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Technological and non-technological innovations, performance and propensity to innovate across industries: The case of an emerging economy

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ABSTRACT

Innovation in a firm may be non-technological, such as organizational and marketing innovation, and technological, such as product and process innovation. The aim of this article is to explore how different types of innovation affect the innovation development of the firm across industries. We chose Chile as an emerging market context. Our results show that only product innovations affect significantly innovation performance across industries. However, different types of propensities to innovate are affected differently by technological and non-technological innovations. We discuss implications for managers and policy makers in emerging economies, in which data tends to be scarce to develop new policy models and increase the effect of non-technological innovation on innovative performance.

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1. Introduction

Technological innovations are defined as product and process innovations, meanwhile non-technological innovations are associated with marketing and organizational innovations (Mothe & Nguyen, 2012; Schmidt & Rammer, 2007). Although firm's innovation literature is rich, including firm and regional approaches (Cooke, 2008; Crossan & Apaydin, 2010; Damanpour, Walker, & Avellaneda, 2009; Hall & Rosenberg, 2010) their analysis on firm's performance or propensity to innovate has received less attention in the literature of industrial marketing, especially in emerging economies (Geldes & Felzensztein, 2013; Gunday, Ulusoy, Kilic, & Alpkhan, 2011; Mothe & Nguyen, 2012; Schmidt & Rammer, 2007).

The distinction between technological and non-technological innovations arises from the critics to the traditional view that product and process innovations are not sufficient to explain innovation in firms (see Table 1). Indeed, technological innovations are only related to the development and application of new technologies. This perspective only provides a limited explanation for understanding innovation (i.e. Services). For example, it does not include a number of innovative activities such as reorganizing business routines, internal organization, external relations and marketing (Gunday et al., 2011; Mothe & Nguyen, 2010, 2012; Schmidt & Rammer, 2007). The third version of the Oslo Manual (OECD, 2005) incorporates marketing and organizational

innovations to the traditional product and process innovations. This classification reflects the distinction between technological and non-technological innovations and establishes a number of sub-types of innovations or innovative activities to each type of innovation (see Table 2).

Recently, the need for further research in this area has been emphasized. For example, Mothe and Nguyen (2010, p. 314) state that “it is surprising to note that little has been written on the care firms should take when considering the types of innovation that may lead to technological innovation, such as innovation in organization and/or in marketing”. They comment that further research should be undertaken to better understand the impact of non-technological innovations on firm's performance. This is particularly relevant, given the interdependent and interactive nature of the innovation process (Tether & Tajar, 2008). Indeed, it becomes much more relevant when considering how the innovative process differs across industries and global regions (Crossan & Apaydin, 2010; Hall & Rosenberg, 2010). For example, the manufacturing, service and agriculture sectors will tend to have different innovation dynamics. Likewise, developed countries have more advanced institutions and economic, legal and financial systems than developing countries. This environment allows them to increase innovation performance faster than in developing countries (Lee, Özsoy, & Zhou, 2015). Yet, there is a lack of studies that have focused on studying the relation between technological and non-technological innovations across industries in emerging economies.

Some studies are found on the manufacturing and service sectors in developed countries (Evangelista & Vezzani, 2010; Gunday et al., 2011; Mothe & Nguyen, 2012, 2010; Schmidt & Rammer, 2007). They show

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Table 1
Types of innovation across time.

Author	Types of innovation
Schumpeter (1934)	New products, new methods of production, new sources of supply, the exploitation of new markets, new ways to organize business
Knight (1967)	Product or service innovation, production-process innovation, organizational structure innovation, people innovation
Evan (1966)	Administrative and technical innovations
Deward and Button (1986)	Incremental and radical innovations
Garcia and Calantone (2002)	
Damanpour (1987)	Technical innovation, administrative innovation, ancillary innovation (it requires the involvement of clients)
Cooper (1998)	Administrative and technical (incremental or radical) Process and product (incremental or radical)
OECD (2005)	Product innovation and process innovation (technological innovations)
Schmidt and Rammer (2007)	Organizational innovation and marketing innovation (non-technological innovations)
Francis and Bessant (2005)	Product innovation, process innovation, position innovation (commercial or marketing related), paradigm innovation (changes in mental models of organization)
Oke, Burke, and Myers (2007)	Product (radical or incremental), service innovation, process innovation (administrative, service or production)
Rowley et al. (2011)	Product innovation (product, hybrid or service) Process innovation (technical, production, administrative, organizational structure, people and management) Position innovation (commercial/marketing and business systems) Paradigm innovation
Kjellberg, Azimont, and Reid (2015)	Market innovations: "as changes in the way business is done" (including changing existing market structure, introducing new market devices, altering market behavior, and reconstituting market agents)
Nagy et al. (2016)	Disruptive innovations: "an innovation with radical functionality, discontinuous technical standards and/or new forms of ownership that redefine marketplace expectations"
Purchase, Kumn, and Olaru (2016)	Technical innovation Commercialization innovation Ambidextrous (it combines resources of both technical and commercial)

that *innovative performance*, defined as the percentage of total sales coming from new innovative products for the market, and *propensity to innovate*, defined as the implementation of future innovations, are affected by the interaction of technological and non-technological innovations (Cassiman & Veugelers, 2006; Mothe & Nguyen, 2010, 2012). These studies provide a good theoretical basis and new guidelines to enhance knowledge across industries in emerging economies.

Our study seeks to spread out the understanding of the interrelationships of technological and non-technological innovations in the innovative performance of firms and the propensity to innovate of firms across diverse industries. This issue contributes to our understanding of how to improve business performance. First, identifying what innovations have to perform the firms to be more innovative and second, determining what innovations contribute to perform different types of future innovations, and generating business strategies to develop innovations related to innovative performance.

This particular kind of research is necessary in the management and industrial marketing literature as it increases the discussion of the determinants of future business innovations, by incorporating analysis of what technological and non-technological innovations contribute to the future development of various types of innovations (product, service, marketing and organizational). The majority of previous research is only related to product innovation (Mothe & Nguyen, 2012). Moreover, this study contributes to the discussion of what innovations are

Table 2
Types of aggregate innovations and their activities or subtype of innovations.

Source: Oslo Manual (OECD, 2005) and VII National Survey of Innovation of Chile (INE, 2012) adapted by authors.

Types of innovation	Activities of subtypes of innovations
Product	New goods or significantly improved New services or significantly improved
Process	A new or significantly improved manufacturing method of goods and services A new or significantly improved logistic method, delivery or distribution of inputs, goods or services A new or significantly improved support activity for process, like a maintenance systems or operations for purchasing, accounting or computing
Organizational	New business practices for the organization of processes (e.g. management of supply chain, process reengineering, quality management) New methods of organization and decision-making responsibilities (e.g. new management responsibilities, restructuring, training systems) New methods of organizing external relations with other firms or public institutions (i.e. first use of alliances, subcontracting)
Marketing	Significant changes in the design and packaging of products (goods and services). Excludes changes that alter the functionality or use of the product characteristics (this would be product innovation) New media or techniques for product promotion (e.g. the first use of a new advertising medium, new brand image) New methods for product distribution channels (e.g. the first use of franchising or licensing distribution, direct sales, new product concept presentation) New methods of pricing of goods or services (e.g., the first use of variable demand price, discount system)

related to innovative performance, a key dimension of business performance (Gunday et al., 2011; Jiménez-Jiménez & Sanz-Valle, 2011). Additionally, these contributions are tested in the context of an emerging economy, seeking to establish whether there are field differences with developed countries in the sectors of manufacturing and services, adding the agriculture sector, of vital economic, social and territorial importance in the context of emerging countries (ECLAC, FAO, IICA, 2010). Specifically, the research setting is in Latin American, specifically Chile. This country is considered the top one in the Latin America Index of Competitiveness and 33rd in the global ranking. Additionally, it is in the 46th position in the Global Index of Innovation.¹

Furthermore, it is important from a policy maker's perspective for the following two reasons: First, developed economies face the problem of slow growth, and this has changed the role and challenges of firms, such as those located in emerging economies (Mitchell & Tsui, 2012). This new trend calls for a significant reshaping of competition and innovation (Levitt, 1983; Yip, 2003). Therefore, for emerging countries, a better understanding of firms' innovation and new business models is crucial in order to compete in the global marketplace (Johnson, 2010). Second, by understanding how technological and non-technological innovations are currently affecting innovation performance and technological and non-technological propensities to innovate, public policy makers may create new market oriented tools that improve their policies. For example, by creating new industrial studies that allow learning which are those areas that are weakly addressed and elaborating new tools that allow firms to improve their efficiency regarding innovation.

In sum, our study tries to answer the following questions: 1) How are technological and non-technological innovations related to innovative performance of firms and to their propensity to innovate? 2) Can the findings be generalized across industries? How do industries differ? To address our research questions, we test the effects of non-technological innovations in the innovative performance with a logistic model for

¹ The Global Innovation Index, [www.globalinnovationindex.org].

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