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Commentary

Has the global financial crisis had different effects on innovation performance in the agri-food sector by comparison to the rest of the economy?

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ABSTRACT

Background: The globalization and expansion of financial markets and the current economic crisis are changing the rules. Innovation has ceased to be part of the business strategy in many companies. However, in other companies innovation still plays a fundamental role in the improvement of performance and in maintaining competitive advantages in today's global markets. This is particularly the case in the agri-food industry; we will see here how innovations have become an important instrument for companies in this sector.

Scope and approach: The main purpose is to determine the impact of this global financial crisis on the probability of firms introducing technological and non-technological innovations as well as on radical and incremental innovations and the use of innovation inputs. The analysis is based on panel data from the Technological Innovation Panel (PITEC) for Spanish firms between 2008 and 2012. We estimated random-effects Logit and Tobit models.

Key findings and conclusions: This manuscript explores that the economic crisis has had a significant and negative impact on firms' innovative performance and on the effort made by the firms in assigning resources for R&D. A crisis affects technological innovations to a greater extent, as well as small companies, those which carry out less internal R&D and cooperation efforts. However, innovating firms are proved to obtain better results both in economic and productive terms. Further to that, the agri-food sector innovative behavior has been less affected by the crisis than the rest of the economic sectors.

1. Introduction

The agri-food industry is one of the most important sectors in the European Union and it is highly significant in terms of economic output and employment (Hirsch & Gschwandtner, 2013). In addition, it is a leading industrial sector in the Spanish economy and the fifth largest in Europe (Alarcón, Polonio, & Sánchez, 2013); it plays an important role in Spain's economy contributing 7.2% of its GDP and more than 20% of total employment (Spanish Food & Drink Industry Federation, 2014). Traditionally, the agri-food sector is considered a Low-Tech intensive industry and the evidence supports the view that a firm's returns and growth depend on its capacity to innovate (Capitanio, Coppola, & Pascucci, 2009). This is because European food markets are characterized by high market saturation and strong competition (Hirsch & Gschwandtner, 2013) and it allows firms to grow more quickly and be more profitable than non-innovators (Atalay, Anafarta, & Sarvan, 2013).

Nowadays, the globalization and expansion of financial markets and the current economic crisis are changing the rules of the economy. Innovating in times of crisis is seen by many authors as an opportunity to grow, survive and succeed and as the attempt to maintain or develop competitiveness in today's global markets (Kühne, Vanhonacker, Gellynck, & Verbeke, 2010; Mohezar & Nor, 2014; Peters, Shane, & Torgerson, 2009). Despite the importance of innovation during crisis, most of the empirical literature dealing with the impact of an economic crisis on innovation has focused only on firms' innovation investment (Paunov, 2012) or on customer behavior (Ásgeirsdóttir, Corman, & Noonan, 2012; Mansoor & Jalal, 2011).

However, this study focuses on analyzing the overall effects of an economic crisis, both in terms of innovation inputs and

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innovation performance. On this background, the overall objective of this work is to examine the impact of the economic crisis on the probability of Spanish firms to introduce innovations and on innovative sales opened up by a new product. In this sense, we studied firms' decisions to engage in innovation taking into account all the types of innovation described by the Oslo Manual (OCDE, 2005) i.e. technological and non-technological innovations. Additionally, we measured performance in terms of the market success of firms' innovations according to the share of turnover generated by new products. We chose the Spanish case because it is one of the countries which have suffered most seriously from the financial crisis in the EU (Sinitsky, 2013).

Finally, this paper developed a conceptual model highlighting different innovation indicators which impact on the innovative performance of firms related to the past literature like business factors (in-house R&D; external R&D; domestic and foreign cooperation in innovation) and the international strategy of the firm measured by export operations.

2. Literature review

2.1. Source of innovation in the agri-food sector

Agri-food industries are traditionally regarded as a sector with low levels of R&D intensity (Capitanio et al., 2009; Grunert et al., 2008), which has been confirmed to be true in the case of Spain (Garcia Martinez & Briz, 2000). Despite relatively low R&D investments, innovation for this sector has become an important instrument in the turbulent environment that increasing globalization creates, which includes changing quality demands and price discount fights among retailers (Batterink, Wubben, & Omta, 2006). Food firms are mainly process-innovation oriented (Batterink et al., 2006) and both product and process innovation are to a large extent characterized by incremental rather than radical changes (Bayona, Cruz, Garcia, & Sanchez, 2013; Fortuin & Omta, 2009; Hervas-Oliver, Sempere-Ripoll, & Boronat-Moll, 2014). The importance of incremental innovation is associated with constraints on the demand side (including retailer behavior) and conservative consumer behavior (Capitanio et al., 2009; Filippaios, Papanastassiou, Pearce, & Rama, 2009).

Regarding the origin of agri-food innovations, a large part of them seem to start from customer and retailer demands, marketing strategies, consumer perception of quality and safety and environmental pressure.[1] Vanhonacker et al. (2013) indicate that few innovations are widely accepted by consumers in this sector, where 50% of new products launched on the market fail (Ronteltap, van Trijp, Renes, & Frewer, 2007). Consumer acceptance is crucial to the adoption and dissemination of new technologies in food production and to the success of any new product launched on the market (Garcia Martinez & Briz, 2000). Additional detailed knowledge of consumer preferences in terms of food technology innovations can help minimize innovation failure rates (Chen, Anders, & An, 2013). In this context, marketing innovation plays an important role in the food sector apart from product and process innovation when it comes to creating information exchange between producers and consumers and to the success of new food products in the market.

Particularly in times of crisis, when consumers' confidence and overall consumer expenditures are greatly affected, both the demand and the supply side pay great attention to the price trends of food products (Koutsimanis, Getter, Behe, Harte, & Almenar, 2012). The foregoing considerations are based on the literature and indicate the importance of all types of innovation in the agri-food industry. Firms in this sector tend to innovate so as to stand out from their competitors at all times and fulfill the needs and expectations of their customers, particularly in times of crisis, and also to sustain prosperity, attain long term goals and develop competitiveness in today's global markets (Kühne et al., 2010; Mansoor & Jalal, 2011).

2.2. Determinants of firm innovative performance

This section describes the conceptual framework built on the basis of the Resource-Based View (RBV) (Barney, 1991) and the Dynamic Capabilities Theory (Teece et al., 1997) to analyze how firms may adapt, assimilate and deploy their behavior, resources and capabilities within a changing environment. Using the Resource-Based View (RBV) of the firm as a theoretical backdrop; we aim to find out the relative impact of different activities beyond formal R&D (internal and external), sources of innovation outside firms' boundaries (domestic and foreign cooperation in innovation) and firms' internal characteristics (firm size, business sector and productivity) on their short- and long-term competitive position. Extending the RBV theory, we build on the Dynamic Capabilities Theory to examine why and how some firms have handled the current crisis better than others and how factors (inputs) allow firms to effectively face the crisis by improving their innovative performance during such periods. We argue that managers of firms that want to achieve competitive advantage need to adapt, integrate and reconfigure resources and competences to match the changing market (Makkonen, Pohjola, Olkkonen, & Koponen, 2014; Teece et al., 1997). We summarize our arguments in a set of hypotheses listed below.

2.3. Firm factors

The first determinant on firm innovative performance is Research and Development activities (R&D). R&D is considered to be one of the key drivers for innovation (Bascavusoglu-Moreau & Tether, 2012). R&D has a particularly successful impact on innovation efforts when firms carry it out in a continuing way (Köhler, Sofka, & Grimpe, 2012). Moreover, a strong set of internal competencies in R&D not only increases firms' innovative outputs but also allows them to use and exploit knowledge acquired outside the firm (Artz, Norman, Hatfield, & Cardinal, 2010). In this regard, some authors find that the different options for using innovation inputs (internal or external) affect innovation performance more than the R&D effort in general terms (López Rodríguez & García Rodríguez, 2005).

However, the rapid advance of technological knowledge, the growing costs of R&D and shorter product life cycles make it impossible for any firm to sustain all the abilities and knowledge required for production in-house (Berchicci, 2013). In this line, Koschatzky (2001) suggests that firms which do not exchange knowledge in innovation reduce their knowledge base on a long-term basis and lose the capability to enter into exchange relations with other firms and organizations (Avermaete, Viaene, Morgan, & Crawford, 2003). According to this agreement, firms should open their R&D activities to external sources as the externalization of R&D activities allows firms to search for new external knowledge sources outside their environment to benefit from complementary sets of knowledge from external agents and improve their performance and innovate successfully. There is an agreement in the literature that the agri-food industries are slightly more open than

[1] The implementation of food safety management systems has grown significantly in the food production chain in order to improve food security. European food safety regulation covers a broad range of regulatory techniques and standards including the GlobalGAP, IFS, Marks & Spencer's Field-to-Fork, Tesco Nurture, (Kirezieva et al., 2015).