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Differential empirical innovation factors for Spain and the UK

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ABSTRACT

This study considers the role of national differences, derived from structural characteristics in each country, and how they impact on companies' innovation. To do this we include in a firm-level empirical model of innovation traditional factors impacting on innovation, and measure any differences in these determinants between two countries: the UK (comprising more advanced regions) and Spain (which belongs to the "follower" groups of countries in Europe). Using the European Community Innovation Surveys (CIS4), we select two samples comprising private manufacturing firms and estimate a two-step Heckman model to explain firms' innovation. Our results suggest that Spanish firms are at a different stage, with Spain lagging behind the UK in terms of being able to benefit from R&D. Thus in Spain, we find that public support is more important in promoting innovation activities; whereas linkages with international markets are more important for companies in the UK. Based on our results, we would argue that in order to reduce the technological gap between these two countries regional policies to promote innovation in Spain should concentrate more on the promotion of market relationships between co-located firms; while a greater exposure to internationalisation would benefit both countries.

1. Introduction

There is considerable support for the view that innovation (leading to technological progress) is one of the main driving forces of economic growth (Romer, 1990). Increases in R&D investments produce greater knowledge and overall capabilities, which allow different regions to improve the range and quality of their products and processes, leading to higher economic growth (Bilbao-Osorio and Rodríguez-Pose, 2004; Harris, 2011; Nunes et al., 2012). Innovation is a complex process which cannot be fully understood independently of the social and institutional conditions of every country (Asheim and Gertler, 2005). Therefore, the understanding about the specific national factors influencing the innovation process is a fundamental topic to be considered in order to improve the competitiveness and development in certain areas (Almeida et al., 2011). Based on this result, the European Commission (2002) has designed regional policies to reduce the gap between European countries differencing between advanced (core) and backward (periphery) countries (e.g. Cabrer-Borras and Serrano-Domingo, 2007). These measures have not seen any major narrowing in performance as was hoped. Thus there is a need for further research to clarify how national differences impact on innovation.

Despite the importance of this topic, empirical studies in this area are scarce and most of them take a macroeconomic perspective when analysing regional differences in what determines innovation (Navarro et al., 2009). For example, the studies by Castellacci and Archibugi (2008) and Castellacci (2011) look at the role of innovation in growth models, distinguishing between technological clubs in Europe. Regarding the studies which differentiate across countries, there are a wide variety of examples that focus on different variables, such us companies' technological intensity (Heidenreich, 2009; Nunes et al., 2012); spillovers (Faria and Lima, 2012); external linkages (Laursen and Salter, 2006; Faria and Schmidt, 2012); and institutional characteristics (Barbosa and Faria, 2011; Ganter and Hecker, 2013). In this context, interregional comparative studies dealing with the effects of the 'region' on innovation activities are mostly absent (Edquist, 2005). The aim of this study is to consider the role of these national differences, derived from structural characteristics in each country, and analyse how they impact on companies' innovation. Our empirical approach is to analyse the effects of the traditional factors impacting on innovation, and measure any differences between two countries: the UK and Spain. We select these countries because they have different structural characteristics. The UK is composed of more advanced regions with better economic development and stronger industrial specialisation based on medium-high and high-tech manufactures (Navarro et al., 2009). Spain belongs to the "follower" group of countries in Europe. It is characterised by lower economic and technologically development regions, with lower per

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capita income than the EU average. Its productive system is based on service (mainly tourism) or agriculture sectors where industry is more 'light weight' in this type of structure. The important gap between these countries, and the political efforts directed to promote innovation in less development European areas, highlights the importance of this study. Our empirical application allows us to identify the particular mechanisms which promote innovation activities in each country and establish the differences between them. For each country, we have access to the European Community Innovation Survey (CIS4). These databases were made available from the National Institute of Statistics (in Spain) and the Office for National Statistics (in the UK). These surveys provide detailed information about innovation activities over the period 2002–2004 of a representative group of companies in each country. Based on this information, we select two samples comprising private manufacturing firms. With the aim of identifying the particular driving factors which characterise the activities of innovation, using a two-step Heckman model of the determinants of R&D expenditure.

Our findings indicate that although the role of traditional explanatory variables is comparable to previous contributions in this area (Rogers, 2004; Arbussa and Coenders, 2007 or Hauge, 2009, among others), the extent to which they affect innovative activities is dissimilar between the two countries, which is associated with the specific characteristics of each country (Fagerberg and Srholec, 2008). Particularly in Spain, public support is more important in promoting innovation activities; whereas linkages with international markets are more important for companies in the UK. Based on these results, we would argue that regional policies to promote innovation in Spain should concentrate more on the promotion of market relationships between co-located firms. Since our results suggest that Spanish firms (and the development of Spanish industries) are at a different stage, with Spain lagging behind the UK in terms of being able to benefit from R&D, greater exposure to internationalisation is also necessary for Spanish firms as well as UK based firms.

This paper is organised into four sections. The Section 2 presents the literature review and our hypotheses to be tested; the Section 3 presents general descriptive characteristics of innovation activity in the UK and Spain. Section 4 presents our empirical application, while the main conclusions are summarised in Section 5.

2. Innovation and regional effects

There is an extensive literature which considers 'territory' as an important element in the explanation of firms' innovation outcomes (Porter, 1998). According to these studies, the specific characteristics of a country result in differences in firms' capacity to assimilate innovation (Barbosa and Faria, 2011). In this sense, company innovation is not only determined by internal factors but it is also defined by external elements which vary by country (Cooke, 2001). Understanding the mechanisms which generate innovation represents a significant contribution in the design of regional policies to promote economic growth (Rodriguez-Pose, 1999). Despite their importance, studies examining national differences in innovation systems are scarce, and those that exist mostly focus on specific areas and/or take an aggregate approach (Sternberg and Arndt, 2001). Regarding empirical studies focused on European countries, both advanced and backward areas have been observed (Castellacci and Archibugi, 2008; Castellacci, 2011). This division has not only been examined in research papers but it has also been applied by the European Commission (2002) in policy terms. According to this typology, advanced regions are characterised by productive systems based on medium-high and high tech industrial sectors with high levels of development in innovation activities. Backward regions present low levels of economic and technological development. Their productive systems are usually based on the service sector (mainly tourism) and on agriculture (Navarro et al., 2009), with overall economic performance levels lower than European averages. Dissimilarities between advanced and backward regions may therefore result in differences in the manner in which the factors that determine innovation operate in these different areas, thus influencing firm innovation rates. This leads to our first overall, and more general, hypothesis:

H1. The determinants of innovation are influenced by differences in regional characteristics; the strength of these determinants therefore varies between more advanced and backward regions.

2.1. Factors hampering innovation and regional development

The importance of innovation to enterprise success has provoked an interest in identifying the specific barriers and obstacles that limit the development of these activities. Some of the key factors hampering innovation are derived from environmental characteristics (financial costs, institutional constraints, government policies, lack of finance, lack of customer responsiveness or government regulations) and cannot be controlled by managers (Silva et al., 2008; Barbosa and Faria, 2011). Distinguishing between advanced and backward regions, the former is characterised by companies which take greater advantage of internal resources to increase innovation outcomes, and thus cost factors and the availability of technological information are relatively more important. For example, (Frenz and Ietto-Gillies, 2009) found that information asymmetries were important barriers to innovation for advanced regions. In contrast, companies located in backward regions are affected more by economic deficiencies derived from the characteristics of the external environment (such as lack of qualified personnel, and inefficiencies in market structures) (Navarro et al., 2009). These characteristics impose a more fundamental set of external barriers which have to be overcome in order to improve innovation rates and thus promote economic growth in these less favoured areas. It is also likely that public policies to overcome 'market failures', and thus encourage more firms to engage in (and spend more on) innovation, will be different; in advanced regions receiving public support is more likely to mitigate against the initial cost barriers and result in more firms engaging in innovation; in disadvantaged areas public support is less likely to overcome more 'systemic' external barriers, and instead encourage firms that do spend on innovation to invest more resources (Dachs and Peters, 2013).

H2a. Barriers identified by enterprises in advanced and backward regions are quantitatively different. Companies in advanced regions are more affected by a lack of internal resources (link to the cost of innovating) whereas restrictions to innovation in more backward regions are dominated by the external structural deficiencies of the economy.

H2b. Public support for innovation will impact different on firms in advanced and backward regions.

2.2. Absorptive capacity in different environments

'Absorptive capacity' concerns the ability of firms to recognise, internalise and make effective use of (i.e., assimilate) external knowledge (Cohen and Levinthal, 1990); that is, the mere exposure to such knowledge does not guarantee an increase in innovation (Escribano et al., 2009). Following Arbussa and Coenders (2007), we recognise two types of absorptive capacity: the use of external knowledge related to new technology, and the capability to integrate this knowledge into a firm's innovation process. We expect that both internal and external absorptive capacities differ

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