



# The impact of Triple Helix agents on entrepreneurial innovations' performance: An inside look at enterprises located in an emerging economy



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## ABSTRACT

During the past few decades, the configurations of new knowledge-intensive environments have required fertile settings for innovative and entrepreneurial activities. In these environments, Triple Helix has been operationalized in different ways, spaces, and contexts where those agents are transforming their roles in the development and strengthening of national innovation and entrepreneurial ecosystems. As a consequence, the phenomenon of entrepreneurial innovations emerged from enterprises with an entrepreneurial or high-growth orientation that collaborate with Triple Helix agents generating economic benefits and spillover effects. In emerging economies, the available literature about innovation and entrepreneurship is limited to explore the determinants of innovation performance as well as innovation constrains. Based on this argument and diverging from prior research, this research tries to provide a better understanding about the influence of Triple Helix agents on entrepreneurial innovations' performance of enterprises located in emerging economies. In particular, we analyze the effects produced by the links of enterprises with other enterprises, universities and government on their innovation performance (e.g., access to knowledge/technology, sources of funding, government subsidies), as well as, the moderation effects generated when those enterprises have a high-growth orientation (e.g., distinction of enterprises that develop entrepreneurial innovations or traditional innovations). To achieve this aim we look inside at the case of Mexico because is an emerging economy that during the last two decades has facing a transition to a knowledge-based economy. Using a cross-section dataset of 19,188 Mexican enterprises interviewed in the period of 2006 to 2012, we tested our proposed conceptual model with a Tobit regression. Our study provides interesting implications for the main actors involved in the Mexican Science, Technology and Innovation System, as well as, contributes about the debate of the impact of enterprises-university-government linkages on entrepreneurial innovations from diverse perspectives and research fields (e.g., open innovation, knowledge transfer, high-growth entrepreneurship, academic entrepreneurship, public entrepreneurship).

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## 1. Introduction

During the past few decades, the configurations of new knowledge-intensive environments have required fertile settings for innovative and entrepreneurial activities. Both types of activities play a crucial role in the economy, and many studies have examined the factors that influence these activities. Despite innovation and entrepreneurship being multidimensional processes, empirical studies continue to employ models that presume that these phenomena occur at a single point in time (McMullen and Dimov, 2013). Those facts explain why the Triple Helix concept has been operationalized in different ways (e.g., with/without government intervention, closed/opened, administrated/

entrepreneurially, etc.) in different spaces (e.g., global, national, regional, local) and in different contexts (e.g., organizational, institutional, technological, social, etc.). Because of this diversity, there has been growing interest in the study of how Triple Helix organizations transform their roles and practices in the development and strengthening of national innovation and entrepreneurial ecosystems (Etzkowitz and Leydesdorff, 2000; Leydesdorff and Ivanova, in press). Therefore, how different agents operate, collaborate, make decisions, identify benefits, or transform their roles is still an interesting research area (Cunningham and Link, 2015; Cunningham et al., 2014) with special attention in emerging economies where are introducing conventional strategies during their transformation into knowledge economies (Wright et al., 2005). In this regards, in both temporal and spatial contexts, entrepreneurial innovation is the result of a variety of elements that compare the attributes of national innovation systems, entrepreneurship, contextual influences and the main benefits for the actors

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involved in this process (Autio et al., 2014). However, only a few studies have worked in the intersection of entrepreneurship and innovation literature (Zahra and Wright, 2011).

Applying these perspectives, this research focused on the influence of Triple Helix agents on the performance produced by entrepreneurial innovations defined such as the economic benefits obtained from innovations by enterprises with an entrepreneurial orientation (i.e., Ireland et al., 2009 operationalize this orientation in terms of risk-taking, proactiveness, and innovativeness). Given the difficulties to operationalize the entrepreneurial enterprises and based on the arguments exposed by Autio et al. (2014), we adapted the high-growth orientation criteria (Audretsch, 2012; OECD, 2010) introducing the basis of innovations' performance (Klomp and van Leeuwen, 2001; Laursen and Salter, 2006; Stam and Elfring, 2008; Thornhill, 2006; Tsai and Wang, 2009; Wiklund and Shepherd, 2005; Yamin and Otto, 2004; Zott and Amit, 2007) to identify enterprises that develop entrepreneurial innovations and obtained benefits from those type of innovations. More concretely, we apply this distinction to enterprises that development innovations and that have an orientation annualized to growth >20% - in both in terms of number of employees and in terms of turnover - per annum over a three year period. In this scenario, micro-foundations of Triple Helix organizations are explored through the main actors and actions involved in the development of entrepreneurial innovations' performance. Based on these arguments and diverging from prior research, our study offers three contributions.

Firstly, *linking innovation performance and the access of technology/knowledge from R&D collaborations*, traditional literature has largely focused on knowledge transfer and innovation, devoting particular attention to performance issues. It is widely agreed that innovation plays a major role in enterprises that try to survive in the market, especially by complementing their resources and capabilities required to improve their performance (Ireland et al., 2009). Empirical studies found that innovation practices produced positive effect on enterprise performance (Zott and Amit, 2007). However, research has been strictly focusing on R&D cooperation with competing firms, and has paid little attention to R&D collaboration with universities, or with firms that are not direct competitors (Belderbos et al., 2004). Exploring R&D collaboration allows understanding the role of internal/external agents involved in the innovation process (Huizingh, 2011). In this point of view, Belderbos et al. (2004) argue that any type of cooperation implies a decision to choose the type of partner when the enterprise requires knowledge for the innovation process (scientific), or when exhibit faster technological and product development (commercial or intrapreneurial) or when is looking for a source of competitive advantage to have long lasting effects on firm performance (mixed). Even than a number of empirical studies have found a positive impact of engaging in R&D cooperation on innovation performance (Klomp and van Leeuwen, 2001; Faens et al., 2005), others studies have obtained ambiguous results (Hall, 2005). An explanation is a substantial heterogeneity in the determinants to establish R&D collaborations with different partners and their impact on innovation performance. It could be related to the measures used to analyze performance but also with the enterprise incentives to cooperate such as a high-growth orientation (Van Leeuwen and Klomp, 2001). However, the enterprises' decision about the selection of a Triple Helix collaborator has been not explored in terms of the distinction of entrepreneurial innovations as well as in the context of emerging economies. In this sense, this paper expects to contribute to the open innovation literature debate about the necessity of exploring the main effects produced by enterprises' selection of internal/external collaborations for the development of entrepreneurial innovations (Leydesdorff and Ivanova, in press), as well as, to the debate of the implementation of new open innovation models to capture the benefits of collaborations among Triple Helix agents (Chesbrough, 2012).

Secondly, *linking innovation performance and the access of funds from R&D collaborations*, financial literature recognized a gap in the analysis and use of internal funds for innovation beyond the favorable tax

treatment experimented in some many countries (Hall and Lerner, 2010). It provides an interesting opportunity to explore the role of Triple Helix agents that provides innovation funds. In this regards, the innovation literature also recognizes that the main innovation constrain that faced enterprises located in emerging economies (e.g., Brazil, Mexico, Central America) is associated to the access to financial sources based on the scant and insufficient bank loads or venture capital markets (Santiago et al., 2016). Moreover, a common practice in emerging economies is that policymakers establish the requirement of the development of enterprise-university partnership or commercial partnership to receive some innovation subsidies (Cohen et al., 2002; Czarnitzki et al., 2007). In this sense, this paper expects try to contribute to the financial literature debate about the gap in the analysis and in the use of internal/external source of funds for financing entrepreneurial innovations in emerging economies (Hall and Lerner, 2010; p. 40), as well as, the impact of subsidies on enterprises with an entrepreneurial and innovative behavior and that supported their innovations by other sources (Czarnitzki and Lopes-Bento, 2013; p.31). In this scenario, universities play a relevant role such as partner that provides new technology/knowledge as well as the access to government subsidies (Audretsch, 2014). However, the decision to select public/private innovation funds will depends on the opportunity cost that implies each fund for enterprise strategies (Hall, 2005; Moreno and Casillas, 2007). In this regard, the literature about the impacts of universities in entrepreneurial and innovation processes is limited. In this sense, this paper expects to contribute to knowledge transfer literature debate about to obtain a view or performance indicators of the impact of university-enterprises collaboration on entrepreneurial innovations (Grimaldi et al., 2011; p.1053; Guerrero et al., 2015).

Thirdly, *linking innovation performance and the socio-economic context*, entrepreneurship literature also recognizes that any entrepreneurial and innovative activity is influenced by contextual conditions (Thornton et al., 2011). In competitive and uncertain environments, innovation is a necessary feature for an enterprise to develop an organizational strategy, bring innovations to the market, satisfy customer needs, and ensure survival (Boyd, 1991). We can observe an inverse relationship because innovation contributes to regional development but at the same time regional conditions affect the development of innovation. According to this argument, the major policy challenge is an adequate configuration of Innovation and Entrepreneurship Ecosystems (Autio et al., 2014). However, the configurations and the benefits among the links of entrepreneurial and innovative enterprises with the other Triple Helix agents are not well understood; particularly, in emerging economies that experiment complex socio-economic conditions (Edwards, 2001; Meyer et al., 2009; Wright et al., 2005) liked to the lack quality of their institutions (Sobel, 2008). In this sense, this paper expects to contribute to the entrepreneurship literature debate about the national systems of innovation, entrepreneurship, and entrepreneurial innovations; more concretely, about the impact of context for entrepreneurial innovation and enterprise growth in emerging economies (Autio et al., 2014; p. 1089 and p.1104).

Based on these arguments, the purpose of this research is to provide a better understanding about the influence of Triple Helix agents on entrepreneurial innovations' performance of enterprises located in emerging economies. More concretely, we analyze the effects produced by the links of enterprises with other enterprises, universities and government on their innovation performance (e.g., access to knowledge/technology, sources of funding, government subsidies), as well as, the moderation effects generated when those enterprises have a high-growth orientation (e.g., distinction of enterprises that develop entrepreneurial innovations or traditional innovations). We selected the case of Mexico to understand the ways, the spaces, and the contexts associated with Triple Helix agents that affect entrepreneurial innovations' performance of enterprises located in emerging economies. Authors such as Hoskisson et al. (2000); Kuznetsov and Dahlman (2008) and Solleiro and Castañón (2005) argue that Mexico is facing a transition to a

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