Impacts of a green hydrogen value chain on the labor market in Germany

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Author: Linus Ronsiek
Co-Authors: Johanna Zenk

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Hydrogen has the potential to play a key role in the energy transition. It can contribute to decarbonize the industry, transport or heating sector and to achieve the national climate targets. Hydrogen produced via electrolysis from renewable energies is considered as Â«greenÂ» hydrogen. The German National Hydrogen Strategy aims at fostering the usage of green hydrogen, promoting its market rollout and establishing a green hydrogen value chain (BMWi 2020). Recently, hydrogen is not only discussed regarding climate policy but is also evaluated as an option to decrease the dependency on supplier countries for fossil fuels (BMWK 2022). However, establishing a green hydrogen value chain raises the question of how the labor market will be affected by labor supply and demand changes.

Our study analyses the impact of a green hydrogen value chain on employment, occupations and qualifications in Germany until 2045. The results are based on demographic and economic modelling in conjunction with the scenario technique. For the economic modelling, several assumptions for future technological and economic developments are made and integrated into the QINFORGE (Qualification and Occupation in the INterindustry FORecasting GErmany) analytical tool. The economic core of the QINFORGE model is the macroeconomic input-output model INFORGE (INterindustry FORecasting GErmany) which is based on the INFORUM modelling approach. INFORGE enables econometric forecasting and simulation as the model is disaggregated according to economic sectors, production areas and groups of goods. The extended QINFORGE model further forecasts labor market demand and supply, disaggregated by 63 economic sectors, 144 occupational groups and four requirement levels (Zika et al. 2023).

The data for the demographic and economic modelling is based, amongst others, on the German Microcensus (last survey year 2019). It is an official representative statistic of the Federal Statistical Office - involving one percent of all households in Germany each year - and provides information on the population and the labor market. The German national accounts â€“ including the input-output-tables (until 2021) â€“ are the basis for the projection of the overall economy. The Federal Employment Agencyâ€™s register data of employees subject to social insurance contributions (SVB) and of those in marginal employment only (AGB) provide additional information on the employed population by occupation and the corresponding wages paid (until 2020) (Maier et al. 2022).

To identify the economic and labor market effects of a green hydrogen value chain, two scenarios are computed using the QINFORGE analytical tool. The first scenario is a baseline projection which extrapolates past trends and behaviors in the education system, the labor market and economic development neglecting the development of a green hydrogen value chain. The second, alternative scenario assumes the development of a green hydrogen value chain according to assumptions derived from a broad literature review. The model relationships remain unchanged in both scenarios. Thus, differences in the results lead to direct, indirect, and induced overall impacts to the economy and labor market entailed by the development of a green hydrogen value chain (MÃ¶nnig et al. 2019, Becker et al. 2022).

The scenario analysis shows that establishing a green hydrogen value chain will lead to an overall

higher level of employment in Germany, but labor demand development differs across economic sectors and occupational groups. Direct positive effects are especially pronounced in the construction and engineering sector and their related occupations due to an additional expansion of renewable energies needed for green hydrogen production. Other economic sectors directly and positively affected are research and development as well as manufacturers of machinery and equipment leading, inter alia, to a higher demand for occupations in machine-building and -operating as well as electrical engineering. Negative effects on single economic sectors and occupational groups remain low. However, and in contrast to other studies evaluating the employment effects of hydrogen use, negative employment effects are considered in our analysis.