

What Are the Determinants of Investment in Environmental R&D?

There is a global concern for climate issues and of the steps needed to improve the environmental performance of countries around the world. The agreement reached in Paris in 2015 committed all country signatories to stem their greenhouse gas emissions over the coming century. In facing up to this challenge, environmental R&D and innovation are key factors in cutting emissions.

While the world is moving towards more sustainable development green innovation remains relatively new to firms. Hence, there has recently been a rising interest in determining the drivers of investment in environmental innovation (Del Río et al., 2016). Here, we present the results of a recent piece of research (Costa et al., 2017) on the determinants of investment in environmental R&D for Spain.

Environmental Innovation: Definition and Main Potential Drivers

The terms environmental innovation, green innovation and eco-innovation are used frequently synonymously. The most common definition is: "(...) innovation is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (...) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives" (Kemp and Pearson, 2007).

The main determinants of eco-innovation are firm strategies, technology, market/demand and regulation. For firms to develop environmental innovations, technology and market factors alone do not provide sufficient incen-

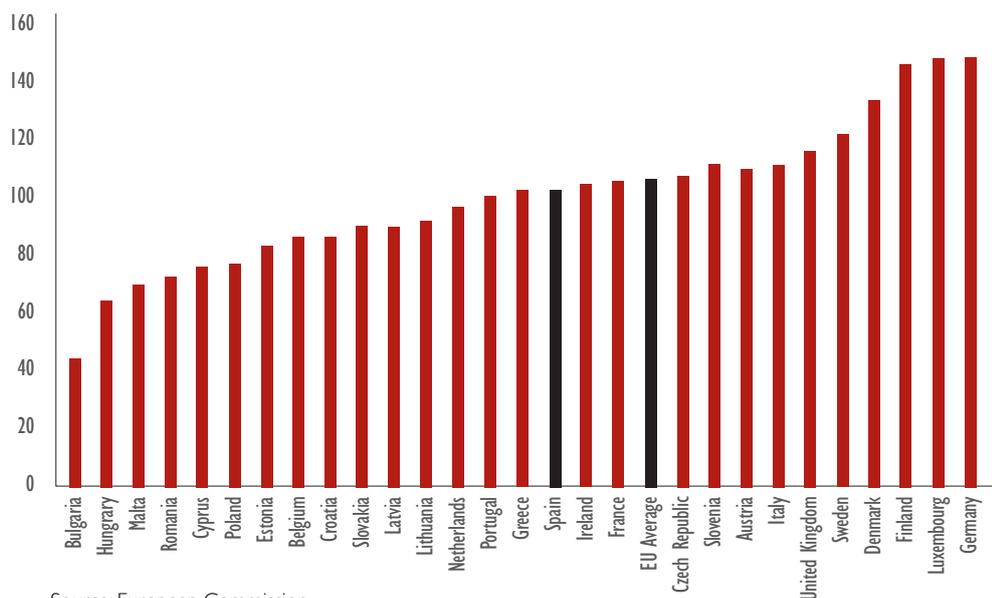
tives. While society as a whole benefits from environmental innovations, the costs are borne by individual firms. Despite the fact that certain environmental innovations can be marketed successfully, a firm's ability to appropriate the profits from such an innovation can be hindered if environmental benefits have the character of a public good. Consequently, the regulatory framework and environmental policies are important drivers of environmental innovations.

Environmental R&D in Spain

Although Spain does not perform nearly as well as the European Union (EU) in general innovation, it is only slightly below the EU average in eco-innovation (Figure 1).



Figure 1. Eco-innovation index. 2016



Source: European Commission

“R&D subsidies have a significant impact on promoting R&D specifically devoted to environmental concerns”

A major resource for innovation is R&D investment but data are not usually reported by technology and tend only to be available by economic sector. However, in the Spanish version of the Community Innovation Survey (CIS), firms have been required since 2008 to classify their R&D expenditure into fourteen socio-economic objectives, according to the purpose of the R&D programme or project. One of these objectives is the control and care of the environment. Around 3.2% of private R&D investment was directed towards this objective by the Spanish industry. Although all sectors report investing in environmental R&D, there are significant differences between them (Table 1).

To examine the determinants of environmental R&D investment it is necessary to consider different explanatory variables, including policy instruments. Hence, we build a comprehensive dataset for 22 manufacturing sectors for the period 2008–2013 from six surveys, five conducted by the Spanish Institute of Statistics (INE) and one by the International Organisation for Standardisation (ISO).

Environmental R&D: Determinants and Policy Implications

The results of our empirical analysis show, first, that there is a positive relationship between investment to prevent pollution and R&D efforts. We also find a positive association between the greater use of energy products as an intermediate input in the production process and investment in environmental R&D. Managerial strategy also appears as a relevant driver of environmental R&D investments.

Second, instruments of innovation policy as well of environmental policy have a positive

impact on levels of investment in environmental R&D. R&D subsidies have a significant impact on promoting R&D specifically devoted to environmental concerns. The empirical analysis also shows that specific environmental taxes that target pollution and the use of resources also have a positive effect on environmental R&D but the same does not hold true for general energy taxes.

In synthesis, our results show the importance of environmental R&D investment to achieve the goal of climate change mitigation. What this requires is a combination and mix of energy policies, the promotion of R&D, regulatory and fiscal policies all which complement one another; and the promotion of self-regulation and dissemination of information.

References

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Del Río, P., Peñasco, C., and Romero-Jordán, D., 2016. What drives eco-innovators? A critical review of the empirical literature based on econometric methods. *Journal of Cleaner Production*, 112, 2158-2170.

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MEI Project number 044513. Deliverable 15.

Table 1. Business R&D investment with an environmental objective (weight on the total internal R&D of each sector, in %). Spain (average 2008-2014)

Mining and Quarrying (CNAE 05, 06, 07, 08, 09)	11,08
Coke and refined petroleum products (CNAE 19)	4,15
Food, beverages and tobacco products (CNAE 10, 11, 12)	2,53
Textiles and wearing apparel (CNAE 13, 14)	1,12
Leather and related product (CNAE 15)	4,51
Wood and of products of wood and cork (CNAE 16)	2,52
Paper and paper products, Printing and reproduction of recorded media (CNAE 17- 18)	3,96
Chemicals and chemical products (CNAE 20)	5,46
Basic pharmaceutical products and pharmaceutical preparations (CNAE 21)	0,15
Rubber and plastic products (CNAE 22)	4,54
Other non-metallic mineral products (CNAE 23)	7,24
Basic metals and Fabricated metal products, except machinery and equipment (CNAE 24, 25)	2,92
Computer, electronic, and optical products and Electrical equipment (CNAE 26, 27)	2,19
Machinery and equipment n.e.c. (CNAE 28)	2,09
Motor vehicles, trailers and semi-trailers and other transport equipment (CNAE 29, 30)	2,39
Furniture and other manufacturing activities (CNAE 31, 32)	1,47
TOTAL INDUSTRY	3,21

Source: INE and own elaboration

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