Economic impacts of the German energy transition

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Overview

In the energy concept of 2010, Germany has committed to transform its energy system fundamentally until 2050. This transformation builds on a shift towards renewable energy sources and increased energy efficiency to reduce carbon emissions drastically (-80% to 95% against 1990). Together with the phase out of nuclear energy until 2022 the restructuring is referred to as German energy transition. The paper focuses on macroeconomic impacts of the transformation. The results are given for the years 2000 to 2050 and in comparison to a counterfactual situation without the energy transition.

Methods

The results in this paper are derived from a quantitative and empirical analysis of different scenarios, with the macroeconometric top-down model PANTA RHEI. The model links the energy balance to economic sectors and behavioural equations. Two scenarios are defined: an energy transition scenario (ETS) and a counterfactual scenario (CFS). ETS includes the historical development until 2015 and an ex-ante scenario, in which the major national energy and climate policy targets are reached until 2050. The counterfactual scenario contains a consistent counterfactual development without support of renewable energy and energy efficiency. Following recommendations of the Expert Commission on the Energy of the Future Monitoring Process (Löschel et al. 2016), the year 2000 has been set as the beginning of the energy transition. Earlier work (Lehr, Lutz 2016, Lutz et al. 2014) on the energy concept and the energy transition has been updated and extended to 2050. Both scenarios are quantified in several bottom-up models. Differences in investment, prices and energy demand are then used as input for the macroeconometric model. Finally, macroeconomic, sector specific and environmental effects are calculated including direct effects and different second-round and feedback effects.

Results

Macroeconomic effects are mainly driven by additional investment for the energy transition, which influences GDP positively to the extent it will not crowd out other investment. Higher electricity prices in the ETS dampen the impacts, especially between 2012 and 2020. But due to various exemptions electricity price differences are small for large energy consumers such as energy-intensive industries as steel, chemicals or paper. Therefore, impacts on international competitiveness of these companies are low. Small electricity consumers such as private households and companies with low energy use have to pay significantly higher prices, however. In the ETS the share of domestically produced energy is also higher. Overall, the energy transition has positive macroeconomic effects compared to the CFS. GDP in constant prices is higher; the differences will increase until 2050. Labour market effects are also positive, but higher consumer prices, which burden low income households above average, call for additional policy measures. Distributional impacts have to be monitored closely. In sensitivity analyses the different effects are decomposed.

Conclusions

The German energy transition has been fiercely debated in the last years. As often in transformation processes job losses and negative impacts for some companies are more visible and discussed than the new jobs created in emerging industries. But future positive macroeconomic effects of the energy transition still have to be accomplished by smart energy and climate policy. As with current policies Germany will miss most of its climate and energy policy targets in 2020 (Löschel et al. 2016), more ambition is needed by the new government. At the same time, policy has to better address the distributional implications. While exemptions for electricity-intensive companies in international competition are necessary without a global carbon price regime, energy price increases, particularly driven by the feed-in-tariff, should not burden low income households above average. New financing sources are needed to keep social acceptance high for the transformation of the German energy system.

References

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