

# ***GROWTH OF WIND ENERGY IN GERMANY: THE ROLE OF REGIONAL POLICIES AND POLICY CO-ORDINATION***

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## **Overview**

The expansion of renewable energies in Germany is strongly associated with a decentralization of energy provision. For wind energy in particular the spatial, technical, economic and social ramifications are particularly evident at the regional level. Beyond differing natural conditions and the strong push from the federal level (notably the feed-in law) policies and initiatives at the level of states, counties and municipalities have to be considered to explain the pattern of wind energy expansion across time and space and to improve the co-ordination of multi-level energy policies. The states, counties and municipalities influence the legal and administrative conditions for implementing renewable energy projects. They are also free to set their own renewable targets and incentivize expansion beyond the national feed-in tariffs. However, the renewable goals across levels of government deviate between federal and aggregated state (or county) level and across states. For example, the federal government aims to achieve a 35% share of renewables in electricity consumption by 2020 according to the so-called energy concept, whereas the aggregated goals of the states amount to between 50-55%. As a result of this uncoordinated approach additional costs in the electricity system (and possibly beyond) can occur.

In general, there are few empirical analyses of the evolution of renewables and their determinants across German “regions”. Previous research is based on regional case studies (bottom-up) and a compilation of indicators, but mostly ignores the all-German dimension of heterogeneous growth patterns in renewables. A quantitative-econometric and top-down analysis is helpful to explain the incentives to expand renewables across space, regions and time.

## **Methods**

This paper uses pooled panel regressions at the level of German counties from 2001 to 2012 to explain the growth of wind power capacity. Both supported by theory and based on the observed distribution of the dependent variable we use a Poisson regression model to undertake a counterfactual analysis of what causes wind power installation.

We first consider the main determinants of variation in capacity additions. For this purpose, we refer to economic theories of location and agglomeration, the spatial implications of the federal feed-in law, the political incentives for regional policy makers to expand wind energy and the spatial impacts and externalities of wind turbines. Variables employed include natural conditions, economic conditions, policy incentives, societal influences or a combination of these factors. Some of these variables are outside of the influence of policy at the regional level. This is true for wind speeds, area size, history, federal feed-in tariffs and (somewhat less) differing land values, for example. By contrast, other variables explain why – controlling for (quasi-)fixed factors – some regions expand wind energy more than others. Regions facing economic decline or high unemployment might be interested in attracting new investment and job opportunities to their territory. As the location decision of wind turbines is ultimately a matter of negotiation and deliberation at the local level, differing norms of reciprocity and thus differing conditions for co-operation can explain differences in the realization of wind energy projects. Moreover, differing policy preferences and party coalitions at the subnational level might be important explanatory factors.

Based on the above estimates we then analyze counterfactual scenarios, in which factors (strongly) influenced by the regional (county) level are considered individually. For example, we can study the roll-out of wind energy across Germany if the level of unemployment had been as low as in the county-year combination with the lowest level of unemployment. Moreover, the comparison of the studied factors helps to understand the relative importance of these factors. Based on that, we can derive some implications in terms of state and county-level policies.

## **Results**

We find that the strongest effects come from the county-level green party percentage, followed by the mean level of unemployment. The green party percentage is likely to be a proxy for the strength of local networks favouring decentralized renewable energy sources. Furthermore, norms of reciprocity, a left-of-center state government, the increase of unemployment and the decrease of county GDP also have significantly positive regression coefficients, but the effects are small. At the county-level, the regional distribution of these counterfactual results is more pronounced than at the state level and tells a story of quite uneven wind power development. The heterogeneity of growth patterns also suggests that renewable energy governance at the local and county level is on average more influential than state policies and planning.

## **Conclusions**

We conclude that there is a tension between consistency and heterogeneity of renewable expansion policies. More consistency in renewable expansion goals across levels of government would be particularly helpful given the intermittent nature of wind energy, the characteristics of the power market and the planning of infrastructure networks. By contrast, heterogeneity can bring about multiple perspectives on how to solve current energy and climate problems and facilitate learning and adaptive management. Further research should be done to clarify this trade-off.