

# **Policy-Induced Expansion of Solar and Wind Electricity-Generating Capacity: Economic Growth and Employment in EU Countries**

Jūratė Jaraitė, Amin Karimu and Andrius Kažukauskas

Centre for Environmental and Resource Economics, School of Business and Economics, Umeå  
University, Biblioteksgränd 6, SE-90 187, Umeå, Sweden

The role of renewable energy is gradually increasing in modern economic and social development. Over the last couple of decades, the deployment and use of renewable energy sources have been growing significantly worldwide. According to the International Energy Agency, the share of renewable electricity generation in the global electricity mix increased from 18 per cent in 2007 to almost 22 per cent in 2013. Worldwide, renewable electricity generation is now on par with that of natural gas. In 2013, renewable electricity generation accounted for more than 27 per cent of total gross electricity generation in the European Union (EU), almost twice the figure for 2005.

This expansion of renewable energy in the EU would be impossible without support from policy makers. For a long time, several EU member states have stimulated renewable energy production through various funding schemes, yet it was not until the early 1990s that promotional programs really picked up the speed across the EU. Since then, subsidies to renewable energy have been growing rapidly in many EU countries. For instance, according to the European Commission, in Germany they increased from EUR 9.5 billion in 2010 to EUR 12.7 billion in 2012, and in Spain from EUR 5.4 billion to EUR 8.4 billion in the same period.

Given the intensifying debates on whether governments should use industrial policies to promote certain renewable energy technologies, the main objective of the present study is to investigate the effects of policy-induced expansion of renewable *solar* and *wind* energy capacity on economic growth and employment in 15 European Union member states (EU-15) in the 1990–2013 period by using panel-data time-series econometric techniques. In particular, this paper aims to expand the existing literature in the following three unexplored directions.

First, this study focuses on the rather, development-wise, homogenous EU-15 region. EU-15 has promoted renewable energy for a long time and is also the most coordinated region in terms of renewable energy policies. This makes it a well-suited case for examining the effects of policy-induced changes in renewable electricity-generating capacity. The Renewable Energy Directive requires the EU to meet at least 20 per cent of its total energy needs with renewables by 2020 – to be achieved through the

attainment of individual national targets. EU member states are free to choose their own measures to meet their individual obligations. This has resulted in a number of different policies, including feed-in tariffs, tradable green certificate systems, tax breaks and investment subsidies.

Second, instead of looking at total renewable energy consumption or generation, as done in earlier similar empirical studies on the renewable energy-economic growth nexus, we focus on wind and solar electricity generating *capacity*. The rationale for using capacity instead of consumption is that capacity is a better measure for comparing the *efforts* of renewable energy policies to enhance the technological advancement through learning-by-doing effects. Renewable energy capacity utilisation (production) levels differ a lot across EU member states. The presence of high volatility in capacity utilisation data mainly because of weather and other factors makes it difficult to capture slow changing output gains due to learning-by-doing and other technological advancement effects.

The last contribution of our study is that we perform our analysis at three different data aggregation levels to understand the effects of solar and wind energy capacity expansion not only on the overall economy, but also on total manufacturing and the sector of manufacturing of machinery and equipment that includes manufacturing of solar and wind energy technologies. By performing the analysis at three different levels of economic activity, we will be able to provide more insights about the economic effects of policy-induced expansion of the capacity to produce renewable energy on the EU economy.

The main hypotheses of this study are that the EU's policy-induced renewable electricity-generating capacity leads to (1) technological advancement, followed by economic growth, *in the long-run* and to (2) increased economic growth and employment *in the short-run*. In summary, our results support the hypothesis that renewable energy policy-induced wind and solar electricity-generating capacity promotes growth and/or employment in the short-run, but not the hypothesis that these capacity increases promote growth and possibly the associated employment effect in the long-run. Instead, our results tend to support the opposite relationship: to date, changes in wind and solar electricity-generating capacity are associated with negative economic growth in the EU-15 region.

A possible explanation for the negative effect of renewable energy on output in the long-run is that the renewable energy technologies are still not developed well enough to benefit from international trade, which could otherwise generate employment opportunities beyond domestic markets to growth-stimulating levels. Another explanation could be that renewable energy investments crowd out investments in more productive EU sectors.