

EXPLORING LABOUR MARKET IMPLICATIONS AND TRANSITIONAL REQUIREMENTS OF A NET-ZERO ECONOMY

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Overview

The green transition plays a crucial role for future labour markets, as fossil-fuel intensive industries will be downscaled and new ones, running on climate-friendly production processes and energy inputs, will emerge, implying both job creation and destruction (Bücker et al., 2023). The associated employment effects can be highly influential for distributional outcomes as individuals might be more or less demanded in the future depending on their occupation, skills and sector affiliation (Marin & Vona, 2019). In this study, we explore the labour market implications of achieving a state of net-zero emissions in Austria by 2050 at the macroeconomic and household level. We build our analysis on a comprehensive scenario targeting net-zero emissions in the key sectors buildings, transport, industry and energy. We focus on two main research questions. First, we ask how a net-zero future state in Austria affects labour demand across sectors and occupation types. Second, we want to know which household groups are affected by the resulting transformations in the labour market. Based on these insights we aim to identify the occupations, sectors and individual characteristics like income and gender that need to be prioritized for retraining in a climate-neutral future state. Our analysis indicates a strong increase in the demand for Plant and Machine Operators especially from the wood and transport sectors. In contrast, Service and Sales workers are demanded less. Professions needed more strongly in net terms are currently predominantly carried out by male middle-income employees. Yet, this obscures the fact that the reallocation of workers with diverse socio-economic backgrounds may still be pronounced.

Methods

The starting point of our analysis is a comprehensive energy demand scenario for the core sectors buildings, transport, industry and energy reaching net-zero emissions in Austria in 2050, as extensively described in Salomon et al. (2025). The scenario depicts a future characterised by a relatively low demand for energy, driven by strong energy demand reduction efforts of both households and industry. With respect to Austria's economic trade relations with Europe and the rest of the world, we assume that Austria follows a strategy of energy independence with limited international energy trade and the aim to mostly produce renewable energy domestically. To test the sensitivity of our underlying scenario assumptions we also implement three further scenarios with different assumptions on the overall level of energy demand and the integration in international energy markets.

We use the computable general equilibrium model WEGDYN-AT (Bachner, 2024) to explore the aggregate changes in sectoral labour demand that emerge in a state with net-zero emissions in 2050 relative to a future baseline state without additional mitigation efforts. We then conduct a fine-grained post-processing of these results to gain insights into the composition of sectoral labour use in terms of occupations and socio-demographic characteristics of workers. From the Microcensus derived in the Austrian Labour Force Survey (Statistik Austria, 2025) we use annual datasets during the time period 2011-2023 containing information on labour force by occupation, economic sector, net labour income, gender and further-sociodemographic characteristics. We match the economic sector (NACE) categorisation of WEGDYN-AT to the 2nd and 3rd-digit level in the Microcensus and relate it to persons employed according to the International Standard Classification of Occupations (ISCO) at the main group level. By integrating the time series of 2011-2023 we create a large dataset reflecting the average composition of ISCO occupations across sectors in Austria, and the associated socio-demographic characteristics of employees. This allows us to track the change in labour demand according to household-specific characteristics.

Results

Our analysed low energy demand scenario with limited renewable energy imports requires major structural change in all sectors, leading to direct and indirect effects in the whole economic system. We observe the strongest changes in labour demand in the following sectors. In the energy sector, more labour is needed to keep the future power system running as electricity becomes a crucial energy carrier in both industry as well as residential use. In contrast, there is a substantial decline of jobs in the gas manufacturing industry, as natural gas and other fossil gases

are no longer in use and substituted by bio- or syn-methane to a very limited extent. Further effects directly resulting from measures to decarbonise the economic system occur in the transport service and wood sector. The wood sector increases its labour demand mainly due to the increasing need for biomass as energy carrier, especially from industry. The transport service sector requires more workers, as the modal split strongly shifts in favour of public transport. On top of these direct effects, we also observe relevant changing labour requirements due to indirect (i.e. price-induced) effects in the macroeconomic model. Specifically, labour demand increases in the public administration and buildings sector. At the same time, less jobs are available in wholesale and retail trade sectors as households strongly reduce their demand for fossil fuel-based goods (e.g. cars), which account for a large share of value added in these sectors. The machinery equipment industry is also negatively affected due to its strong reliance on the wholesale trade sector.

Based on the relative changes in sectoral labour demand resulting from the macroeconomic modelling, we can derive changes in occupations and the associated socio-demographic characteristics of employees using the Microcensus data. With respect to occupations, we see a remarkable increase in the demand for Plant and Machine Operators especially from the wood and transport sector. Positive, but less strongly pronounced net effects likewise emerge for Craft and Related Trades Workers and Technicians and Associate Professionals, which are also needed in the electricity and buildings sector. Net effects are negative for the three occupational groups of Managers, Clerical Support Workers, and Service and Sales Workers, whereby the latter are clearly most challenged to find new employment. Across income groups, the overall demand for workers changes in an inverted-U shaped fashion. Occupations provided by lowest and highest income groups are on average requested relatively less in the labour market, while the demand for occupations provided by all other groups is higher in net terms. Moreover, we observe that individuals in the lowest income group need to shift their occupations most strongly. Interestingly, for some groups in this income decile, e.g. Elementary Occupations or Technicians, there are good opportunities to find new jobs using their existing qualifications in other sectors with the prospect of higher income. Looking at the change in labour demand by gender we see that the demand for occupations currently provided by male workers increases to a much greater extent than for occupations currently provided by females, implying that women will have to switch their professions more strongly in the future. This is due to the overproportional presence of men in the area of Plant and Machine Operation and Craft and Related Trades, while women are more frequently employed in service and sales. A small proportion of high-skilled women could more easily find new jobs as Professionals in rising green industries, while others, particularly lower-skilled retail employees, would have to receive targeted support in order to gain foothold in new professions.

Conclusions

Conceptually, our study shows that looking beyond the aggregate net effects of labour demand change and considering also indirect effects resulting from the economic restructuring in a climate-neutral future state are necessary to identify relevant focus areas for labour market policies. Our analysis indicates a strong increase in the demand for Plant and Machine Operators especially from the wood and transport sectors, as the latter gain strongly in relevance in a climate-neutral economy. In contrast, Service and Sales Workers are demanded much less as the trading sector loses priority. Across the remaining professions, net changes are minor, but nevertheless contain substantial reshuffling of jobs in some cases. These results are largely robust to different assumptions on the overall level of energy demand and Austria's integration in the international energy market. In a future state with relatively low energy demand and limited availability of energy imports we observe a decrease in the demand for occupations in sectors provided by very low- and high-income earners, and an increase for all other groups. Under the condition that targeted retraining programmes are implemented, this suggests that a more equal distribution of labour income could result. However, if such policies are not put into place, especially low-income workers are at risk of unemployment. Finally, we observe opposing net effects in the employment demand of genders, i.e. an increase in demand for male and a decrease in demand for female employees. Overall, our fine-grained analysis based on household micro data can help to find which household groups have the possibility to find new jobs with similar tasks and which would require substantial retraining in a climate-neutral economy.

References

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