The Policy Mix's Influence on Inventor Networks in Renewable Energies[1]

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Extended Abstract

The increasing share of electricity produced by renewable energy technologies is to some extent driven by heavy subsidies, especially in Germany. The aim of these subsidies is a sustainable transition, which culminates in the German Energiewende. To achieve this transition, the processes of invention, innovation and diffusion of these technologies are supported by different kinds of policies. There are three categories of policy instruments which address the development and diffusion of renewable energy technologies. Demand side instruments support the diffusion of technologies and create a (niche) market. Supply side instruments directly support inventors and researchers to engage in innovative activities. Related to that, systemic instruments provide a framework and create an underlying network structure fostering research cooperation and knowledge exchange between actors. Together, these instruments from the innovation, environmental and climate policy fields foster a sustainable transition towards a clean energy production. We derive our understanding of this policy mix from the conceptualization of Rogge/Reichardt (2013) and operationalize the instrument mix, which is a central part of a consistent and coherent policy mix.

The aim of the present study is to understand how these different economic instruments in the instrument mix influence changes within the photovoltaic (PV) and wind power technology innovation systems. The key elements of innovation systems are knowledge and knowledge exchange. The accomplished technological change and the desired sustainable transition are induced by the cumulative process of knowledge creation and innovation, in which novelty is created by combining knowledge from a diverse set of actors. Cooperation and the resulting networks of knowledge transfer and learning constitute one important driver of innovation and technological change (Dosi 1988, Powell et al. 1996, Ahuja 2000). These networks can be studied using social network analysis, by mapping the different actors and their relations in the context of innovation and knowledge transfer (see Cantner/Graf 2011 for an overview of innovation networks).

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We observe the underlying structure and properties of the networks formed by inventive activity at the meso level. Based on patent data, inventor networks are constructed in which inventors are linked through common patents. To account for the influence of the instrument mix, a set of supply and demand side, as well as systemic instruments, is used in an econometric approach to analyze the influence of the different kinds of instruments on the growth and the structure of the networks over time. We use the growth of installed capacity of PV and wind power as a proxy for the demand side instruments, and the funding for research projects as supply side and systemic instruments. Systemic instruments consist of funded projects, which have the specific target to foster cooperation between the actors. In a regression framework we estimate the influence of the instrument mix on the changes in the network structure from 1985 until 2008.

Results indicate that an increase in supply side funding has a negative effect on the network size and the connectivity among the actors in the network, while an increase in the share of funding of collaborative research projects increases network size as well as connectivity among the actors in the network. The specific demand side instruments show negative effects, indicating that demand inducing policies have an adverse effect on inventive activity.

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