IMPACT OF REGULATION ON RENEWABLE ENERGY DEVELOPMENT: LESSONS FROM THE FRENCH CASE

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Overview

The development of renewable energy sources (RES) is necessary to address global warming through the reduction of green-house gases emissions, and thus to achieve a sustainable development of our economies. In the electricity sector, developing RES are mainly wind power and solar photovoltaics (PV). Their development is now quite advanced in Europe, which has announced RES shares targets to be reached during the next decades: 20% by 2020 and 27% by 2030; but still, these energies often need to be subsidised. However, the cost of these public subsidies being usually passed on to consumers, such subsidies tend to increase the cost of electricity for final consumers. Also, as most of newly installed renewable production is connected to the distribution network (95% in France), many investments need to be made at the distribution level in order to adapt it to this new environment, the cost of which is also borne in part by consumers through the distribution tariff. It is therefore crucial for both policy makers and distribution system operators (DSO) to understand the dynamics of RES development and its main drivers, including the effect of regulation, in order to promote green energies in the most efficient possible way.

A very popular way of subsidising electric RES has been the use of feed-in-tariffs (FIT), which guarantee a fixed price for each kWh produced over a certain duration (typically 15 to 20 years). As many other countries, France has had such tariffs for over a decade, before switching to feed-in-premiums at the beginning of 2017 for most new installations. In addition, France has implemented an original framework to share network reinforcement charges between RES installations of capacity higher than 100kW, through regional RES connection schemes. These schemes aim at avoiding so called deep connection charges (i.e. individual payment of network reinforcement charges caused by the connection to the grid) and hence remove some barriers to entry created by the deep-cost approach. Also, by creating an equivalent of a regional tax on installed capacity, such schemes provide a locational price signal aiming at an more efficient use of the available network capacity.

Additionally, financial issues are not expected to be the only drivers of renewable development. Indeed, considering RES as relatively new technologies, their spreading is likely to follow an intrinsic diffusion process, which will be influenced in particular by regulation. Such a dynamics is expected to exhibit contagion and stock effects, as often described in the literature. Also, the implementation of the aforementioned regional connection schemes might create inter-regional dependencies as a result of possible location arbitrages for “large producers”, and should be taken into account as well.

Methods

The aim of this paper is to disentangle various effects influencing the development of RES in France. For this purpose, we use a database kindly provided by Enedis, which is the DSO for 95% of French clients. Our data consists of all connection applications by RES producers to Enedis, with information such as capacity of the installation, date of application, and location. We aggregate this data at the regional level in order to study the diffusion of small-scale (< 3 kW) PV diffusion at the quarterly time step, taking into account changes in the proposed FIT. We assess the heterogeneity of this dynamics between regions by estimating seemingly unrelated regressions (SUR). We also model the dynamics of diffusion of wind energy (> 100 kW) at the regional level and quarterly time step and measure both the influence of network reinforcement charges and inter-regional dependency thanks to a dynamic spatial panel model.

Results

Some first data analysis shows that agents act in a rather rational way. This is confirmed by a sound econometric treatment, after which we observe a significant and positive impact of FIT on the deployment of small-scale PV in almost all regions, with a strong heterogeneity between regions. We also disentangle this purely financial impact from epidemic and stock effects, that are also mainly significant. The analysis of wind energy diffusion shows that network reinforcement charges have a negative impact on the number of connection requests, as

expected, while the implementation of the RES connection schemes has a global positive effect on connection requests, which lets us thinks that the goals of this policy have been at least partly achieved.

Conclusions

Energy production is a highly regulated world, in which RES have some specific regulation. Understanding how some rules affect the development of renewable energy is highly important in order to support them efficiently and hence achieve an energy transition at the lowest possible cost. This paper examines the impact of two French regulation instruments on two different technologies, namely small-scale PV and "large" wind energy facilities. We show that the regulation has had the expected impact on the two dynamics, using two econometric modelling approaches that can be adapted to other situations.

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