



# Open innovation: Factors explaining universities as service firm innovation sources <sup>☆</sup>



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## ABSTRACT

The service innovation literature lacks empirical studies that focus on the links between service firms and universities. This paper aims to contribute to a better understanding of these links. This paper applies the Portuguese version of the Community Innovation Survey (CIS 2006) to obtain data on 967 service firms. The model uses a random intercept in an ordered probit regression to empirically assess which factors influence the collaboration of service firms with universities for innovation related activities. The regression also considers the unobserved firm heterogeneity. The results demonstrate that innovation success, radical innovations, and innovation intensity are crucial to the development of links between innovative service firms and universities.

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## 1. Introduction

The current economic environment is driving firms to become more competitive and innovative. Researchers such as Chesbrough (2003) and Prahalad and Krishnan (2008) show that firms are accessing global networks in which they are able not only to capitalize on all existing knowledge but also to develop their own innovation activities. Such networks represent new means of adapting to competitive contexts, avoiding high fixed costs, offsetting risks, and expanding the scope of innovative success.

Thus, the ability to access these networks becomes a new competitive advantage that is capable of providing long-term strategic competitiveness. Chesbrough (2003) characterizes this new paradigm of open innovation as a way for firms to collaborate with external innovation sources and to develop new products or services. Competitors, suppliers, customers or universities are some examples of external innovation sources that firms can use in the course of their development of innovation activities.

Furthermore, although countries in the Organization for Economic Co-operation and Development (OECD) face low economic growth and huge challenges for economic development, national governments

also seek to stimulate firms' competitiveness by developing strong cooperative links between firms and universities. As a foundation of the National System of Innovation (NSI), universities are renown for their abilities to produce both highly qualified professionals and cutting-edge scientific research, especially related to basic knowledge. More cooperation between firms and universities might quickly bring a greater diffusion of knowledge, better results from firm innovation, and training programs for students. Therefore, a need exists to understand just which types of firms now collaborate with universities on innovation activities.

Although this paper aims to explore the types of firms that adopt universities as innovation sources, the focus is only on innovative service firms because the service sector makes an overwhelming contribution to sustaining employment and wealth creation in OECD countries. However, in the literature on innovation, the industrial sector receives the greatest attention. Indeed, few studies focus exclusively on innovation in services (e.g., Adame-Sánchez & Miquel-Romero, 2012; Flikkema, Jansen, & Van der Sluis, 2007). Hence, the paper's objective is to contribute to a better understanding of this field. This paper also represents an innovative contribution to the study of the linkages between firms and universities. Other studies exist that focus on service and industrial sectors, such as Negassi (2004), Schmidt (2005), and Segarra-Blasco and Arauzo-Carod (2008). Some studies focus only on the industrial sector, such as Cohen, Nelson, and Walsh (2002) and Laursen and Salter (2004).

This paper provides empirical evidence on the determinants of innovation activities between firms and universities in a sample of 967 Portuguese service firms. The data set comes from the Community Innovation Survey (CIS 2006) and covers the period between 2004 and 2006. The Portuguese case is especially interesting as the country carries out less investment in research and development (R&D) than any other European country.

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Yet Portugal has faced the problem of economic competitiveness since the turn of the century, which is similar to other southern European countries. Despite this, Portugal is slightly distinct from others as the service sector holds far greater relevance to the economy. Eurostat (2011) concludes that in 2008, the Portuguese service sector was responsible for 60% of the business sector's R&D expenditures; while in countries such as Germany, Italy, and Spain, the service sector was responsible for only 11%, 26%, and 47% of the national business sector's R&D respectively. Taking only the service sector weighting into consideration for EU-27 economies, the Portuguese service sector has the fourth highest contribution to the business sector's R&D expenditures behind only Bulgaria, Estonia, and Cyprus at 65%, 64%, and 62% respectively. Thus, this research constitutes an opportunity to better understand the role of service sectors within the framework of NSIs.

The remainder of the paper is organized as follows. Section 2 outlines the theoretical and empirical background of the role of universities in the innovation process, before presenting the hypotheses. Section 3 introduces the data and method, and Section 4 details the econometric study. Section 5 comprises the discussion of the main results and the conclusion.

## 2. Theoretical and empirical background

### 2.1. The role of universities as an innovation source for firms

The research on the role of innovation sources in firms has a long history that consists of a large number of academic papers (Chesbrough, 2003; Gibbons & Johnston, 1974; Mol & Birkinshaw, 2009; Mueller, 1962; Von Hippel, 1988, 2006). Von Hippel (1988) defines functional sources of innovation as the types of economic actors (users, suppliers, producers, or others such as universities) that contribute towards the development of product, process, or service innovations. Additionally, GPEARI (2008) suggests that information sources for innovation are the sources that provide useful information for new innovation projects or those that contribute to the conclusion of innovation projects in progress. Newer innovation models strongly emphasize the role of the interaction between firms and a wide number of innovation sources, especially lead users, suppliers and universities, as well as other public entities (Herrera, Muñoz-Doyague, & Nieto, 2010; Lundvall, 1992; Niosi, 1999; Von Hippel, 1988, 2006). For instance, the open innovation model argues for firms working with external knowledge sources (Chesbrough, 2003). This model defends this path as developing new competitive advantages, especially in terms of companies designing and developing new products, services, or ventures. The open innovation concept illustrates how the most valuable ideas and innovations might derive from either internal company or external environments and may also be susceptible to market launches through either internal or external paths to the company.

Chesbrough (2003) suggests that firms that excessively focus on developing new ideas internally tend to miss a great deal of opportunities that a wide range of actors external to the company might provide. Therefore, a fundamental part of the innovation process now focuses on this need to search out new ideas and to partner with firms developing new products and services, as opposed to investing large amounts of time, money, and other resources in the production of radical new innovations.

According to Chandy and Tellis (1998), the distinction between incremental and radical innovations is due to the substantial difference in the technology (whether current or new) and to the consumer needs (whether existing or new) being met. Radical innovation incurs greater risks because this type of innovation incorporates new technology and meets new consumer needs and demands. This risk explains why, typically, radical innovation also generates higher returns (Skarzynski & Gibson, 2008). However, radical innovations need new knowledge, and sources of new knowledge come from the fundamental research undertaken by universities. Universities

are a special case as an innovation source both because of their research potential and the diversity of their research groups (Santoro & Chakrabarti, 2002). Furthermore, the literature emphasizes the role of universities. Even before Lundvall's (1992) NSI model, Nelson (1993), and the Triple Helix model in Etzkowitz and Leydesdorff (2000), research places a major focus on universities.

In Portugal, the role of universities in the innovation system is particularly important as clearly demonstrated by a range of statistics (Eurostat, 2011): in 2008 Portuguese R&D investment stood at only 1.51% of the gross domestic product (GDP) (EU-27: 1.92%), government R&D expenditure accounted for 0.11% of the GDP (EU-27: 0.24%), the private sector accounted for 0.75% of the GDP (EU-27: 1.21%), while the expenditure of the higher education sector accounted for 0.52% (EU: 0.44%). These figures show that in Portugal in 2008, only the university sector invested relatively more in R&D activities than their European counterparts. The numbers also reflect the increasing role of universities in the intensity of R&D that is taking place in Portugal; in 2004, university R&D expenditure accounted for just 0.27% of the GDP.

Universities are also drivers of knowledge diffusion because they can exert strong influences over regional innovation ecosystems by establishing interactions with local firms or economic actors (Brown & Duguid, 2000). This influence reflects the importance endowed to universities and their perceived position as one of the pillars of NSIs (Fagerberg, Mowery, & Nelson, 2005). The creation of new knowledge at universities fosters the development of the radical innovations able to sustain new competitive advantages and the firms' entries into new markets. As Spencer (2001) states, the interaction between firms and universities increases the number of innovations that firms produce. This interaction between firms and universities most commonly involves research, contract research, and consultancy based relations (Perkmann & Walsh, 2007).

However, interactions between firms and universities are also shaped and conditioned by what Gemünden and Ritter (2004) call network competence, which is the firm's ability to establish and benefit from relations with other organizations. The same authors suggest that firms with higher network competence levels are better at attracting and retaining customers, suppliers, research centers, and other partners. Furthermore, these firms are better at maintaining their innovation networks and accessing the various knowledge sources for their innovation projects. However, in spite of the rich depth of the literature on interactions between universities and firms, many studies adopt only small samples commonly associated with the industrial sector (Hicks, Breitzman, Olivastro, & Hamilton, 2001).

### 2.2. Hypotheses from the literature

This study maintains that the level of success for a firm's innovation policy extends beyond the ability to launch new products or services into the market. This study uses the same approach as Gemünden and Ritter (2004) who define innovation success as the junction of the success related to the product or service innovation coupled with the success of the process innovation. These authors conduct a survey that asks German firms how they classify the level of success in product and process innovations. Although product metrics are easier to define and measure, process analysis is also a good complement for evaluating the success level of the innovation activities.

Thus, this study adopts the approach of Gemünden and Ritter in order to propose a new strategy for studying the relationship between firms and universities. This strategy acknowledges that innovation success means that firms are able to transform their new product and service development into innovation policy, thereby ensuring that the firm can broaden its product or service portfolio, enter new markets, increase sales, reduce unit labor costs, increase service quality, and so on. Firms with higher levels of innovation success

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