is expected to change the way cars are produced as well as households' expenditures, as EV could hold 10 to 20 percent of new cars in 2030. The possible impacts on the economy are manifold, especially in Germany. Manufacturing of cars with electric drives needs different – and fewer – inputs than a car with a combustion engine. Therefore, long-term changes in the value chain are going to occur with impacts on the whole economy ([2]). Further effects can be expected due to the substitution of conventional fuels by electric power. There are only few studies which assess employment effects in Germany. Two studies are using a market model for the simulation of impacts of development paths ([3], [4]). In addition, value added and employment rates are used to derive macroeconomic variables. Further fiscal effects are evaluated in order to finally pursue the question, how e-mobility should be promoted by the state. Spath et al. use a detailed modelling framework to analyze employment impacts on the level of manufacturing plants ([5]). A more integrated approach is followed by Peters et al. ([6]). The proposed approach in our paper intends to address both value added chain effects in manufacturing and input substitution during operation. The aim is to assess possible changes in the role industrial sectors play and to show structural effects in a macroeconomic, dynamic modelling framework. In contrast to previous approaches, changes of intermediate interrelations are modeled explicitly in the input-output context.
This contribution is organized as follows: This introduction is followed by section 2 on the methodology applied. The modeling framework is explained and the scenarios are described. Section 3 presents modeling results followed by a discussion. Section 4 concludes.

## 2. Methodology

### *2.1. Model*

The analysis is based upon simulation results obtained with the environmental macroeconometric model PANTA RHEI. PANTA RHEI is an environmentally extended version (cf. [7], [8] [9], [10]) of the macro-econometric simulation and forecasting model INFORGE. It is based on official statistics and consistently describes inter-industry flows between 59 sectors. It includes consumption, government, investment, construction, inventory and exports as well as prices, wages, labor compensation, profits, taxes, etc. on the sectoral and macroeconomic level ([11] [12]). The behavioral equations reflect bounded rationality rather than optimizing behavior of agents. All parameters are estimated econometrically from time series data (1991 – 2010). Producer prices are the result of mark-up calculations of firms. Output decisions follow observable historic developments, including observed inefficiencies rather than optimal choices.

The transportation module describes changes of traffic performance of both people and goods. Especially for the individual passenger vehicle inventories are updated. The traffic performance is linked to production and consumption within the economic model and changes the energy consumption in the energy module. The energy module captures the dependence between economic development, energy input and $CO_2$ emissions. It contains the full energy balance with primary energy input, transformation and final energy consumption for 20 energy consumption sectors, 27 fossil energy carriers and the satellite balance for renewable energy [13]. The energy module is fully integrated into the economic part of the model.

To examine the economic effects of a stronger market penetration of EV in Germany our analysis applies PANTA RHEI to two scenarios: a business as usual scenario and a scenario with an increased share of EV among new cars. Both scenarios are implemented in the macro-econometric model PANTA RHEI. The respective differences in economic indicators, such as employment, GDP etc. can then be attributed to more e-mobility in the scenario, since all other factors are held equal. Changes in volumes and prices are fully accounted for. The simulation model runs until 2030.

### *2.2. Modelling structural changes*

The transportation module within PANTA RHEI describes traffic performances of all transport sectors and includes vehicle stocks with fuel or technology categories. Traffic and its modal split are extensively linked with private consumption, intermediate inputs and energy use. To analyze specific implications of drive technologies in cars the transportation module was extended and specific links to the energy use were established. Intermediate inputs between manufacturing industries were changed aligned to the technological transition.

The core of the macroeconomic model is the input-output table with 71 industries and goods. The implemented input coefficients are defined as the quotient of the intermediate input of industries and total production. By changing the input coefficients the interrelation between industries are changed as well as the technology or cost structure of the producing sector. Table 1 shows a selection of the derived price adjusted coefficients for the automobile industry in PANTA RHEI. Most important deliverer of inputs for the motor vehicle production is the sector itself with more than 35 percent. All other products and respective industries are of minor importance. Metal products (basic metals, foundry products and fabricated products) sum up to 9.5 percent. The electrical machinery sector delivers only 3.6 percent of the production of the motor vehicle production.

*Table 1: Most important input coefficients of motor vehicle production and considerations regarding the changes subject to e-mobility*

| No (1-71) | Products (CPA) | Input-coefficient, % | Fewer inputs needed | More inputs needed |
|---|---|---|---|---|
| 36 | Motor vehicles, trailers and semi-trailers | 35.2 | Combustion engine, gear | Power electronics |
| 30 | Fabricated metal products | 5.4 | Fuel tank, gear, oil pan | |
| 62 | Other (company-related) business services | 5.2 | | |
| 33 | Electrical machinery and apparatus n.e.c. | 3.6 | Conventional battery, dynamo, starter, spark plug | Electric drive, traction battery, power electronics |
| 27 | Basic metals | 2.8 | | |
| 24 | Plastic products | 2.6 | | |
| 31 | Machinery and equipment n.e.c. | 2.2 | | |
| 23 | Rubber products | 1.8 | | |
| | … | | | |
| 22 | Chemicals, chemical products and man-made fibers (ex. pharmaceutical products) | 1.4 | | Chemical inputs for battery |
| 29 | Foundry products | 1.3 | | |

If input-coefficients represent a composition of materials, inputs of metal products of any kind would be lower in a world of high e-mobility. Instead electrical devices would increase as an input. But the cost structure of the automobile sector hardly represents the composition of material of the output product (vehicles). Instead the input coefficients show the high integrity of the vehicle and motor / automotive part industry. As they deliver parts of high value, the upstream value chain is hardly represented.

We assume that the substitution of conventional vehicles by EV in the market for new cars lead to a higher input of electrical machinery or apparatus and a lower input from the car industry itself. Put simply, the combustion engine is substituted by an electric drive. No gear is needed, instead there are traction batteries. This would represent a production chain in which “gear producers” would lower their production and “electric drive producers” would increase their production. This is a rather simplified model of the changes triggered by higher EV-production. It potentially would overestimate the role the electronic industry, could play in the future value chain. But we assume the electric drive producers to be in the electrical industry, as lowering metal inputs instead of (conventional) automotive inputs would overestimate the role todays gear or engine producer could play in the electric drive production. The input-coefficient of the automobile industry represents the metal-based conventional engines and they are the core of today’s production technology. By lowering them also the metal production is lower in the second round.

The extent to which inputs are replaced in terms of share of production is derived from studies. Spath et al. develop different e-mobility scenarios and showed changes in the demand for different components of both conventional vehicles and EV ([5]). By relating them to market shares of EV and intermediate production, we derive parameters for changing input-coefficients.

In the modelling approach the share of intermediate inputs in total is the same in both scenarios. This means that changes in value added are exclusively a result of structural changes in final demand as well as indirect and induced effects. The shifts in the car market shown in the scenario analysis lead to an increase of the input-coefficient for electrical machinery of 2.6 percentage points by 2030 and respective change of -2.6 in the motor vehicle sector.

Germany’s position in terms of industrial value-added within the global EV-market is considered to be weaker than in conventional vehicles. Even though the number of EV-models of German manufacturers grows, they are still considered to be more observant than progressive [6]. Even more critical regarding the value added chain is the fact that there is hardly any national cell production for high-end batteries ([14]). To account for this the imported inputs of the electrical sector were modeled to make them react to changes in the e-mobility shares. The higher the share of EV on the market is the higher is the share of imported intermediate inputs among total intermediate inputs for “electronical machinery”. In the modelling framework this effect is evolving within the scenarios rather than being a basic setting in the base year. This means that Germany within the scenario analysis loses production of domestic intermediate e-inputs, as EV-production grows.

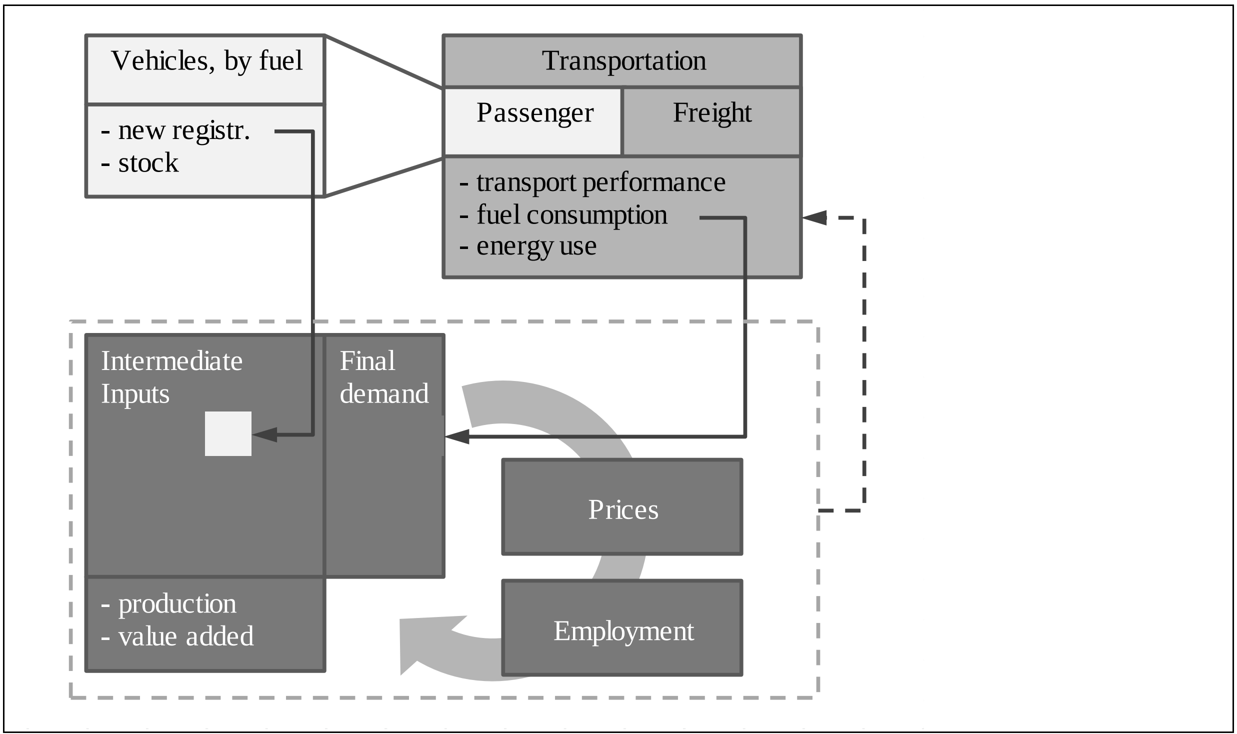


*Figure 1: Overview of major interrelations within PANTA RHEI related to the issue*

**Fehler! Verweisquelle konnte nicht gefunden werden.** shows an overview of the model parts of PANTA RHEI that are involved in the structural changes in the scenario analysis. The interlinkages between the vehicle market and production technology is shown on the left side of the figure. The second direct effect arises from the changes in the fuel consumption. With higher shares of EV among the stock there will be less consumption of conventional fuels. This leads to a changed final demand in terms of commodity shares in private consumption. If a reduction of costs during the vehicle operation occurs, it is – by assumption – compensated by higher consumption in other commodities.

### *2.3. Scenario definition*

As the government claims an objective of 1 Mio electric vehicles (EV) in operation by 2020 and 6 Mio by 2030 this indicator is used to define an e-mobility scenario. To analyze the impact of stronger market penetration of electric drives this scenario is compared to a reference scenario. It is derived from the Energy Reference Forecast, which represents developments according to trends observed in 2012-13 ([15]). The scenarios are also quite similar to development paths derived from market models ([16]).

The group "electric vehicles" or "electric drives" referred to below comprises the following types of vehicles: battery electric vehicles, range extended electric vehicles, plug-in hybrid. Parameters of the passenger car market of the scenarios are shown in Table 2. Until the year 2030 combustion engines will stay the dominating drive technology. Even in the e-mobility scenario over 78 percent of the passenger vehicle stock is operated using gasoline, diesel or natural gas. The share of EV amounts to approximately 14 percent. In the scenario with an increased share of EV among new cars the government target of 6 Mio EV in 2030 is met. In total 2.9 Mio EV are in the rolling stock compared to the reference. To achieve this higher stock of e-cars, the share among new cars has to rise to over 20 percent. In 2030 the total sales (registrations) has to be about 300.000 EV's higher than in the reference case. The long useful life period of cars leads to a rather long term transition even if developments among electric drives are exponential.

*Table 2: Development of the mix of fuels among new and existing vehicles in the scenarios*

| Passenger cars | 2012 | 2020 Reference | 2020 Scenario | 2030 Reference | 2030 Scenario |
|---|---|---|---|---|---|
| **Registration of new cars (,000)** | | | | | |
| Diesel | 1,760 | 1,600 | 1,460 | 1,300 | 1,130 |
| Gasoline | 1,840 | 1,530 | 1,320 | 1,060 | 1,130 |
| Gas (LNG, CNG) | 20 | 110 | 170 | 330 | 310 |
| Mild-Hybrid | 25 | 90 | 190 | 310 | 430 |
| Electric vehicles | 4 | 140 | 330 | 430 | 740 |
| Other (e.g. fuel cell) | 0 | 0 | 0 | 3 | 4 |
| Share of E-cars | 0.1% | 4.0% | 9.6% | 12.4% | 21.5% |
| **Vehicle stock (Mio)** | | | | | |
| Diesel | 12.4 | 14.7 | 14.1 | 13.2 | 11.6 |
| Gasoline | 29.8 | 27.3 | 26.4 | 22.8 | 19.8 |
| Gas (LNG, CNG) | 0.5 | 1.1 | 1.4 | 2.9 | 3.3 |
| Mild-Hybrid | 0.1 | 0.7 | 1.2 | 2.3 | 3.6 |
| E-Cars | 0 | 0.5 | 1.2 | 3.2 | 6.1 |
| Share of E-cars | 0.0% | 1.1% | 2.7% | 7.2% | 13.7% |

Not only is the stock of electric vehicles pushed in the scenario. Also new registrations of mild-hybrid are 120,000 higher in the scenario than in the reference. This means that the efficiency of gasoline-driven cars is pushed compared to the reference. In 2030 1.3 Million more hybrid vehicles are in stock, which is 18% of the gasoline vehicles.

The performance of Germany's automobile industry in the EV-world market is subject to many different influencing factors. To further concentrate on domestic structural changes we assume, that the distribution of fuel types among domestic production is the same as among new car registration. This can be interpreted rather as similar market trends in Germany as in the rest of the world than autonomy of the German car market.

As all interdependencies are represented in the model – changes of the production technologies are directly linked to the changes of the passenger car market –, no other parameter is changed for the simulation in PANTA RHEI. By changing the share of electric vehicles among the new car registrations, the mix of fuels or drives for stock and performance changes in the model. Overall transport performance is constant aside from indirect effects deriving from the overall economic growth.

## 3. Results

### *3.1. Use of fuels*

The assumption related to the passenger vehicle market and stocks lead to a rather unsteady deviation of e-mobility scenario and the reference. By 2025, the development of the scenario is very dynamic. Subsequently, the development paths are approaching again. To show the change in fuel shares we look at the final energy consumption of the individual motor car traffic (see Figure 2). Up to 2025 use of diesel or gasoline is already 60 petajoule (PJ) lower. The energy consumption related to all other, not conventional, drives is 40 PJ higher. The total energy consumption is around 20 PJ lower, as hybrid drives and electric cars are more efficient.

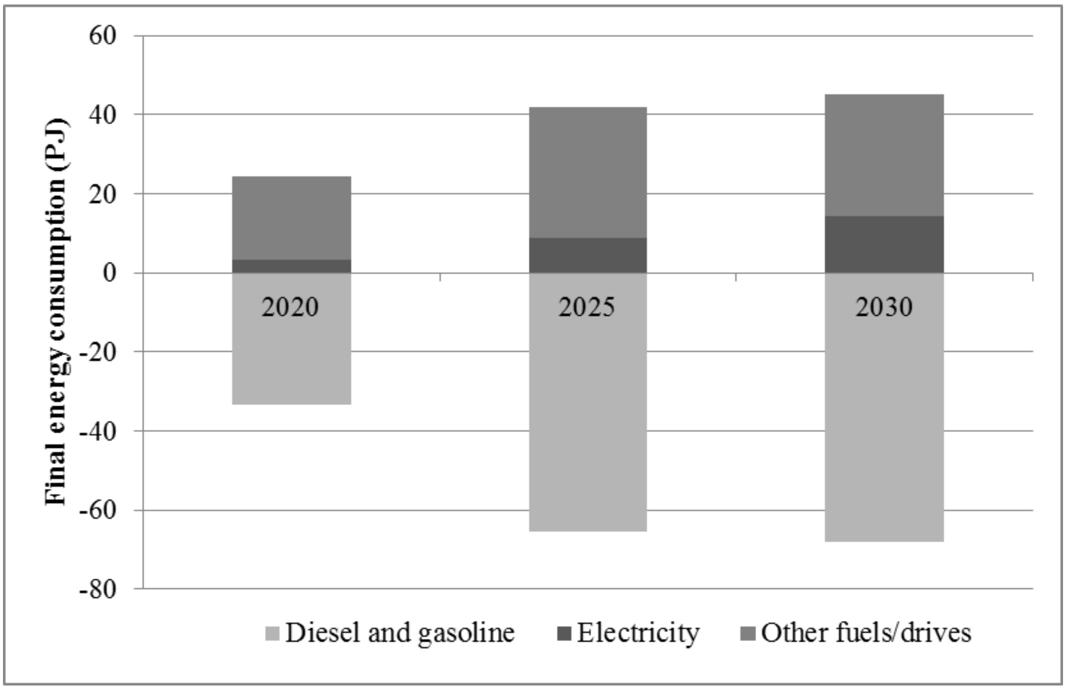

*Figure 2: Deviation of final energy consumption of traffic between the scenarios*

The effects on the fuel consumption are dominated by hybrid drives rather than pure electric drives. However, demand changed dramatically for electricity in the individual motor car traffic. By 2020 electricity use is 130 percent higher than in the reference scenario.

### 3.2. Macroeconomic effects

As Table 3 shows, that effects on the gross domestic product (GDP) turn out very low. After a short period of positive deviation GDP is lower from 2024 on. This negative deviation is mainly due to the effects on trade. Exports are about 700 million Euros lower, Imports are 1 billion higher. Due to the lower production also investments falls back slightly. The slightly higher prices causes a lower private consumption. In general employment turns out to be positive in deviation up to the last but one year. The higher employment and slightly lower imports prepares the basis for a positive macroeconomic environment up to 2020. A phase of employment potentials and low reaction to international trade is followed by a phase of negative trade balances and slightly higher prices.

*Table 3: Comparison of the E-mobility scenario with the reference, overview of macroeconomic indicators*

| | **Year** | **2020** | **2025** | **2030** | **2020** | **2025** | **2030** |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | Absolute deviation | | | Relative deviation, % | | |
| GDP | Billion Euros, price adjusted | 0.3 | -0.4 | -2.2 | 0.01 | -0.01 | -0.07 |
| Private consumption | | 0.1 | 0.0 | -0.2 | 0.01 | 0.00 | -0.01 |
| Capital investment | | 0.0 | -0.1 | -0.3 | 0.00 | -0.04 | -0.09 |
| Exports | | 0.0 | -0.2 | -0.7 | 0.00 | -0.01 | -0.03 |
| Imports | | -0.2 | 0.1 | 1.0 | -0.01 | 0.01 | 0.05 |
| Consumer price index | Index | 0.0 | 0.0 | 0.0 | 0.01 | 0.02 | 0.01 |
| Employment | ,000 persons | 2.6 | 1.0 | -0.4 | 0.01 | 0.00 | 0.00 |
| Primary energy consumption | PJ | -3.1 | -8.5 | -17.7 | -0.03 | -0.08 | -0.17 |

Primary energy consumption is 0.2 percent lower in the scenario compared to the reference. The effect on energy-related emissions is also 0.2 percent in 2030. The macroeconomic effects are the result of different drivers and interrelations within the model. The changes in sector production and employment are much higher than it appears on the macro-level. In the following we concentrate on the two main sectors to explain the effects on the macroeconomic indicators.

### 3.3. Sectoral production and employment

If we compare the results for the e-mobility scenario to the reference results input-coefficients for motor vehicle production is lower, and for electronical devices higher. As a consequence the production of the automobile industry is lower. This is not equivalent with a lower production of cars but only shows the reaction of the production of intermediate inputs delivered for the production of cars. By 2020 the production is around 4 billion euros lower, which is to be seen alongside with nearly 3 billion more for the electronical industry (see Figure 3). With the ongoing transformation to more e-mobility this reversed image changes. Exports of motor vehicle parts get substantially lower as costs are higher for the sector. The deviation of production in the electronical industry is also getting higher. The most striking difference is the particularly higher imports in electronical machinery. They outnumber the lower imports of motor vehicle parts and slightly higher exports in the electrical industry are no counterweight to the lower exports. The assumption made regarding the competitiveness of "automobile electronics" makes shifts within the industrial sector unproportional.

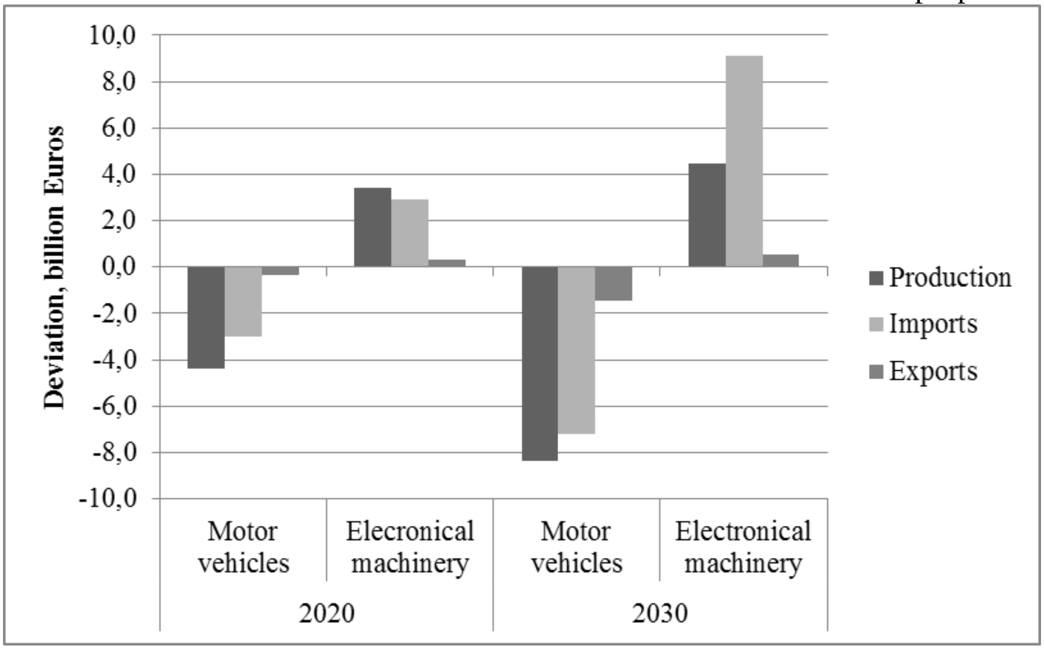


*Figure 3: Effects on production, imports and exports (price adjusted) for the most affected industries*

The shift in production as well as imports and exports is the main but only one aspect of the macroeconomic effects. The second main aspect is the reaction of employment, which is also linked to GDP-effects in total. Employment in the electronical industry is higher than in the reference. The deviation outnumbers the negative employment effect in the motor vehicle industry over the whole scenario period. This is due to the relatively lower labor productivity of the electrical industry. Figure 4 shows the deviations in the scenario for a selection of aggregated industries. In terms of employment there are also notable effects in the sector of "Trade and repair of motor vehicles, petrol stations". The lower demand for conventional fuels leads to more than 4,000 lower employment in this sector. The impact on the energy supply sector can be interpreted as the counterpart of that effect; however, it is much lower. The reaction of the metal and steel as well as intermediate goods industry is the consequence of the lower production in vehicle construction.

In general it is the strong positive effect in the electronical industry that shapes the macroeconomic effect in total. The positive GDP-effect up to 2020 is strongly related to the boost of employment in this sector. In the end of the scenario period it is the strongly increasing imports in the sector accompanied by the effect of a weakened automobile industry that leads to a negative GDP-effect.

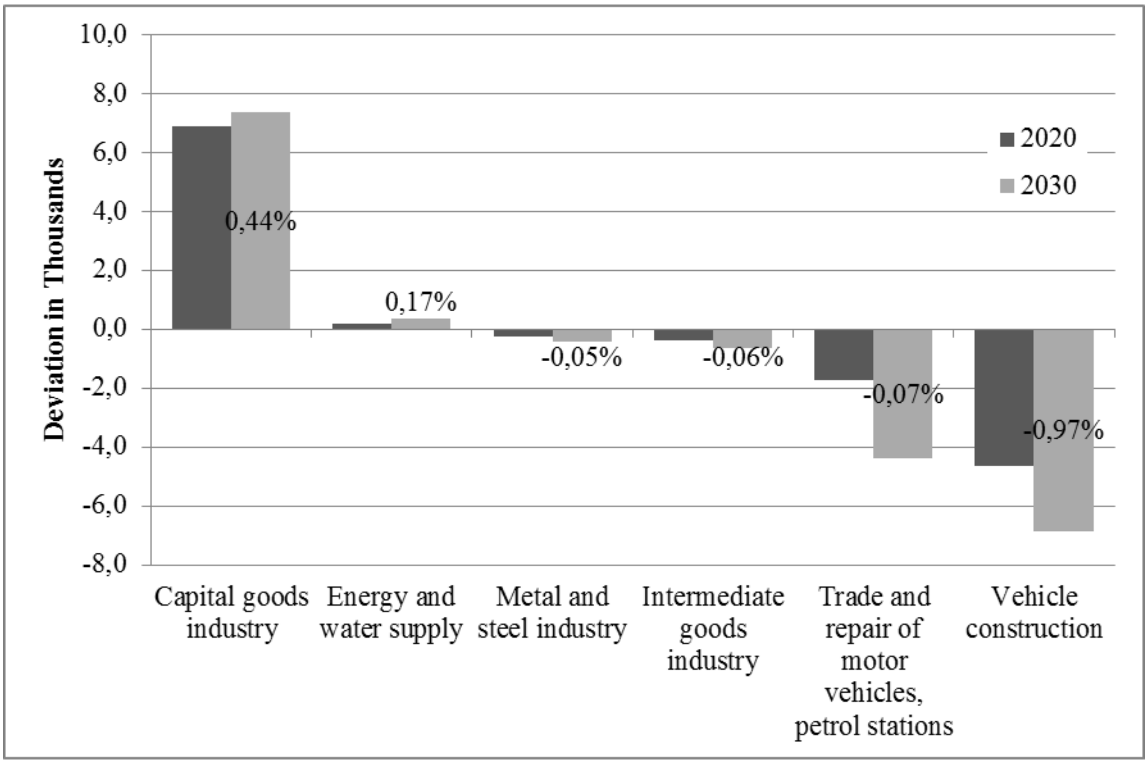


*Figure 4: Effects on employment for a selection of aggregated sector*

## 4. Discussion and Conclusions

The results show that the upcoming shifts in structures of manufacturing and consumption described in the model are not leading to strong macroeconomic effects. In the long term they are found to be negative, as increasing demand in electrical industry is overcompensated by decreasing demand in the automobile industry and higher imports in total. Demand is also lower for related suppliers as well as (traditional) gas stations. Energy consumption in the EV-scenario is lower than in the reference, and so is the import of fuels.

The well-established links of conventional car production and operating to the metal industry and gas stations potentially multiply the impact of decreasing demand. It is a matter of the electronical engineering to fill upcoming gaps. In our scenario analysis the only slowly evolving weakness of the electronical industry on the world market and the lower labor productivity makes GDP-impacts be only slightly lower and employment effects rather positive.

Given the past structures these effects are rather negative as capacities for manufacturing electrical drives and batteries are not part of the – often metal-related – sectors.
In the scenario analysis employment is higher in the electrical industry and in the energy sector. From 2020 on especially the lower employment in the automobile industry and gas stations lead to a slightly negative or rather balanced net employment effect. The increasing imports of electronic engineering goods – as a consequence of the assumption of Germany's lower competitiveness – lead to a slightly lower GDP by 2024.

The way the well-established automotive value chain is adapting to the upcoming new technologies is very critical for the economic effects in Germany. Our approach assumes that higher production of electric vehicles is related to the performance of the very heart of the automobile industry. The automobile industry in terms of the core drive (conventional engines and gears) is metal-related. This representation could be considered to be rather pessimistic. In contrary the short- and medium-term potential for the domestic electronical industry is rather optimistic both in production and productivity. To better capture the effects on the value chain an automobile industry satellite account would be of substantial use. To better represent the shifts, a more disaggregated view on the production and the value chain is needed.

The structural changes in the fuel market and linked sectors are only captured roughly. The way electric power is fueled in an e-mobile car market is open for new concepts, which are not represented in historical data. Investment in charging infrastructure is not included in the model. The additional direct and indirect demand could – in the short-term – compensate lower demand in conventional gas stations.

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**References**

[1] Nationale Plattform Elektromobilität, Third Progress Report, 2012.

[2] Barthel, K., Böhler-Baedeker, S., Bormann, R., Dispan J., Fink, P., Koska, T., Meißner, H-R., Pronold, F., Zukunft der deutschen Automobilindustrie, 2010, Diskussionspapier der Arbeitskreise Innovative Verkehrspolititk und Nachhaltige Strukturpolitik der Friedrich-Ebert-Stiftung.

[3] Holtermann, M., Radeke, J., Weinmann, J., Massiani, J, Hemmert, G., Gohs, A., Marktmodell Elektromobilität, Bericht Teil 1 Ansatz und Ergebnisse, 2011, Berlin.

[4] Nationale Plattform Elektromobilität, Zweiter Bericht der Nationalen Plattform Elektromobilität, Anhang, 2011.

[5] Spath, D., Bauer, W., Voigt, S., Borrmann, D., Herrmann, F., Brand, M., Rally, P., Rothfuss, F. Sachs, C., Frieske, B., Propfe, B., Redelbach, M., Schmid, S., Dispan, J., Elektromobilität und Beschäftigung – Wirkungen der Elektrifizierung des Antriebsstrangs auf Beschäftigung und Standortumgebung, 2012.

[6] Lehr, U., Nitsch, J., Kratzat, M., Lutz, C. & Edler, D., Renewable Energy and Employment in Germany. Energy Policy, 36, 2008, pp. 108-117.

[7] Peters, A., Doll, C., Kley, F., Möckel, M., Plötz, P., Sauer, A., Schade, W., Thielmann, A., Wietschel, M., Zanker, C., Konzepte der Elektromobilität und deren Bedeutung für Wirtschaft, Gesellschaft und Umwelt, 2012, TAB-Innovationsreport.

[8] Meyer, B., Lutz, C., Schnur, P., Zika, G., Economic Policy Simulations with Global Interdependencies: A sensitivity analysis for Germany. Economic Systems Research, 19(1), 2007, p. 37-55.

[9] Lutz, C., Meyer, B., Nathani, C., Schleich, J., Endogenous innovation, economy and environment: impacts of a technology based modelling approach for energy-intensive industries in Germany. Energy Studies Review, 15(1), 2007, pp. 72-18.

[10] Lutz, C., Meyer, B., Nathani, C., Schleich, J., Endogenous technological change and emissions: The case of the German steel industry. Energy Policy, 33 (9), 2005, pp. 1143-1154.

[11] Meyer, B., Distelkamp, M., Wolter, M.I., Material Efficiency and Economic-Environmental Sustainability. Results of Simulations for Germany with the Model PANTA RHEI, Ecological Economics, 63(1), 2007, pp. 192-200.

[12] Ahlert, G., Distelkamp, M., Lutz, C., Meyer, B., Mönnig, A. & Wolter, M.I.,. Das IAB/INFORGE-Modell. In: Schnur, P. & Zika, G. [Eds.]: Das IAB/INFORGE-Modell. Ein sektorales makroökonometrisches Projektions- und Simulationsmodell zur Vorausschätzung des längerfristigen Arbeitskräftebedarfs. IAB-Bibliothek 318, Nürnberg, 2009, pp. 15-175.

[13] Arbeitsgemeinschaft Energiebilanzen, Energiebilanzen für die Bundesrepublik Deutschland, Satellitenbilanz „Erneuerbare Energien“ 2011.

[14] Bernhart, W., Schlick, T., Olschewski, I., Busse, A., Garrelfs, J., E-Mobility Index Q3 2015, 2015, Roland Berger & Forschungsgesellschaft Kraftfahrwesen mbH.

[15] Prognos, EWI, GWS, Energy Reference Forecast, Study commissioned by the German Federal Ministry of Economics and Technology, 2014, Basel, Cologne, Osnabruck.

[16] Plötz, P., Gnann, T., Kühn, A., Wietschel, M., Markthochlaufszeanrien für Elektrofahrzeuge. Studie im Auftrag der acatech und der Arbeitsgruppe 7 der Nationalen Plattform Elektromobilität, 2013.