WHY DO MANUFACTURING INDUSTRIES INVEST IN ENERGY R&D?

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Overview

Investment in energy R&D is a key issue in facing the challenges regarding energy efficiency, mitigation of climate change and competitiveness (Eurelectric, 2013, Jamasb and Pollit, 2015). Although many reports and papers have emphasized that internal R&D of utilities remains low to meet these challenges, not only energy supply firms invest in energy related R&D. Many other industries also devote a proportion of their research expenditure to energy issues.

Some recent papers have analysed the R&D determinants of the energy supply firms (Costa et al., 2014; Sterlaccchini, 2012). Nevertheless, data constraints on private R&D expenditure are substantial (GEA, 2012; Jamasb and Pollit, 2015) and have made it, to the best of our knowledge, impossible to differentiate in non-energy industries between their energy and non-energy related R&D. Understanding the participation of other sectors in R&D in energy and its determinants is relevant to establish the actual effort in R&D which is being made in energy and the impact of energy policy on business decision-making.

The objective of this paper is to examine the determinants of investment in energy R&D in non-energy industries. We focus on manufacturing industries where we can differentiate R&D between energy and non-energy related expenditure.

Methods

To carry out the empirical analysis we have built a comprehensive dataset for 21 manufacturing sectors in Spain for the period 208-2013 from five different surveys. These are the R&D Survey and the Technological Innovation Survey (the Spanish version of the Community Innovation Survey), the Industrial Companies Survey, the Environmental Tax Account, from we draw information about energy and pollution taxes by industrial sector and in the Input-Output framework, we collect from the Use Table the information on intermediate consumption of the utilities sector of products of other industries.

The dependent variable is energy R&D investment at industry-level. Data on energy R&D are often not available (GEA, 2012) because data on private R&D expenditure are not usually reported by technology. Nevertheless, in the Spanish version of the Community Innovation Survey (CIS), since 2008 firms have been asked to classify their internal R&D expenditure according to its socio-economic objective, in line with the criteria employed in the Frascati Manual (OECD, 2002). One of these objectives is the production, distribution and rational utilisation of energy.

The independent variables are as follows. First, we consider those control variables that have been identified in the literature as being determinants of general R&D expenditure at industry-level (Cohen, 2010). Second, we include the amount of the acquisitions by utilities of products from manufacturing sectors. With this variable we can analyse the role of suppliers in energy R&D investment that according to the literature play a significant role in R&D in energy. Third, we include a proxy for energy efficiency, the other main reason that may explain energy R&D in non-energy industries. Finally, we include a set of variables to examine the effect of different policy instruments on fostering energy R&D.

Results

The results of the estimations can be summarised as follows. First, there is a positive relationship, even controlling for the amount of sales, between intermediate consumption by utilities of manufacturing products and R&D in energy. This result shows, as suggested by the literature, the significant importance that suppliers have in explaining R&D in energy. Second, R&D investment by non-energy firms does not seem to be related with the energy efficiency objective of innovation. Third, in the estimations we consider three instruments of public policy: public subsidies to

business R&D projects, energy taxes and meeting environmental, health and safety regulatory requirements. Our results suggest that only public funds have a positive relationship with R&D investment.

Conclusions

The objective of this paper has been to contribute to the literature on energy economics examining the drivers of energy R&D in non-energy industries. Although R&D is one of the main variables considered when analysing the economics of innovation, data constraints have substantially limited empirical analyses of investment in energy R&D by non-energy sectors. To examine these determinants, we have compiled a database with information taken from several sources concerning innovation, energy and economic characteristics of firms and sectors. With this information, we have carried out an empirical analysis with panel data for 21 manufacturing sectors in Spain for the period 2008–2013.

The data on the amount of R&D investment in energy by manufacturing sectors show the importance of including other sectors than the energy supply industry to explain R&D in energy and their main drivers. The results from the empirical analysis point towards the substantial importance of suppliers in explaining energy R&D. On the other hand, R&D investment by non-energy firms does not seem to be related to the energy efficiency objective of innovation. The estimations also suggest that, among the three policy instruments examined, only public financing to business R&D is related to R&D investment in energy by non-energy industries.

These results have some policy implications regarding how to foster energy R&D and show that it is necessary to consider the total effort in R&D in energy to define public policies. To improve R&D effort and innovation in energy requires an increase in cooperation in innovation between energy supply firms and those in other related industries as well as with public institutions and agents.

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