Ph. D. Dissertation in Engineering

Exploring the relationship between organizational innovation, dynamic capabilities and firm performance

- Evidence from Latin America-

조직혁신, 동적역량과 기업성과 간의 관계 탐구
: 라틴 아메리카를 중심으로

August 2018

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이 논문을 공학박사학위논문으로 제출함

2018 년 06 월

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2018 년 06 월

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Abstract

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Organizational innovations play as important a role as technological innovations in achieving business success and economic growth. Over

the years, research on organizational innovations has gained momentum and innovations are being considered as a source of sustainable competitive advantage. Innovations help improve management principles and firm efficiency in overcoming environmental uncertainties.

Dynamic capabilities indicate an organization's capacity to transform resources and competences to achieve environmental fitness. They have been widely covered in management sciences as they provide a comprehensive framework for understanding organizational change.

However, the association between dynamic capabilities and organizational innovations requires further exploration. Building on previous research, my study uses a multi-dimensional approach to dynamic capabilities referring to ordinary and high-order capabilities. Using firm-level data from the Latin America region, my study shows a substitution effect between ordinary capabilities and organizational innovations and provides evidence on the positive influence that dynamic capabilities have on a firm's performance through the adoption of organizational innovations.

The relationship between organizational and technological innovations and its effect on a firm's performance has also received attention in literature though the perspectives on this are divided. Both sets of innovations have a direct impact on performance. Recent evidence suggests that what is needed is a holistic approach to understand the intrinsic relationship between innovative activities. My study uses a fsQCA analysis for a sample of Latin American firms to explain the complex causal interactions between a firm's attributes and different types of innovations leading to better performance. My results show several equifinal solutions leading to a business' success.

Lastly, my study uses the dynamic capabilities view to investigate the adaptation processes that organizations follow by considering business practices as inter-related activities. My study uses the NK Model to simulate the adaptive processes followed by organizations through a fitness landscape.

Keywords: dynamic capabilities, organizational innovation, firm performance, fuzzy sets, fitness landscape.

Student Number: 2015-30758

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Chapter 1. Introduction

1.1 Motivation

The field of innovations has been dominated by studies on technological innovations (Camisón & Villar-López, 2014). Organizational innovations became a separate discipline in management sciences in the late 1990s (Černe et al., 2016). Even though the field was influenced by early studies, formal interest in the topic increased considerably during this period. According to Sanidas (2004) like technological innovations, organizational innovations also generate economic growth. Lin et al. (2016) explain that organizational innovations are the most important reason for competitiveness. According to Hamel (2006), 'Over the past century, breakthroughs such as brand management and the divisionalized organization structure have created more sustained competitive advantage than anything that came out of a lab or focus group.' Such an argument is convincing enough to

understand the implications of organizational innovations not only for managers but also for policymakers.

Bloom et al. (2012) show that management practices across countries are more advanced in developed nations. These offer developing nations an opportunity to rely on organizational innovations rather than on technological innovations for fostering economic growth. This is true especially if one considers that organizational innovations are not R&D intensive and therefore require only minor investments.

More importantly, implementing organizational innovations in a firm improves knowledge and leads to the accumulation of experience (Cohen & Levinthal, 1990) which are important prerequisites for organizational change.

Currently, there is no evidence on the effect that organizational innovations have on a firm's performance in the Latin American region as most research on this region has studied technological innovations (for example, Crespi et al., 2016).

Moreover, understanding theoretical perspectives is fundamental for an understanding of the emergence of organizational innovations as this helps provide practical solutions for business owners; it also helps in updating innovation policies.

My study uses the dynamic capabilities theory to provide a theoretical framework for my research. Research has provided a number of conceptualizations of dynamic capabilities. Teece et al., (1997) suggested what became the foundation of dynamic capabilities; theirs is also the most influential study in this domain. They established the dynamic capabilities approach as an advancement of a firm's resource-based view (RBV) (Barney, 1991). The resource-based view of an organization explains the conditions in which firms achieve sustainable competitive advantages based on their resources and capabilities. Resources must be valuable, rare, inimitable and non-substitutable (Barney, 1991; Grant, 1999). RBV assumes that a firm's resources and strategies are heterogeneous and hence are a unique source of competitive advantage. However, RBV considers a firm's resource base

as immobile and neglects the influence that changing environments have on it (Barreto, 2010; Wang & Ahmed, 2007).

The dynamic capabilities theory complements RBV by emphasizing two important aspects: first, the term ‘dynamic’ refers to the character of the environment in which a firm is competing, and second the term ‘capabilities’ refers to the fundamental role that strategic management plays in adequately adapting and reconfiguring organizational skills, resources and competences towards changing environments (Teece & Pisano, 1994).

Overall, the theory of dynamic capabilities addresses the importance of strategic management and how organizations can alter their resource base to achieve competitive advantage. It is perceived as a substantial complement to RBV. Both theoretical perspectives have been widely used in studies on innovations.

1.2 Problem statement

My dissertation investigates three perspectives of organizational innovations considering the dynamic capabilities theory as the

theoretical framework. The relationship between dynamic capabilities and competitive advantage has received considerable attention in literature. However, a major criticism of this relationship is that the concept of dynamic capabilities is tautological linked to success (Barreto, 2010; Wang & Ahmed, 2007). According to Eisenhardt and Martin (2000) dynamic capabilities are necessary but not sufficient for attaining a sustainable competitive advantage. Therefore, scholars suggest the necessity of identifying the indirect links between dynamic capabilities and performance through the operationalization of intermediary constructs. Previous studies have found the fundamental role that innovations play to be an important mediator of dynamic capabilities and a firm's performance. For example, Zhou et al. (2017) showed that technological and marketing innovations served as moderators between dynamic capabilities and competitive advantage. Lin et al. (2016) explored the relationship between dynamic capabilities and the management innovation process and Pai et al. (2013) found a positive and direct effect between dynamic capabilities and innovation performance. However, no previous research has considered

organizational innovations as an important mediator between dynamic capabilities and a firm's performance. Moreover, previous studies evaluate innovations and dynamic capabilities as separate domains. According to my study this gap in literature is because of lack of attention to how organizational innovations can be integrated into the dynamic capabilities framework with the intention of adequately discussing the paths to competitive advantages through the exploitation of a firm's capabilities.

Second, the association between organizational and technological innovations and its effect on performance has been the focus of attention of several scholars (e.g., Battisti & Stoneman, 2010; Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Gunday et al., 2011; Haned et al., 2012; Min et al., 2015; Mothe et al., 2015). However, research that explores the combined effect of these two modes of innovation on performance moves in two directions: that which supports the thinking that organizational innovations are an antecedent of technological innovations and that which finds that technological innovations enable organizational innovations. According to Ganter and Hecker (2014), this

lack of consensus and scattered results are attributable to the constrains of traditional analytical methods that fail to unveil complex interactions and interdependencies among the variables under study. Additionally, most studies of organizational innovations are merely descriptive and only a handful invoke a specific theory (Crossan & Apaydin, 2010). Černe et al. (2016) suggest a new research direction mentioning the necessity of understanding the complementarities between organizational and technological innovations under an integrated perspective. My study presents a set-theoretic methodological approach to organizational innovations (a fuzzy-set comparative qualitative analysis). Although previous research has followed this approach to study innovations at the firm and country levels (e.g., Ali et al., 2016; Crespo & Crespo, 2016; Ganter & Hecker, 2014), this method has not been used to explore the relationship between organizational and technological innovations under the dynamic capabilities view of a firm.

Third, earlier studies have identified important determinants of organizational innovations such as characteristics of leaders and managers, organizational attributes and structures, individual factors and

the institutional context (e.g., Damanpour, 1991; Damanpour & Evan, 1984; Damanpour et al., 1989; Kimberly & Evanisko, 1981). Most recent studies show that organizational context and internal and external sources of knowledge are important antecedents of organizational innovations (e.g., Ganter & Hecker, 2013). Mol and Birkinshaw (2009) discuss how firms adopt organizational innovations by providing a theoretical reasoning to show that the introduction of novel management practices is a consequence of a firm's necessity to adopt new ideas that can be learnt from other parties and relations. A similar phenomenon is also explored by Teece (2018), the founder of the dynamic capabilities theory. According to him, a fundamental component of dynamic capabilities is a firm's ability to recognize opportunities through the implementation of 'search' activities to find out what is going on in the business ecosystem (Teece, 2007). Apart from (Mol & Birkinshaw, 2009) and (Ganter & Hecker, 2013), very few studies have adopted a knowledge search perspective to explain how organizations adopt new business practices. My study addresses this gap and complements prior research by employing a systemic view of dynamic capabilities recently

introduced by Teece (2018). Till date, there is no empirical evidence following this new perspective of dynamic capabilities.

Lastly, no existing research investigates organizational innovations and their effect on a firm's performance and complementarities with other types of innovations in the Latin American region. The anecdotal evidence available so far is biased towards technological innovations (for example, Crespi et al., 2016).

1.3 Research purpose, questions and outline

With the intention of contributing to the field of organizational innovations and addressing the knowledge gap described in the previous section, my dissertation answers three research questions following the research framework presented in Figure 1.

First, several scholars have explained the relationship between dynamic capabilities and competitive advantage by adopting a multi-dimensional approach (e.g., Helfat & Peteraf, 2003; Pavlou & El Sawy, 2011; Protogerou et al., 2011; Zahra et al., 2006). These studies decompose dynamic capabilities into ordinary capabilities (low-order)

and higher-order capabilities. Ordinary capabilities represent a bundle of activities and routines that enable organizations to execute their day to day operations, while higher-order capabilities entail the modification of ordinary capabilities to alter business functioning. Previous studies have found that innovations are a mediator between ordinary capabilities and a firm's performance. (Lin et al., 2016; Mu, 2017; Pai et al., 2013; Zhou et al., 2017). Hence, my study raises the question: What is the relationship between organizational innovations, dynamic capabilities and a firm's performance? To find an answer to this I propose organizational innovations as a high-order capability to understand the impact of ordinary capabilities in the adoption of organizational innovations. My study also explores their effect on a firm's performance.

Second, literature explains that competitive advantages arise from a combination of different innovations, explaining that superior firm performance is a result of both organizational and technological innovations (e.g., Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Mothe et al., 2015; Schmidt & Rammer, 2007). My study complements these findings by answering the research question: How do

complementarities between organizational and technological innovations affect a firm's performance under the framework of dynamic capabilities? In answer my study provides further evidence from quantitative and qualitative research investigating the relationship between organizational and technological innovations under the dynamic capabilities framework of organizations by using the fuzzy-set qualitative comparative analysis (fsQCA).

Third, according to existing research attributes the adoption of organizational innovations to search mechanisms that represent managerial activities intended to seek out new business practices available in the business ecosystem (Massini et al., 2005; Mol & Birkinshaw, 2009). Similarly, the dynamic capabilities theory describes adaptive capabilities as search routines that constitute a wide range of activities aimed at identifying 'best practices' in the organizational context in which a firm operates (Pavlou & El Sawy, 2011; Teece, 2007). Both perspectives agree on the way in which new managerial ideas come from different knowledge sources. Lin et al. (2016) found that adaptive capabilities positively influenced the adoption of organizational

innovations. Therefore, my study addresses the research question: How are organizational innovations adopted under the framework of dynamic capabilities? My study explores the concept of search and adaptation by organizations following a systemic view of dynamic capabilities.

The research framework of my dissertation is summarized in Figure 1.

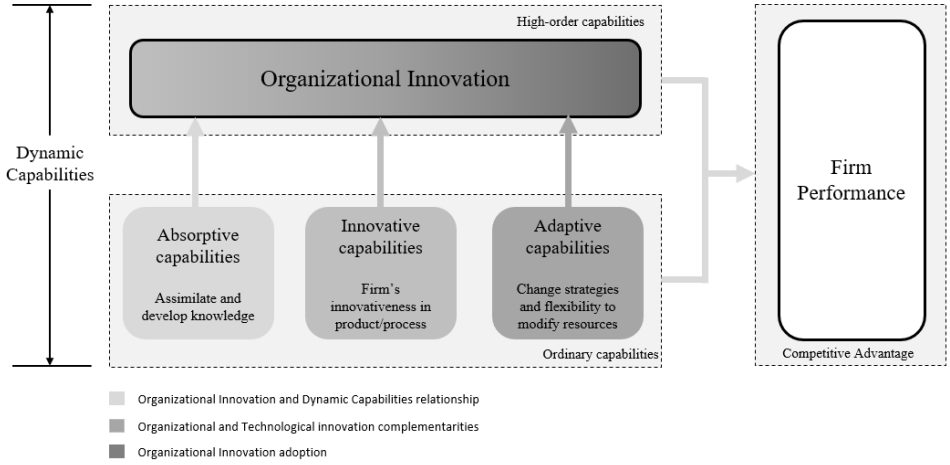

Figure 1. Research framework

1.4 Research contributions

Chapter 3 analyzes the mediating role that organizational innovations play between dynamic capabilities and a firm's performance using a generalized ordered logistic regression and ordinary least square modeling. My study's findings provide further evidence of the evolution and emergence of dynamic capabilities through the integration of the concept of organizational innovations and the dynamic capabilities framework.

Chapter 4 implements the fuzzy-set qualitative comparative analysis (fsQCA) to investigate the inter-relation between organizational and technological innovations in explaining a firm's performance. The analysis explains that several combinations of a firm's innovative capabilities lead to a similar outcome, thus showing some discrepancies regarding the relationship between organizational and technological innovations.

Chapter 5 explores the influence of knowledge sources and firm level attributes as fundamental determinants influencing the processes

that businesses undergo to adopt organizational innovations. It explains this phenomenon using agent-based modeling. These findings contribute to a new research avenue of dynamic capabilities by describing the effect of complex interdependencies of a firm's sub-systems of activities and their relation to environmental adaptation.

Additionally, these findings provide further evidence on the importance of organizational innovations in achieving superior performance in the Latin American region.

1.5 Research structure

The structure of this dissertation is as follows. Based on previous literature, Chapter 2 describes the main research domains of the dynamic capabilities theory and the theoretical background of organizational innovations. It provides details of the definitions that it uses and gives an overview of the dynamic capabilities framework. Chapter 3 investigates the relationship between dynamic capabilities and organizational innovations and their effect on competitive advantage. Chapter 4

evaluates the association between organizational and technological innovations and its influence on a firm's performance under the scope of the dynamic capabilities theory. Chapter 5 gives the determinants that influence the process which a firm follows for organizational innovations. The outline of these three chapters is summarized in Figure 2. Finally, Chapter 6 presents managerial and policy implications based on the findings of my study.

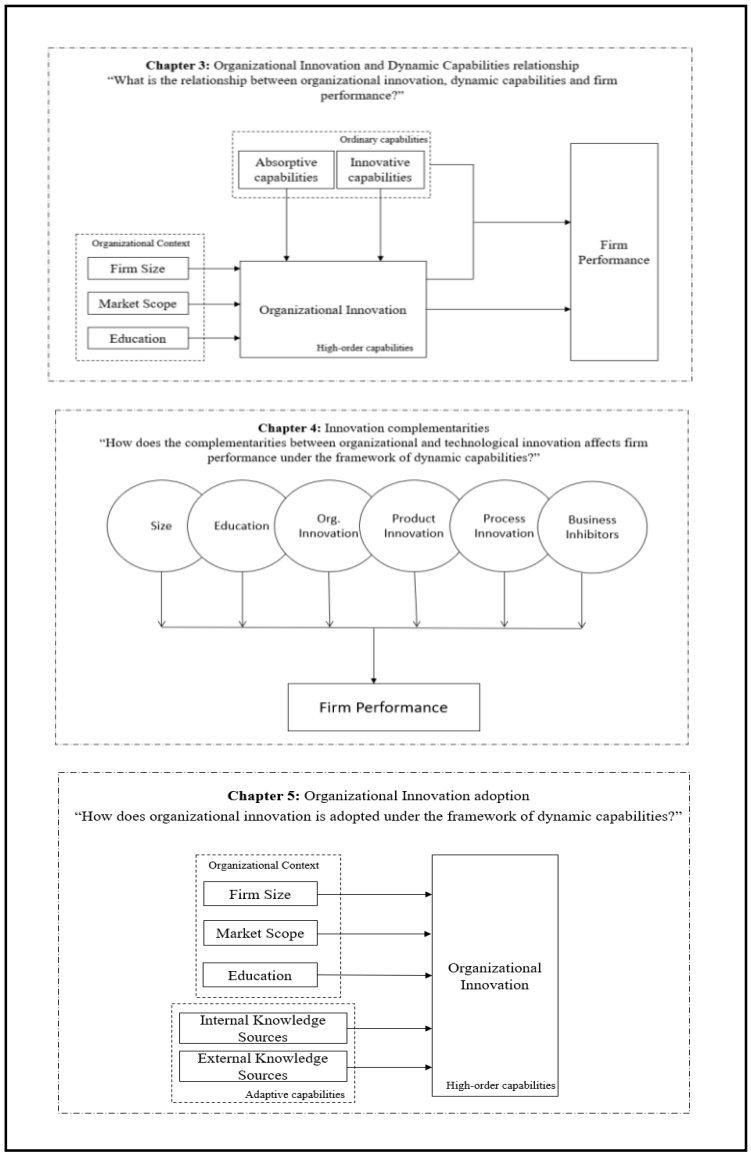

Figure 2. Research outline

Chapter 2. Theoretical background

2.1 Dynamic Capabilities

The concept of dynamic capabilities was introduced by Teece et al.'s (1997) influential work. Subsequently, literature focused on providing a deeper understanding of dynamic capabilities. Several attempts provided a distinction between the different research paths that were explored. For example, Peteraf et al., (2013) indicate that research on dynamic capabilities has been influenced by two knowledge domains: one is led by Teece et al., (1997) while the second is led by a seminar paper presented by Eisenhardt & Martin (2000). Both domains offer evolutionary and ecological perspectives of the dynamic capabilities theory (Arndt & Bach, 2015). However, regardless of this theoretical contrast in literature, numerous authors have criticized the dynamic capabilities theory by calling it a tautological concept, ambiguous, abstract and even vague (Barreto, 2010). Literature is also full of overlapping definitions and perspectives (Zahra et al., 2006).

However, regardless of these inherent contradictions, the dynamic capabilities theory has attracted the attention of scholars in management sciences with a large collection of contributions to the field. Dynamic capabilities have been examined in three main domains of research: the first one aiming to adjust dynamic capabilities definition, the second one trying to understand the emergence of dynamic capabilities and the third one related about how to measure dynamic capabilities.

2.1.1 Definition of dynamic capabilities

The first domain of research provides a comprehensive definition of dynamic capabilities (for example, Albort-Morant et al., 2017; Barreto, 2010; Eisenhardt & Martin, 2000; Teece et al., 1997; Wang & Ahmed, 2007; Wu et al., 2012). Earlier, dynamic capabilities were defined as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997). This offered a broader consideration of the influence that market dynamism had on a firm's reorganization and evolution over time to maintain a competitive advantage. Before Teece et al.'s (1997) study,

this perspective was overlooked by management theories. Later, Eisenhardt and Martin (2000) proposed that dynamic capabilities are the antecedents on which firms rely to establish organizational processes and strategic routines by altering their resource bases to generate new value-creating strategies (for example, product development, forging alliances and other strategic decisions that manipulate the resource configuration). In other words, dynamic capabilities are 'the drivers behind the creation, evolution, and recombination of other resources into new sources of competitive advantage' (Eisenhardt & Martin, 2000). According to Helfat et al., (2009) dynamic capabilities are an organization's capacity to purposefully create, extend or modify its resource base. Alternatively, Barreto (2010) states that dynamic capabilities are a firm's potential to systematically solve problems with timely and market-oriented decisions (Table 1).

Table 1. Definitions of dynamic capabilities

Study	Definition
Teece et al., (1997)	A firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments.
Eisenhardt and Martin (2000)	A firm's processes that use resources, specifically processes to integrate, reconfigure, gain and release resources to match and even create a market change. Thus, dynamic capabilities are organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die.
Teece (2000)	The ability to sense and then seize opportunities quickly and proficiently.
Zollo and Winter (2002)	A dynamic capability is a learned and stable pattern of collective activity through which an organization systematically generates and modifies its operating routines in pursuing improved effectiveness.
Zahra et al., (2006)	The ability to reconfigure a firm's resources and routines in an envisioned manner which is deemed appropriate by its principal decision-maker(s).
Wang and Ahmed (2007)	A firm's behavioral orientation to constantly integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to a changing environment to attain and sustain competitive advantages.
Helfat et al., (2009)	An organization's capacity to purposefully create, extend or modify its resource base.
Barreto (2010)	A firm's potential to solve problems systematically; this is formed by its propensity to sense opportunities and threats, to take timely and market-oriented decisions and to change its resource base.
Pavlou and El Sawy (2011)	Dynamic capabilities as a means of addressing turbulent environments by helping managers extend, modify and reconfigure existing operational capabilities into new ones that better match the environment.

2.1.2 Emergence of dynamic capabilities

The second domain of research answers a more important question: How do dynamic capabilities emerge? It is evident from previous studies that there is a degree of uncertainty around the definition of dynamic capabilities. Nonetheless, some authors have focused on understanding the nature of such capabilities and what 'triggers' their creation and use. My study contributes to this research path.

Zollo and Winter (2002) argue that dynamic capabilities emerge when organizations undergo improvements in their operating processes as a result of organizational activities that arise from the establishment of a learning mechanism. Their main premise is that accumulating organizational knowledge evolves into 'operational routines', while dynamic capabilities constitute the modifications to such operating routines. Winter (2003) theorized a hierarchical approach to the concept, referring to 'ordinary' or 'zero-order' capabilities which is explained by Albort-Morant et al., (2017) as 'how we earn a living now.' Dynamic capabilities are the rate of change of ordinary capabilities into 'higher-

order' capabilities with an indirect impact on organizational performance. In the same line, Helfat and Peteraf (2003) and Helfat and Winter (2011) suggest ordinary capabilities as the area in which dynamic capabilities operate and indirectly contribute to a firm's output. Further, Pavlou and El Sawy (2011) state that dynamic capabilities influence a firm's performance by reconfiguring its ordinary capabilities in turbulent environments.

Zahra et al., (2006) argue that the emergence of dynamic capabilities is determined by a firm's entrepreneurial behavior and add that dynamic capabilities are 'the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-maker(s).' In other words, the creation and use of dynamic capabilities is triggered by an organization's capacity to recognize opportunities that enable a change in existing routines or resource reconfigurations. My study considers this conceptualization because of its inter-relation with organizational innovations. Zahra et al., (2006) add that the creation of dynamic capabilities follows two important considerations: first, the value that they provide to managerial

decisions for recognizing opportunities and therefore triggering the modification of ordinary capabilities into new business practices, and second by a firm's necessity to change as a direct response to environmental uncertainties such as market dynamism and business regulations.

2.1.3 Commonalities in dynamic capabilities

The third body of research develops a construct on which dynamic capabilities can be measured for practical purposes. Eisenhardt and Martin (2000) recognize that rather than being firm specific as previously expected, commonalities in dynamic capabilities can be observed among firms and industries. Most of the studies in this stream of research measure dynamic capabilities as multi-dimensional constructs. Teece (2007) explains that to maintain a competitive advantage, organizations cannot rely only on difficult to replicate (knowledge) assets and they also need to work on difficult-to-replicate dynamic capabilities. These are divided into three types of capacities: the capacity to sense and shape opportunities (that is, sensing capabilities); the capacity to seize

opportunities (that is, seizing capabilities); and the capacity to reconfigure intangible and tangible assets (that is, reconfiguring capabilities) of a business. Wang and Ahmed (2007) did an exploratory study of previously published papers. They identified four commonalities: the capacity to change strategies and the flexibility to modify resources (that is, adaptive capabilities); the capacity to assimilate and develop knowledge from external sources (that is, absorptive capabilities); and the capacity to bring a firm's innovativeness to the marketplace (that is, innovative capabilities). Wu et al., (2012) identified three components: scanning, identification and reconfiguration capabilities. Pavlou and El Sawy (2011) propose a measurable model of dynamic capabilities composed of sensing, learning, integrating and coordination capabilities. With the objective of discovering the effect of dynamic capabilities on the adoption of management innovations, Lin et al., (2016) did a fuzzy cluster analysis of 62 dynamic capabilities available in literature. Their study found four commonalities: sensing capability for directional change; absorptive capability for organizational

learning; relational capability for relationships and social capital; and integrative capability for communication and coordination.

Collectively, these studies outline the composition of dynamic capabilities on the basis of a sub-classification of operational capabilities with each component having a particular functionality. Lin et al., (2016) explain that firms have different dynamic capabilities that serve different purposes (Table 2). Taken together these findings in literature on the commonalities of dynamic capabilities serve as a reference point for developing measurable constructs for observing their effects on performance or organizational change.

Table 2. Components of dynamic capabilities

Component†	Description
Absorptive capabilities	Capacity to assimilate and develop knowledge from external sources.
Innovative capabilities	Capacity to links a firm's inherent innovativeness to marketplace-based advantages.
Adaptive capabilities	Capacity to change strategies and flexibility to modify resources.

Note: †Based on Wang and Ahmed's (2007) view of dynamic capabilities.

2.2 Organizational innovations

According to literature, the focus of organizational innovation research was not the primarily point of attention during the last few decades and the field was predominantly dominated by technological innovations (Lin et al., 2016). However, the situation has changed now and there is plenty of literature on the subject. Organizational innovation has been categorized as a sub-field of non-technological innovations (Černe et al., 2016) and its conceptualization has evolved with a range of innovation studies. This section describes the three main research paths followed in this field.

2.2.1 Definition of organizational innovation

The first research domain focuses on terminology. Literature on organizational innovations evolved from a previous conceptualization of the topic and has now become the main focal point in management research. Early studies investigated the adoption of organizational innovations. Daft (1978) gave a dual model of innovations stating that innovations happened in an organization's administrative and technical

systems. Organizational innovations sprang from new ideas that could flow within a firm from top to bottom (administrative innovations) or from bottom to top (technical innovations). This conceptualization influenced organizational innovation research. Kimberly and Evanisko (1981) and Damanpour and Evan (1984) explored the impact of administrative and technological innovations on a firm's performance following the concept that 'innovations at the organizational level may involve the implementation of a new technical idea or a new administrative idea' (Damanpour & Evan, 1984). Later, Damanpour's (1991) influential work explained organizational innovations pertaining to technological innovations. These perspectives brought confusion to the field as they suggested that organizational innovations also included the development of new products or processes (Černe et al., 2016). Consequently, organizational innovations also included another aspect: the emergence of managerial innovations. Birkinshaw et al., (2008) define management innovations as the 'invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals.' This

concept entails all new business practices that are implemented as a result of managerial decisions. There is wide literature on this subject (for example, Damanpour & Aravind, 2011; Hamel, 2006; Mol & Birkinshaw, 2009). According to Damanpour and Aravind (2011) organizational, administrative and managerial innovations overlap significantly since previous research aimed to differentiate administrative innovations from technological innovations.

OECD (2005a) provides the most accepted and most used definition of organizational innovation as the 'implementation of a new organizational method in the firm's business practices, workplace organization or external relations.' This terminology encompasses the traditional view of management and administrative innovations and has been adopted by several studies (for example, Armbruster et al., 2008; Azar & Ciabuschi, 2017; Battisti & Stoneman, 2010; Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Koellinger, 2008). This concept differs from previous definitions (Camisón & Villar-López, 2014) as it considers not only new managerial and working concepts and practices within an organization, but also considers new business

practices aimed at pursuing external relations (for example, Armbruster et al., 2008) (Table 3). This concept avoids definitions overlapping, therefore I use this concept in my study.

Table 3. Definitions of organizational innovations

Author	Terminology	Definition of OI
Daft (1978)	Administrative innovations / technical innovations	The adoption of a new idea or behavior in relation to the organization's technical environment.
Kimberly and Evanisko (1981)	administrative innovations / technical innovations	Adopting innovations as a result of administrative and technical decisions.
Damanpour and Evan (1984)	Administrative innovations / technical innovations	Innovations at the organizational level may involve the implementation of a new technical or a new administrative idea.
Damanpour (1991)	Organizational innovations	The adoption of an internally generated or purchased device, system, policy, program, process, product or service that is new to the firm.
OECD (2005a)	Organizational innovations	Implementation of a new organizational method in the firm's business practices, workplace organization or external relations.
Birkinshaw et al., (2008)	Management innovations	Invention and implementation of a management practice, process/ structure or technique that is new and is intended to further organizational goals.
Armbruster et al., (2008)	Organizational innovations	The use of new managerial and working concepts and practices.
Mol and Birkinshaw (2009)	Management innovations	Introduction of management practices that are new to a firm and

		are introduced to enhance performance.
Damanpour and Aravind (2011)	Managerial innovations	New approaches in knowledge for performing management work and new processes that produce changes in the organization's strategy, structure, administrative procedures and systems.

2.2.2 Definitions of technological innovations

To maintain compatibility with the definition of organizational innovation, my study follows OECD's definition of technological innovations. Technological innovations comprise of product and process innovations (Camisón & Villar-López, 2014). A product innovation is 'the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses' while process innovation is 'the implementation of a new or significantly improved production or delivery method' (OECD, 2005a).

2.2.3 Organizational innovation as a non-technological process

The second research domain views organizational innovations as a non-technological process, explained as a multi-phase iterative

procedure that is initiated by recognizing an opportunity and finalized with the adoption of a new idea (Birkinshaw et al., 2008; Hamel, 2006; Lin et al., 2016; Van de Ven, 1986; Zaltman et al., 1973). Evaluating the organizational innovation process provides managers and decision makers a framework that guides their actions (Van de Ven, 1993). Much of the current literature on managerial innovations describes various sub-processes of managerial innovations. Hamel (2006) suggests that a management innovation is a systemic process for producing organizational advancement. He mentions several aspects: commitment to a big management problem, novel principles that illuminate new approaches, a deconstruction of management orthodoxies and analogies from atypical organizations that redefine what is possible. Birkinshaw et al., (2008) propose the following process for management innovations: i) motivation which refers to conditions in which an organization's members experiment with new management practices driven by problem identification; ii) invention which involves designing new hypothetical management practices to be implemented; iii) implementation which includes arranging the technical aspects required for the adoption of

management practices and employee retention; and iv) theorizing and labeling which refer to the validation of new management innovations within an organization.

Lin et al., (2016) analyzed the impact of dynamic capabilities in a four-phase process for adopting management innovations: i) initiation which reflects a firm's recognition of the need to implement management innovations to tackle an organizational problem; ii) an outside search which is a concept of reaching out for new information or 'best practices' observable in external partners that best fit organizational goals; iii) proposal establishment which is a specific process that must be created and is usually supported by re-engineering methods and information technologies that allow new management practices to be internalized; and iv) innovation implementation which requires testing and absorbing innovations in a firm's structure and securing acceptance among employees, accompanied by some technical reinforcements.

In contrast, Van de Ven (1993) presents a model of the organizational innovation process which encompasses six inter-related phases: i) initiation of a change process that sets the stage for launching

an organizational innovation; ii) concentrated actions to allocate resources which allow organizational participants to make concerted efforts; iii) implementing innovative ideas diverging and converging into different paths of activities over time; iv) setbacks signaling rejection of the innovation or an opportunity for reinventing ideas; v) innovation receptiveness and evaluation to modify innovations to fit local situations; and vi) innovation assessing so that the success of its implementation is secured with experience and learning from past attempts. Additionally, Van de Ven (1993) also state '… to stay in business, most organizations have developed effective and efficient routines to manage a wide variety of recurring changes…' implying that the organizational innovation process is a non-linear cycle that involves the application of a set of social, learning and organizational activities that transform novel practices into routines. Similarly, Zaltman et al., (1973) describe a five-phase generic model applicable to organizational and technological innovations: knowledge awareness, forming attitudes, taking decisions, initial implementation and continued sustained implementation. Their model delineates the process of implementing an innovation starting

from recognizing an opportunity and ending when the innovation is considered a routine part of organizational life (King, 1992). Thus, the process of innovation adoption is observed as a special case of organizational change (Damanpour & Aravind, 2011). My study maintains that the implementation of organizational innovations represents a bundle of inter-related activities embedded in organizational routines.

2.2.4 Organizational innovations and a firm's performance

The third research path identifies the antecedents of organizational innovations. Early studies in this domain identified key determinants such as characteristics of organizational leaders and managers, organizational attributes and structures, individual factors and the institutional context (for example, Damanpour, 1991; Damanpour & Evan, 1984; Damanpour et al., 1989; Kimberly & Evanisko, 1981). These studies elaborate on a homogenous theoretical background which then stems into organizational innovation research (Černe et al., 2016).

However, recent research points out that the organizational context and internal and external sources of knowledge are important ingredients of organizational innovations (for example, Ganter & Hecker, 2013).

Additionally, several studies empirically explore the relationship between organizational innovations and other modes of innovations (for example, Battisti & Stoneman, 2010; Gunday et al., 2011; Schmidt & Rammer, 2007) and their association with a firm's performance (for example, Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Hervas-Oliver et al., 2014; Mol & Birkinshaw, 2009). My study adds to these findings.

2.2.5 Complementarities in organizational and technological innovations

The conditions that enable organizational innovations are typically attributed to factors related to leadership capabilities, managerial levers and business processes (Crossan & Apaydin, 2010). In contrast, R&D intensity and technological assets are important preconditions for technological innovations (Černe et al., 2016). Shim et al., (2016) found

that an integration between R&D and marketing positively affected new product development. However, prior research exploring the combined effect of these two modes of innovations on performance is divided.

The first perspective indicates that organizational innovations are a result of technological innovations (for example, Battisti & Stoneman, 2010; Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Gunday et al., 2011; Haned et al., 2012; Min et al., 2015; Mothe et al., 2015). Implementation of new business practices, external relations and workplace organization improve processes and manufacturing efficiency (Camisón & Villar-López, 2014). Mothe et al., (2015) found that new methods of organizing routines and external relations had an effect on product innovations. Organizational innovations allow structural flexibility and knowledge articulation within a firm, promoting the generation of new ideas in an organization's technical domain.

According to the second perspective, technological innovations promote organizational innovations (Armbruster et al., 2008; Ganter & Hecker, 2013; Mol & Birkinshaw, 2009; Raisch & Birkinshaw, 2008; Schmidt & Rammer, 2007; Wang & Ahmed, 2004) (see Table 4). Ganter

and Hecker (2013) explain that in highly competitive markets, product and process innovations trigger the adoption of organizational innovations to overcome environmental rigidities. Mol and Birkinshaw (2009) state that the quality of organizational innovation adoption is potentially more important than an organization's performance based on R&D investments for product development. The implementation of organizational innovations often entails unobserved R&D processes shared with external entities through cooperation or technology transfer. Therefore, the relationship between technological innovations (that is, product and process innovations) and new organizational methods is highly correlated (Ganter & Hecker, 2014).

Table 4. Relationship between organizational and technological innovations

Perspective 1: Organizational innovations enable technological innovations		
Author	**Data and Methodology**	**Proposal or Findings**
Camisón and Villar-López (2014)	SEM analysis of 159 Spanish manufacturing firms	Organizational innovations affect process innovations. Process innovations affect product innovations. Non-technological and technological innovations affect a firm's performance.
Haned et al., (2012)	Probit logistic regression using panel data of 2,360 French	Explore the effect of organizational innovations on four modes of

	firms using CIS 2002-08	technological innovations, finding a positive relationship.
Mothe et al., (2015)	Tobit regression analysis of 2,673 French firms using the CIS 2008 survey	Organizational innovation practices differ according to the type of innovation (that is, product or process).
Evangelista and Vezzani (2010)	Logistic and linear regression if 5,000 Italian firms using CIS 2004 (manufacturing and service sector)	Explore the effects of organizational and technological innovations on performance. Positive effects of organizational innovations on performance.
Min et al., (2015)	SEM analysis of 543 Chinese firms	Investigate the relationship between technological and organizational innovations and absorptive capacity. Organizational innovations are a partial mediator in the relationship between absorptive capacity and technological innovations.
Gunday et al., (2011)	SEM analysis of 83 Turkish firms	Explore the effect of different types of innovations on performance. Organizational innovations affect process and marketing innovations. Process and marketing innovations affect product innovations. Organizational, product and market innovations affect innovation performance.
Battisti and Stoneman (2010)	CIS 2004 UK survey. Regression and cluster analysis of the antecedents of adopting different types of innovations	Effects of the reasons for adopting organizational and technical innovations do not differ greatly.

Perspective 2: Technological innovations enable organizational innovations

Author	Data and Methodology	Proposal or Findings
Ganter and Hecker (2013)	Ordered linear regression analysis of 2,900 German firms (manufacturing and service sector) using the CIS 2005 survey	Expand Mol and Birkinshaw's (2009) model. Findings provide contrary evidence on the interaction effect between organizational context and search. Organizational context and

		external/internal sources are reasons for organizational innovations.
Mol and Birkinshaw (2009)	Ordered linear regression analysis of 3,700 UK firms (manufacturing and service sector) using the CIS 2009 survey	Antecedents are rooted in the concept of organizational context and search which acts as a substitute for larger firms with greater education levels of the workforce and market scope. Organizational innovations increase a firm's productivity.
Schmidt and Rammer (2007)	Logistic regression using the CIS 2005 survey of German firms	Technological innovations influence the adoption of organizational innovations.
Armbruster et al., (2008)	Qualitative	Organizational innovations involve new intra- and inter-organizational practices.
Wang and Ahmed (2004)	SEM analysis of 231 UK firms	Explore complementarities of five innovation modes: product, process, behavioral, market and strategic innovations and their effect on overall organization innovativeness.
Raisch and Birkinshaw (2008)	Qualitative	Explore the ambidexterity between organizational and technological innovations.

2.3 Dynamic capabilities and organizational innovations

Recent evidence shows a relationship between dynamic capabilities and innovations. Zhou et al., (2017) found that technological and marketing innovations served as a mediator between dynamic capabilities and performance. Mu (2017) explains that a firm's operational and marketing activities moderate the effect of its dynamic capabilities in achieving higher performance. Lin et al., (2016) explored

the relationship between dynamic capabilities and management innovations, highlighting the positive effects of different capabilities on the process of adopting organizational innovations. Pai et al., (2013) found a positive and direct effect between dynamic capabilities and innovation performance. Breznik and Hisrich (2014) and Teece (2007) argue that dynamic capabilities are preconditions that enable sustainable innovations.

However, these investigations evaluate innovations and dynamic capabilities as separate domains. My study links organizational innovations to the dynamic capabilities framework. This logic follows two arguments:

First, the emergence of dynamic capabilities and organizational innovations within an organization recall the concept of routines and follow a similar approach. Birkinshaw et al., (2008) explain that adopting new business practices produces fundamental changes in an organization's routines. Adopting organizational innovations requires changes in a firm's functioning and activities and represents a clear variation of existing routines (Crossan & Apaydin, 2010; Damanpour,

1991). Further, several authors have attempted to outline the nature in which dynamic capabilities operate within an organization to investigate its emergence and evolution (for example, Eisenhardt & Martin, 2000; Helfat et al., 2009; Pavlou & El Sawy, 2011; Zahra et al., 2006; Zollo & Winter, 2002). Zahra et al., (2006) and Zollo and Winter (2002) explain the evolution of dynamic capabilities as a cyclical process, focusing on the relevance of organizational learning and transformation of knowledge into routines. Both conceptualizations explain that dynamic capabilities are either the capacity to modify operating routines or converting ordinary capabilities into new routines (Zahra et al., 2006). In simple words, organizational innovations are routines embedded in an organization's knowledge base, while dynamic capabilities are a firm's ability to create new operating routines.

Second, the relationship between dynamic capabilities and organizational innovations arises when considering a hierarchical perspective. Wang and Ahmed (2007) present a four-level hierarchy between an organization's resources, capabilities and dynamic capabilities. 'Zero order' are resources, 'first order' are capabilities,

‘second order’ represents a bundle of resources and capabilities and ‘third order’ are dynamic capabilities. According to Winter (2003) ‘zero-order’ or ordinary capabilities are those that allow firms to ‘make a living’ in the short term, while other organizational activities that require a certain level of routinization are conceived as ‘higher-order’ capabilities. Pavlou & El Sawy (2011) followed a two-level approach: a lower level conceived as operational capabilities (for example, routine activities to develop new products) and dynamic capabilities (for example, sensing opportunities in the marketplace). In contrast, following Winter (2003), Zahra et al., (2006) established a framework of dynamic capabilities which comprised of ‘substantive capabilities’ and ‘dynamic capabilities’. My study follows a similar nomenclature decomposing dynamic capabilities into: ordinary capabilities (firm specific capabilities) and organizational innovations as high-order capabilities.

Finally, similarities can be found in the field of organizational innovations and dynamic capabilities pertaining to the study of certain organizational practices where main differences are a matter of scope.

Eisenhardt and Martin (2000) explain that organizations can develop dynamic capabilities as a response to environmental dynamism. For instance, they can create new products to increase revenue, pursue technology transfers through alliances, cross-functional teams, quality control mechanisms, performance measurement systems and business decentralization; these are dynamic capabilities (Teece, 2007). Literature also considers and evaluates similar activities in organizational innovations, for example, activities related to total quality management, business re-engineering, product development, teamwork and R&D cooperation (Armbruster et al., 2008; Birkinshaw et al., 2008).

Chapter 3. Organizational innovation and dynamic capabilities relationship

3.1 Introduction

The field of innovation studies is filled with contributions exploring technological innovation and its crucial role on improving firm competitiveness. However, many scholars have argued that sources of competitive advantage are also attributed to organizational innovation (e.g., Birkinshaw et al., 2008; Camisón & Villar-López, 2014; Černe et al., 2016; Gunday et al., 2011). Specially nowadays with hyper competitive markets, organizational innovation is essential for business success by extending the firm's core competences and building intangible assets (Hamel, 2006; Teece et al., 1997). Organizational innovation plays an important and equal role on firm performance and economic growth as technological innovation (Sanidas, 2004). That makes it an important topic for managers and policy makers.

Research have focused on exploring the antecedents of organizational innovation (e.g., Damanpour & Aravind, 2011; Ganter & Hecker, 2013; Mol & Birkinshaw, 2009) and its direct effect on competitive advantage (e.g., Camisón & Villar-López, 2014; Evangelista & Vezzani, 2010; Gera & Gu, 2004). Organizational innovation enables firms to create intangible and difficult to replicate resources useful for competition and survival (Teece & Pisano, 1994).

Competitive advantage arise from difficult to imitate tangible and intangible assets but also from difficult to imitate dynamic capabilities (Teece et al., 1997). Dynamic capabilities are the firm's ability to build, integrate and reconfigure its resources as a response to environmental dynamism. Several findings attribute the emergence of dynamic capabilities to organizational learning, routinization and entrepreneurial activities of the firm (e.g., Helfat & Winter, 2011; Pavlou & El Sawy, 2011; Zahra et al., 2006; Zollo & Winter, 2002). However, dynamic capabilities are necessary but not sufficient to maintain sustainable competitive advantage (Barreto, 2010; Eisenhardt & Martin, 2000). Research has consistently mentioned an indirect link between dynamic

capabilities and firm performance, and several quantitative analyses have addressed this issue (e.g., Pavlou & El Sawy, 2011; Protogerou et al., 2011).

There has been some discussion about the relationship between dynamic capabilities and innovation. Prior evidence found that technological, marketing and management innovation serves as mediator between dynamic capabilities and performance (Lin et al., 2016; Mu, 2017; Pai et al., 2013; Zhou et al., 2017). However, those articles avoid integrating innovation into the dynamic capabilities framework. In addition, no research has been conducted that considers organizational innovation as mediator between dynamic capabilities and firm performance, and up to date there is no evidence of organizational innovation effect on productivity for the Latin American region, the scarce literature focus mainly on technological innovation (for example, Crespi et al., 2016).

This article addresses this knowledge gap using a multi-dimensional approach to dynamic capabilities and try to answer the following question: how does organizational innovation is adopted under the

framework of dynamic capabilities? The analysis considers two sets of variable, organizational context and dynamic capabilities. Based on previous research, a two-level hierarchy framework decomposes dynamic capabilities into: ordinary capabilities (firm specific capabilities) and high-order capabilities (organizational innovation) Additionally, the analysis consists on measuring the effects of organizational innovation on performance and productivity growth.

Section 3.2 presents the research framework and hypothesis based on the relationship of organizational innovation and dynamic capabilities. Section 3.3 describe the data and operationalization of variables. Section 3.4 contains the analysis of the results and Section 3.5 concludes this study.

3.2 Research model and hypothesis

The framework of this study is design based on the following considerations and presented in Figure 3. The antecedents of organizational innovation are built upon the role of organizational context on determining firm-specific attributes that enables the adoption

of organizational innovation. Following Wang and Ahmed (2007), two components of dynamic capabilities are utilized. The two sets are absorptive capabilities as a measure of the firm's capacity to assimilate and transform knowledge into new organizational routines, and innovative capabilities as important technological assets complementary to organizational innovation. Both sets of dynamic capabilities and its relationship to organizational innovations is based on the conceptualization of Zahra et al. (2006), indicating that the emergence of 'high-order capabilities' (organizational innovation) arises from the reconfiguration of existing 'ordinary capabilities'. The congruent orchestration of a firm's overall dynamic capabilities is also identified by an increase in business performance (Teece, 2007).

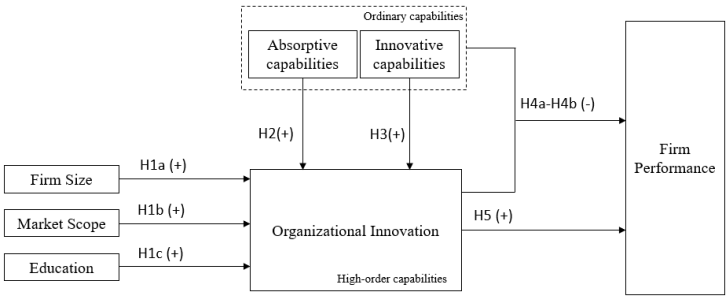

Figure 3. Research framework explaining organizational innovation and dynamic capabilities relation

3.2.1 Context and organizational innovation

For this study, firm size, education of workforce, and market scope is considered as organizational context. The organizational context is considered as important predictors for undergoing innovation activities as proposed by (Mol & Birkinshaw, 2009) and (Ganter & Hecker, 2013). These firm-level attributes are seen as important antecedents on the adoption of organizational innovation (Ganter & Hecker, 2013). Firms differ greatly on the rate they adopt innovations, in part because organizations tend to observe other firm's practices. However, the choices of firms are limited to their reference group. Prior studies

suggested the reference group as an unobservable concept (for example, Massini et al., 2005; Mol & Birkinshaw, 2009), which is used to interrelate the organizational context and the firm's propensity to emulate or imitate their peers.

As the first consideration, organizational size has been positively associated with innovation performance (Damanpour, 1992). Larger firms, given their availability of resources and accumulated knowledge, introduced organizational innovations with greater flexibility (Kimberly & Evanisko, 1981), especially considering that as the firm grows in complexity, new organizational methods and innovations are required to overcome challenges derived from such complexities. Additionally, larger firms face stronger competition that impose organizations to maintain competitive advantage through the introduction of organizational innovation (Mol & Birkinshaw, 2009).

Hypothesis 1a: The size of the firm is positively associated with the adoption of organizational innovation.

Second, as an educated workforce serves as a source of innovation, higher skilled workers improve a firm's capacity to retain and generate new knowledge, and hence, the more likely to adopt organizational innovations. As mention by (Gray, 2006), high skilled workers appear to be more growth-oriented and more likely to engage on organizational goals, thus improving the likelihood of firms to adopt organizational innovations.

Hypothesis 1b: A firm's workforce education is positively associated with the adoption of organizational innovation.

Third, a firm's market scope determines the necessity of introducing new organizational innovations. The degree of internationalization and competition with other firms at local and international markets prone firms on constantly seeking new ways to maintain competitive advantage for survival, identifying new methods and practices beneficial for the firm's position on a competitive market (for example, Delios & Beamish, 1999; Ganter & Hecker, 2013; Mol & Birkinshaw, 2009).

Hypothesis 1c: The wider the market scope of the firm, the greater the adoption of organizational innovation.

Overall, organizational context (size, education of workforce, and market scope) passively influences the propensity of firms on adopting organizational innovations. Organizational context defines the parameters on which firms redeploy and use resources for establishing new practices, and describe the firm's ecosystem, which serves as a reference point where 'best practices' are identified and imitated from other firms, or they develop their own organizational innovations based on their needs.

3.2.2 Absorptive capabilities and organizational innovation

Absorptive capacity is recognize as being an important component of dynamic capabilities (Lin et al., 2016; Wang & Ahmed, 2007; Zollo & Winter, 2002). Firms that demonstrate stronger absorptive capacity tend to assimilate and codify knowledge from different sources more efficiently. Zahra and George (2002) elaborated on a profound

conceptualization of absorptive capacity, suggesting a multi-dimensional construct compound of two subsets of capabilities: potential and realized absorptive capacity.

Potential absorptive capacity refers to the firm's routines to identify and gather external knowledge (acquisition) and, information interpretation and understanding (assimilation) (Cohen & Levinthal, 1990; Mowery et al., 1996), while realized absorptive capabilities refer to the firm's ability to develop routines for combining existing and newly assimilated knowledge (transformation), and exploiting existing and new knowledge into new systematic routines (exploitation) that can be reflected on new goods, services or organizational forms (Kim, 1998; Spender, 1996). Realized absorptive capacity relates specifically on the relationship of absorptive capabilities and innovation outputs (i.e., new products), while potential absorptive capacity allows firms to leverage new information, providing strategic flexibility and freedom to adapt to changing environments (Zahra & George, 2002).

The main premise for developing absorptive capabilities is the organization's ability to internalize external knowledge. For example,

(Ganter & Hecker, 2013, 2014) and (Mol & Birkinshaw, 2009) discussed that external knowledge is gathered from marketing and professional sources. However, foundations of absorptive capabilities development are found in organizational learning (Levitt & March, 1988). Teece et al. (1997) mentioned that learning as a result of the combination of skilled workers and organizational settings, allows repetition and experimentation that can ultimately transform into new ways of production, routines or logic of organization. Additionally, (Cohen & Levinthal, 1990) indicated that "firms also invest in absorptive capacity directly, as when they send personnel for advanced technical training."

Establishing learning mechanisms within an organization is perceived as a source of competitive advantage (Zollo & Winter, 2002). Learning allows the emergence of tacit experience accumulation through information assimilation, knowledge articulation and codification, which are necessary elements for adopting organizational innovations. Training and experience of human capital within an organization contribute extensively on the capacity of a firm to absorb knowledge (Gray, 2006; Muscio, 2007). Previous research suggested that absorptive capabilities

play a fundamental role on organizational innovation (Chen, 2004; Fosfuri & Tribo, 2008; George, 2005; Verona & Ravasi, 2003). Specifically, a firm's absorptive capacity increases the ability to assimilate, interpret and understand new information, to reach out for external knowledge, and ultimately transforms newly absorb knowledge into new organizational practices or methods (Lin et al., 2016).

Hypothesis 2: Absorptive capabilities of firms positively influence the adoption of organizational innovation.

3.2.3 Innovative capabilities and organizational innovation

Helfat et al. (2009) explained that the firm's resource base is comprised of tangible and intangible assets and capabilities and further discussed that technical capabilities is a dynamic capability that allows firms to modify its resources base. Wang and Ahmed (2007) classified innovative capabilities as a component of dynamic capabilities and described innovative capabilities as the firm's ability to link new products to the market, supported by innovative behavior and processes

(Wang & Ahmed, 2004; Wang & Ahmed, 2007). Teece et al. (1997) described technological assets as key differentiators among firms that provide considerable strategic positions. Song et al. (2005) described technological capabilities as idiosyncratic resources that produce competitive advantage. Pavlou and El Sawy (2011) refers to technical capability as the ability to develop new products. Rooted on Teece (2007) exploration of the micro-foundations of dynamic capabilities, innovative capabilities are perceived as technological innovations that serve as complements for the adoption of new organizational methods or practices. Complementarity among different modes of innovation enables firms to properly reconfigure internal resources to maintain competitive advantage (Teece et al., 1997). The development of product and process innovations (innovative capabilities) are timely responses to market dynamism that arise from an opportunity recognition. These activities require specific investments that must be complemented with organizational innovations (Teece, 2007).

In the literature, there are three perspectives on the relation of technological and organizational innovation. The first perspective argues

that technological innovation is an antecedent of new organizational practices (for example, Armbruster et al., 2008; Schmidt & Rammer, 2007). The second perspective indicates that organizational innovation enables technological innovations (for example, Camisón & Villar-López, 2014; Gunday et al., 2011; Sanidas, 2004). The third perspective mentions the presence of synchronous or ambidextrous innovation (for example, Ganter & Hecker, 2013; Mol & Birkinshaw, 2009; Raisch & Birkinshaw, 2008).

Hypothesis 3: Innovative capabilities of firms positively influence the adoption of organizational innovation.

3.2.4 Dynamic capabilities and competitive advantage

The basic premise is that organizations achieve competitive advantage with difficult to replicate assets and dynamic capabilities allow the modification, integration and reconfiguration of the firm's resource base. (Teece et al., 1997). Eisenhardt and Martin (2000) mentioned that dynamic capabilities are necessary but not sufficient for

sustainable competitive advantage. Consequently, sustainable advantage also requires complementing knowledge stocks with difficult to replicate intangible assets (Teece, 2000, 2007). Superior performance is attributed to the firm's ability to create, absorb and manage knowledge (Teece, 2000, 2007; Zahra et al., 2006; Zollo & Winter, 2002). Teece (2000) mentioned that organizations must build knowledge, due to its untradeable characteristics, and that competitive edge is gain through the generation of intangible assets.

Nevertheless, arguing that dynamic capabilities directly affect competitive advantage has been categorized as a tautological statement (Barreto, 2010; Wang & Ahmed, 2007), and that research should identify intermediate outcomes. Therefore, this study follows Protogerou et al. (2011), Helfat and Peteraf (2003), Pavlou and El Sawy (2011), and Zahra et al. (2006), on the idea that the influence of dynamic capabilities on performance is mediated by the reconfiguration of ordinary capabilities into new capabilities. Building on previous studies, organizational innovation is considered as an adequate mediator between

ordinary capabilities and firm performance. (Lin et al., 2016; Mu, 2017; Pai et al., 2013; Zhou et al., 2017).

3.2.4.1 Interaction between organizational innovation and ordinary capabilities

Exploring the emergence of dynamic capabilities has been the focus of attention of many scholars (e.g., Helfat et al., 2009; Helfat & Peteraf, 2003; Helfat & Winter, 2011; Zahra et al., 2006; Zollo & Winter, 2002), The literature makes use of a multi-dimensional approach, in order to understand how dynamic capabilities are created. Prior research refers to ordinary capabilities (low-order) and dynamic capabilities as high-order capabilities (e.g., Helfat & Peteraf, 2003; Helfat & Winter, 2011; Winter, 2003). Helfat and Peteraf (2003) clearly explained that ordinary capabilities are a set of individual tasks, or routines that enable organizations to execute day to day operations, while dynamic capabilities entails the modification of ordinary capabilities with the intention to alter how it currently makes its living (see Helfat & Winter, 2011). Zollo and Winter (2002) explained that ordinary capabilities does not guarantee long term competitive advantage, and that firms must

create new operating routines in order to deal with competition, regulatory, technological and market change.

In summary, organizations develop high-order capabilities not only through the reconfiguration of operating capabilities (Pavlou & El Sawy, 2011; Winter, 2003) but also when there is a necessity to change or strategic direction (Helfat & Peteraf, 2003; Zahra et al., 2006), when they are capable to modify its knowledge base into new routines (Teece, 2007; Zollo & Winter, 2002), when managers are able to recognize opportunities (Zahra et al., 2006) and when they face turbulent environments (Eisenhardt & Martin, 2000). Following this line, ordinary capabilities represent the firm's current routines and knowledge base, and high-order capabilities represent organizational innovation.

Finally, how ordinary capabilities interact with organizational innovation requires explanation. Organizational innovation comprises a wide range of new activities that can be implemented in a firm. It includes new methods for organizing routines, new concepts for structuring activities and new ways of organizing external relations (OECD, 2005a). The implementation of new business practices requires

the coordination, integration and modification of ordinary capabilities into high-order capabilities. For example, Cohen and Levinthal (1990) mentioned that training employees is fundamental for developing absorptive capabilities, highly skill workers are more capable to assimilate knowledge from external agents. But having absorptive capabilities is not guarantee of superior performance, what matters is how organization exploit absorptive capabilities to gather external knowledge with the establishment of strategic alliances. Dynamic alliance capabilities (high-order capability) increase performance by increasing the firm's knowledge base (Zahra et al., 2006). In addition, developing new products demands a coordination of routines and activities and organizations may decide to compete in international markets. Such strategic choice requires the adoption of new business practices, like implementing quality management systems that requires the reconfiguration of ordinary capabilities, resulting into the creation of a new high-order capability (e.g., export dynamic capability). Organizations through the reconfiguration of ordinary capabilities and lead by strategic choice are able to create a variety of high-order

capabilities constrained to the firm's available resources and managerial decisions. The intensity on which firms adopt organizational innovation mediates the influence of ordinary capabilities on firm performance.

Hypothesis 4a: The effect of absorptive capabilities on firm performance is mitigated by the adoption of organizational innovation.

Hypothesis 4b: The effect of innovative capabilities on firm performance is mitigated by the adoption of organizational innovation.

3.2.4.2 Organizational innovation and firm performance.

Organizational innovation exhibit a strong potential to contribute to business performance, for example increase productivity, lead times, quality and business flexibility (Černe et al., 2016; Crossan & Apaydin, 2010). Empirical evidence in the literature is varied, Camisón and Villar-López (2014) found correlates between organizational innovation and firm performance using both an objective measure (return on shareholders' funds, return on capital employed, and return on total assets) and a subjective measure (mean economic profitability, mean

financial profitability, and mean sales profitability). Mol and Birkinshaw (2009) showed the impact of the adoption of management innovations in productivity growth. Gunday et al. (2011) reviewed the impact of different types of innovation on performance and found a positive effect of organizational innovation on overall innovative firm performance (e.g., increase quality of new products and services, number of new products and services and innovations introduced for work). Hervas-Oliver et al. (2014) found that synchronously co-adopted organizational innovation with process innovation, contributes positively to improving production-oriented innovative performance Evangelista and Vezzani (2010) demonstrated the relationship between organizational innovation and sales growth.

Hypothesis 5: The adoption of organizational innovation positively affects firm performance.

3.3 Data and methods

This study uses the Enterprise Survey (ES) conducted by the World Bank in the Latin-American region, where several business-related indicators have been collected in 2006, 2010 and 2017. The objective is to gather establishment-level information regarding the business environment and innovation in the manufacturing and service sectors. As explained by World Bank (2017), the survey methodology considers the enterprise as the unit of analysis with five or more employees and conveys two types of questionnaires that depend on whether an establishment belongs to the manufacturing or service sectors. For most questions, the two questionnaires do not differ from each other. The ES is answered by business owners or top managers and is conduct by approximately 1800, 360 and 150 interviews in large, medium and small size economies, respectively.

In order to test the above hypotheses, ES-2010 manufacturing sample data is utilized, which cover a period from 2007 to 2009. The reason on selecting this data set is that the data includes business

development service indicators as a measure of organizational innovation activities at the firm level, measures that are not collected in other periods of the survey. A total of 5715 observations are considered for the analysis. All variables are constructed based on the ES 2010 and a detailed description is presented in the next section.

3.3.1 Introduction of organizational innovation

The measurement of organizational innovations is built upon the criteria of capturing the introduction of organizational innovations and is extracted from the "Business Development Services" section of the survey. World Bank (2010) provides a detailed explanation of the type of business activities considered for each question as explained below.

Establishments were asked whether over the last three years have implemented any of the following four activities. The first response is in regards to improving quality control or training in order to obtain quality certification. This indicator captures the implementation of practices to prepare the firm for obtaining certifications in order to improve the quality of products. Examples include local or regional standards, ISO

certification, safety and sanitary certifications or verifying quality management systems. The second response is in regards to developing business alliances with other suppliers or clients. Alliances refer to promoting interactions with other firms with the objective of improving business functioning and opportunities. Examples include participation in competitiveness programs, cluster promotion programs or supplier development programs or others seeking business partnerships. The third response is in regards to promoting exports. In this case, activities designed specifically to support exporting are considered. Examples include market identification, participation in trade fairs, coordination with trade offices overseas, or human resource development to enhance export capacity. The fourth response is in regards to using any programs, technical assistance or training on information technology, management, accounting or other functions such as marketing and logistics. This category considers back-office operation to run the establishment properly, relying on information technologies and other types of technical implementations. Examples include software for exports, accounting, human resources, inventory or management control systems

(World Bank, 2010). Each item from the four responses are coded as ‘1’ for implemented and ‘0’ for otherwise.

The objective is to capture organizational innovations intensity pursued by the establishments. Therefore, a categorical variable is created by counting the number of activities introduced by the firm in a scale from ‘0’ to ‘4’ (Ganter & Hecker, 2013, 2014; Mol & Birkinshaw, 2009). For further interpretation, this variable is categorized as follows: 0=No organizational innovation, 1=Low, 2= Medium, 3=High and 4=Very High.

3.3.2. Organizational Context

For firm size, this study uses the number of full time employees during the last fiscal year (2009) and is presented in logarithmic form.

Education/degree measures the education level of labor as a percentage of workers of the total workforce who have at least a bachelor’s degree

Market Scope measures the largest market in which the establishment sold its main product and is coded as ‘0’ (local), ‘1’ (national), or ‘2’ (international).

3.3.3 Absorptive capabilities

For absorptive capabilities, the firm’s training activities are considered. An ordinary variable is created from ‘0’ to ‘3’ on whether a firm executed the following types of training: a) in-house training promoted by the establishment to its employees; b) any type of external training offered by the establishment; or c) any type of external training offered by the government.

3.3.4 Innovative capabilities

Innovative capabilities are considered as complements to organizational innovation. An ordinary variable is created from ‘0’ to ‘3’ on whether a firm have introduced any of the following innovations: a) introduced any new or significantly improved products (goods or services); b) introduced new or significantly improved process for

producing or supplying products? or; c) introduced new or significantly improved products new to establishment's market?

3.3.5 Firm Performance

For firm performance this study used an objective and subjective measure, the subjective measure captures the effect of the introduction of organizational innovation from the following possible benefits: 'increase sales in domestic market', 'opened new foreign market', 'improved quality of goods and services', 'obtained quality or export certification', 'increase number of goods or services offered by establishment', 'reduced unit production costs', 'reduced energy consumption'. The operationalization of this variables intends to capture performance improvements in a broader sense. Therefore, in order to create a single item scale following Dess and Robinson (1984) a dummy variable representing high performers is created, taking the value of '1' if firms report at least 4 possible benefits or '0' otherwise.

The objective variable is based on Mol and Birkinshaw (2009) and represented as productivity growth between 2007 and 2009, in order to

include a time lag to the model. Therefore, productivity growth is computed as (2009 sales/employees 2009) / (2007 sales/employees 2007) – 1.

Implementing a subjective and objective measures of performance are suitable for offering stronger interpretations of the results (Dess & Robinson, 1984; Wall et al., 2004).

3.3.6 Control variables

Innovation support is a dummy variable denoting if the firm have received any type of support towards improving new products or production processes. Innovation support can be guidance, assistance or financial aid that is provided by external public or private entities.

Export Intensity is an indicator included as the percentage of sales that comes from exports. This variable reflects a firms' reaction to international competition since they have to rely on intensifying their innovation activities.

Market competition implies number of competitors faced by the firm's main product and is coded as none (0), one (1), between two and five (2), more than five (3). And group is a dummy variable if the firm is part of a larger firm.

Business inhibitors is a variable that measures the effect of the environment on firm behavior. Business inhibitors in this study are those that limit firms' flexibility and independence in order to pursue effective business functioning. Operationalization of this variable refers to the degree of perceive obstacles in different aspects. The possible answers are 'No obstacle', 'Minor obstacle', 'Moderate obstacle', 'Major obstacle' and 'Very severe obstacle.' Environmental factors considered for this variable are 'Practices of competitors in the informal sector, 'Access to finance', 'Tax rate', 'Economic/Political instability', 'Customs and trade regulations', 'Labor regulations', and 'Inadequate labor force'. In each case, we coded any degree of obstacle as '1' and no obstacle as '0'. The number of cases results in a measure between '0' and '7' (Ganter & Hecker, 2013).

Industrial sector dummies are included at 2-digit level following the classification of manufacturing industries based on technology (OECD, 2005b).

The scope of this study is firm-level analysis, however in order to avoid possible endogeneity problems caused by omitted variables, country fixed effects are included as binary indicators variables representing the effect of unobserved factors that are shared within each country (Bryan & Jenkins, 2013).

3.3.7 Common Method Bias

Addressing common method bias is important in business research and several implications must be considered. Although researches should not automatically assumed presence of common method variance when collecting and analyzing information from the same source (Fuller et al., 2016). Regardless, certain factors were taken into account. The ES survey methodology requires well elaborated face-to-face interviews with business owners, whom are very well familiar with the correct functioning of the establishment and are aware of the firm's strategies,

objectives and outcomes. Responses that were marked by the survey administrator as ‘spontaneous answers’ or ‘unfamiliar’ were deleted from the sample, as well as firms that were stablished after 2007. Our subjective measure of performance is operationalized using single-item indicators (e.g., Dess & Robinson, 1984) and this required caution (Fuller et al., 2016; Wall et al., 2004). Therefore, a time-lagged objective measure of firm performance is included to observe ‘real’ improvement as a result of introducing organizational innovations. Moreover, some other variables are objective in nature, such as size, education, and export intensity. Lastly, Siemsen et al. (2010) empirically proved that common method bias in multivariate regression models is considerably reduced as the number of explanatory variables is increased.

3.4 Analytical method

First, in order to explore the antecedents of the adoption of organizational innovation this study uses generalized ordered logistic regression modelling (gologit). Organizational innovation is a categorical variable with four possible outcomes and categorized as:

0=No organizational innovation, 1=Low, 2= Medium, 3=High and 4=Very High.

For an ordinal outcome with M categories the generalized ordered logistic model can be described as (Williams, 2006):

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1+[\exp(\alpha_j + X_i\beta_j)]}, j = 1, 2, .. M - 1 \ldots\ldots\ldots\ldots\ldots\ldots\text{Eq. (1)}$$

Where M = 4 and X_i is the set of explanatory variables:

$$X_i = \{X_{export,} X_{group,} X_{support,} X_{comp,}\ X_{size}, X_{educ}, X_{scope}, X_{abs}, X_{innov},$$
$$X_{bussiness}, X_{industry}, X_{country}\}$$

In generalized ordered logistic model the betas are the same for each j (Williams, 2006). From the above the probability that Y will take each value of M is equal to:

$$P(Y_i = 1) = 1 - g(X_i\beta_1)$$
$$P(Y_i = j) = g(X_i\beta_{j-1}) - g(X_i\beta_j)\ \ j = 2, \ldots M - 1$$
$$P(Y_i = M) = g(X_i\beta_{M-1})$$

The prediction consists on comparing the M categories among themselves, therefore observing changes on explanatory variables. If M

= 4, then for M = 1 category is compared with categories 2, 3 and 4; for M = 2 the comparison is between categories 1 and 2 versus categories 3 and 4; and for M = 3 the comparison is between categories 1, 2 and 3 versus category 4.

Second, to predict the likelihood of firm performance, this study uses logistic regression modelling based on the following equation:

$$\log\left[\frac{p_{ij}}{1-p_{ij}}\right] = Performance_{ij} =$$

$$\beta_1 X_{orgj} + \beta_2 X_{exportj} + \beta_3 X_{supportj} + \beta_4 X_{groupj} + \beta_5 X_{compj} + \beta_6 X_{sizej} + \beta_7 X_{educj} + \beta_8 X_{scopej}$$

$$+\beta_9 X_{absj} + \beta_{10} X_{innovj} + \beta_{11} X_{bussinessj} + \beta_{12} X_{industryj} + \mu_j + e_{ij} \quad \text{..... Eq. (2)}$$

Third, ordinary least square regression is used for predicting productivity growth based on the following equation:

$$Productivity_{ij} = \beta_{0j} + \beta_1 X_{orgj} + \beta_2 X_{exportj}$$

$$+\beta_3 X_{supportj} + \beta_4 X_{groupj} + \beta_5 X_{compj} + \beta_6 X_{sizej}$$

$$+\beta_7 X_{educj} + \beta_8 X_{scopej} + \beta_9 X_{absj} + \beta_{10} X_{innovj}$$

$$+\beta_{11} X_{bussinessj} + \beta_{12} X_{industryj} + \mu_j + e_{ij} \quad \text{.....Eq. (3)}$$

Where u_j represents country fixed effects as dummy variables and e_{ij} accounts for unobserved firm effects, that are assumed to be normally distributed and uncorrelated with X_{ij} (Bryan & Jenkins, 2013).

3.5 Results and discussion

The analysis is comprised by two parts. First, this study explores the antecedents of organizational innovation and second, it investigates the effects on firm performance. Summary statistics of key variables are presented in Table 5.

Table 5. Means, standard deviations and correlations among variables

		M	SD	1	2	3	4	5	6	7	8	9	10	11
1	Org. innovation	1.6	1.3	1.0										
2	Firm Size	3.7	1.5	0.5	1.0									
3	Education	14	18	0.3	0.2	1.0								
4	Market scope	0.7	0.6	0.2	0.3	0.1	1.0							
5	Export intensity	13	26	0.3	0.3	0.1	0.6	1.0						
6	Competitors	2.6	0.7	0.0	0.0	-0.0	0.1	0.1	1.0					
7	Group	0.7	0.3	0.2	0.3	0.1	0.1	0.1	-0.0	1.0				
8	Innovation support	0.4	0.5	0.5	0.3	0.2	0.1	0.1	0.0	0.1	1.0			
9	Business inhibitors	5.3	1.6	0.2	0.2	0.0	0.1	0.0	0.1	0.1	0.1	1.0		
10	Absorptive capabilities	1.0	1.0	0.5	0.5	0.2	0.2	0.2	-0.0	0.2	0.4	0.1	1.0	
11	Innovative capabilities	1.3	1.1	0.4	0.2	0.1	0.1	0.1	-0.0	0.1	0.3	0.2	0.3	1.0

N=5715

For the first part of the analysis, the dependent variable is categorical, aiming to capture organizational innovation intensity. Initial analysis using ordered logistic regression showed similar results than Model 1. However, after conducting a Brant test (Long & Freese, 2006), the parallel regression assumption was violated, indicating that the coefficients of some explanatory variables differ for different levels of the dependent variable.

Therefore, this study uses generalized ordered logistic regression to predict the adoption of organizational innovation, which allows a more parsimonious interpretation of the data (Williams, 2006, 2016). Table 6 contains the results.

This model supports Hypothesis 1a and Hypothesis 1b, larger firms with higher educated workforce are more likely to implement organizational innovations (at .1% significance). Hypothesis 1c is not supported, market scope does not affect the adoption of organizational innovations. However, export intensity positively affects organizational innovation (at .1% significance).

Table 6. Generalized ordered logistic regression for predicting the implementation of organizational innovation.

(1)	Category 0 versus 1-4	Category 0-1 versus 2-4	Category 0-2 versus 3-4	Category 0-3 versus 4
Export intensity	0.00535***	0.00905***	0.0103***	0.0128***
	(0.00179)	(0.00151)	(0.00142)	(0.00167)
Innovation support	1.815***	1.412***	1.427***	1.625***
	(0.113)	(0.0719)	(0.0728)	(0.120)
Group	0.0687	0.0687	0.0687	0.0687
	(0.0698)	(0.0698)	(0.0698)	(0.0698)
Competitors	0.0321	0.0321	0.0321	0.0321
	(0.0367)	(0.0367)	(0.0367)	(0.0367)
Firm size	0.274***	0.274***	0.274***	0.274***
	(0.0213)	(0.0213)	(0.0213)	(0.0213)
Education	0.0110***	0.0110***	0.0110***	0.0110***
	(0.00145)	(0.00145)	(0.00145)	(0.00145)
Market scope	0.0627	0.0627	0.0627	0.0627
	(0.0509)	(0.0509)	(0.0509)	(0.0509)
Absorptive capabilities	0.783***	0.664***	0.492***	0.440***
	(0.0522)	(0.0390)	(0.0403)	(0.0588)
Innovative capabilities	0.372***	0.272***	0.228***	0.231***
	(0.0350)	(0.0297)	(0.0313)	(0.0444)
Business inhibitors	0.0982***	0.0982***	0.0982***	0.0982***
	(0.0157)	(0.0157)	(0.0157)	(0.0157)
Low tech	-0.300**	-0.300**	-0.300**	-0.300**
	(0.133)	(0.133)	(0.133)	(0.133)
Med-low tech	-0.0976	-0.0976	-0.0976	-0.0976
	(0.137)	(0.137)	(0.137)	(0.137)
Med-high tech	-0.137	-0.137	-0.137	-0.137
	(0.141)	(0.141)	(0.141)	(0.141)
Constant	-1.867***	-3.095***	-4.400***	-6.203***
	(0.195)	(0.199)	(0.208)	(0.246)
Log-likelihood		-7161.831		
Wald Chi^2		3585 (***)		
McFadden R^2		0.20		
Observations		5,715		

Showing coefficients and standard errors in parentheses. *** Significant at 0.01, ** Significant at 0.05, * Significant at 0.1. All calculations include industry and country dummies. Organizational innovation intensity is categorized as 0=No organizational innovation, 1=Low, 2= Medium, 3=High and 4=Very High.

Firms whose products compete in international markets are obliged on intensifying innovation activities (Azar & Ciabuschi, 2017), and more

likely to explore new business practices to cope with competition. Regarding ordinary capabilities, this model also supports Hypothesis 2 and Hypothesis 3. Absorptive and innovative capabilities influence the likelihood of adopting organizational innovation (both at .1% significance). Model 1 is quite interesting and reveals hidden insights, it is possible to observe a substitution effect between ordinary capabilities and organizational innovation. Examining the pattern of coefficients of absorptive capabilities among the four categories of organizational innovation intensity (0=No organizational innovation, 1=low, 2= medium, 3=high and 4=very high), this model shows that as organizational innovation intensity increases (from category 'low' to 'very high') the magnitude of the coefficient of absorptive capacity decreases. In other words, absorptive capabilities are fundamental for exploring and implementing new business practices or methods, and its effect is greater on less innovative firms. Similar substitution effect is found for innovative capabilities. This singularity was explain by Mol and Birkinshaw (2009), evoking the concept of 'productivity frontier' and mentioned that "firms operating on the frontier may seek to push the

frontier out further, by introducing innovations which are new to the state of the art or even completely new to the world". These findings show that firms with higher organizational innovation intensity are less dependent on ordinary capabilities, supporting the theoretical framework of this study.

Regarding other control variables, innovation support positively influences the implementation of organizational innovation and business inhibitors also predict if firms are more likely to adopt new practices (both at significance at 1%). In contrast, degree of competition and belonging to a group are not statistical significant.

The model statistics, WaldChi squared is significant and the model explain approximately 20% of variance. The model represents a generalized ordered logistic regression to predict the adoption of organizational innovation, even though there is no academic consensus regarding a specific criterion for interpreting the goodness of fit in logistic regression. (Long & Freese, 2006), the results are congruent with previous studies (e.g., Ganter & Hecker, 2013; Mol & Birkinshaw, 2009)

The second part of the analysis consist on examining the effect of organizational innovation on firm performance. Table 7 summarizes the results. Two indicators of performance were used, a subjective measure indicating firm's overall performance improvement as the result of adopting organizational innovations, and an objective indicator denoting productivity growth.

Models 2 through 4 contain the analysis of the logistic regression predicting firm performance. Hypothesis 5 is supported in base Model 2, implementing organizational innovation positively affects firm performance (at .1% significance). Modes 3 and 4, supports Hypothesis 4a and 4b which suggest a negative interaction effect between ordinary capabilities and organizational innovation (at .1% significance). Explicitly, the effect of absorptive and innovative capabilities on firm performance is mitigated by organizational innovation. Results from Model 1 in part contribute on understanding this effect. The more likely a firm becomes a high performer; the more organizational innovation and ordinary capabilities are substitutes.

Table 7. Logit regression predicting firm performance and OLS regression predicting productivity growth (2007-2009).

	Firm Performance				Productivity Growth		
	(2)	(3)	(4)		(5)	(6)	(7)
Org. Innovation	0.843***	1.008***	1.002***		0.0512*	0.0664**	0.102**
	(0.0358)	(0.0503)	(0.0532)		(0.0289)	(0.0325)	(0.0422)
Export Intensity	-0.000300	-0.000253	-0.000270		0.155	0.156	0.158
	(0.00176)	(0.00174)	(0.00176)		(0.195)	(0.195)	(0.195)
Innovation support	0.651***	0.650***	0.644***		0.0654	0.0657	0.0651
	(0.0792)	(0.0790)	(0.0789)		(0.0752)	(0.0752)	(0.0752)
Group	-0.0143	-0.00509	-0.0199		-0.0402	-0.0389	-0.0406
	(0.0983)	(0.0966)	(0.0978)		(0.0948)	(0.0950)	(0.0947)
Competitors	-0.00905	-0.00611	-0.0105		0.0294	0.0299	0.0287
	(0.0513)	(0.0516)	(0.0515)		(0.0465)	(0.0465)	(0.0465)
Firm Size	0.149***	0.146***	0.151***		-0.0903**	-0.0906**	-
	(0.0300)	(0.0298)	(0.0300)		(0.0419)	(0.0419)	0.0899**
							(0.0418)
Education	-0.00380*	-0.00379*	-0.00378*		0.000176	0.000167	0.000209
	(0.00219)	(0.00216)	(0.00219)		(0.00244)	(0.00244)	(0.00245)
Market Scope	0.0145	0.00996	0.00358		0.109	0.109	0.103
	(0.0717)	(0.0721)	(0.0716)		(0.0696)	(0.0696)	(0.0689)
Absorptive Capabilities	0.235***	0.537***	0.230***		0.0352	0.0632	0.0332
	(0.0432)	(0.0713)	(0.0430)		(0.0371)	(0.0526)	(0.0368)
Innovative Capabilities	0.201***	0.196***	0.407***		-0.0278	-0.0286	0.0353
	(0.0324)	(0.0324)	(0.0551)		(0.0332)	(0.0331)	(0.0426)
Business inhibitors	0.00576	0.00281	0.00426		-0.0365*	-0.0369*	-0.0378*
	(0.0225)	(0.0226)	(0.0227)		(0.0206)	(0.0207)	(0.0207)
Org. innov. X absorptive		-0.157***				-0.0151	
		(0.0319)				(0.0203)	
Org. innov. X innovative			-0.108***				-0.0360*
			(0.0262)				(0.0191)
Low-tech	0.184	0.170	0.179		0.0904	0.0897	0.0907
	(0.185)	(0.179)	(0.182)		(0.168)	(0.168)	(0.168)
Med-low tech	0.390**	0.374**	0.384**		0.122	0.121	0.119
	(0.192)	(0.186)	(0.189)		(0.169)	(0.169)	(0.168)
Med-high tech	0.418**	0.404**	0.417**		-0.0118	-0.0129	-0.0108
	(0.195)	(0.189)	(0.193)		(0.167)	(0.167)	(0.167)
Constant	-3.818***	-4.069***	-4.079***		0.503	0.489	0.447
	(0.386)	(0.397)	(0.396)		(0.309)	(0.308)	(0.300)
Log-likelihood	-2614.4	-2603.7	-2606.7				
Wald Chi2	1713	17623	1743	F-value	2.61 (***)	2.53	2.53
	(***)	(***)	(***)			(***)	(***)
Pseudo R2	0.32	0.32	0.32	R-squared	0.036	0.036	0.037
Obs.	5,715	5,715	5,715	Obs.	4,327	4,327	4,327

Showing coefficients and robust standard errors in parentheses. *** Significant at 0.01, ** Significant at 0.05, * Significant at 0.1. All calculations include industry and country dummies.

Following, Ai and Norton (2003) the correct computation of the marginal effect of two interacted variables in logistic regression is required. The results showed that the interaction effect becomes more negative with higher predicted probabilities of firm performance, corroborating Hypothesis 4a and 4b. Also notice that Models 2-4 statistics (WaldChi squared and pseudo log likelihood) are highly significant and 30% of variance is explained across all models.

The logic of including an objective measure of performance is to analyze 'real' structural change. If we analyze the operationalization of the dependent variable of Models 2 through 4, it mainly captures business owners' perception of firm improvement, which certainly provides meaningful evidence of the positive effect of organizational innovation, however those effects will be reflected on future sales.

Model 5 through 7 contains the ordinary least square regression analysis predicting productivity growth in a period of 3 years. These models also support Hypothesis 5 (significance at 10%), organizational innovation is essential for competitive advantage, generating more sales and increasing productivity. Even though the findings are significant, the

coefficient of determination of these models only explain 4% of variability of the dependent variable, which is not surprising considering the fluctuation and nature of the data. A cause of this is that the dependent variable measure changes in productivity, and flows are harder to predict that states in models predicting these type of variables (Mol & Birkinshaw, 2009). Although, considering changes in productivity over time helps to overcome possible biases on the model, it certainty affects its explanatory power. As mentioned by Moksony (1999) the coefficient of determination is affected by the degree of variation of the dependent variable, however whether a model is accurate or not it can only be decided by the theoretical reasoning behind the description of the model. Moreover, a variety of other factors affects productivity growth, which can be accounted in future studies.

Some interesting results comes from analyzing other variables in Models 2, larger firms (significance at .1%), that receives innovation support (significance at .1%) but with less educated workforce (significance at 10%) are more likely to be high performers. In contrast, Model 5 also shows that larger firms (significance at 5%) and facing

greater business inhibitors (significance at 10%) are less productive. The reason for this is that larger firms with higher educated employees have less opportunity for improvement since they are closer to the 'productivity frontier' (Mol & Birkinshaw, 2009).

The finding of the results is summarized as follows. First, organizational context is an important predictor for the adoption of organizational innovation. It supports most recent evidence that size, education of workforce and market scope increase the likelihood of organizational innovation implementation (e.g., Ganter & Hecker, 2013). But most importantly explained the context on which firms increase organizational innovation intensity. Absorptive and innovative capabilities are determinants of organizational innovation, this supports the idea that ordinary capabilities are predecessors of dynamic capabilities (Zahra et al., 2006), and its emergence is dependent of the firm's knowledge base (Zollo & Winter, 2002). The results also contribute to the research stream supporting that technological innovation enables organizational innovation (e.g., Armbruster et al., 2008; Schmidt & Rammer, 2007). With respect to business inhibitors,

firms respond to environmental conditions through the adoption of organizational innovation. Environmental barriers can alter industry dynamism and influence firm's dynamic capabilities (Wang & Ahmed, 2007).

Second, the novel approach to evaluate the relationship between dynamic capabilities and organizational innovation use on this study provides the most interesting findings. This study found a substitution effect among ordinary capabilities and organizational innovation (high-order capabilities). The value of 'using' ordinary capabilities is lower in firms with higher organizational innovation intensity. This explain why some scholars have argued that dynamic capabilities are not a source for long term competitive advantage (e.g., Eisenhardt & Martin, 2000). Zahra et al. (2006) mentioned that the repeated use of ordinary capabilities without change renders ordinary capabilities to become obsolete. Therefore, firms with higher organizational innovation intensity must find new ways to modify existing ordinary capabilities. Thus, sustainable competitive advantage is achieved through innovation.

Mol and Birkinshaw (2009) found similar interpretations under the logic of context and search.

Third, this study shows that a proper orchestration of dynamic capabilities positively influence firm performance (Teece, 2007). The results indicate that firms with higher organizational innovation intensity are also high performers, this implies the firms actually observe business function improvement through the adoption of organizational innovation, this support the notion that the implementation of organizational innovation enables the creation or modification of operating routines (Birkinshaw et al., 2008; Van de Ven, 1993). Moreover, the analysis provide evidence about the moderating role between organizational innovation and ordinary capabilities on firm performance, in accordance with previous evidence (e.g., Mu, 2017; Zhou et al., 2017).

Finally, the adoption of organizational innovation increased the firm's productivity during the time period analyzed. However, the interpretation of this finding requires caution due to a small explanatory

power. The results show that larger firms are less productive, and that business inhibitors also reduce productivity.

3.6 Sub-conclusion

This study explains organizational innovation under the dynamic capabilities framework. Building on previous research, a multidimensional approach to dynamic capabilities is implemented. We explore important determinants for the adoption of organizational innovation and the effect of dynamic capabilities on firm performance using a sample of firms of Latin America.

Organizational innovation is categorized as a high-order dynamic capability that enables the modification of operating routines and competitive advantage is achieved through a continuous modification of ordinary capabilities.

Some important insights arise from this study. Integrating organizational innovation into the dynamic capabilities framework helps to overcome several concerns in the field. A main criticism is that the concept of dynamic capabilities is tautologically link to success (Barreto,

2010). Therefore, proper constructs must be implemented to observe the paths to competitive advantage through dynamic capabilities. A hierarchical approach to divide dynamic capabilities into components seems adequate to logically explain the effect of dynamic capabilities on performance. This study demonstrated the rational on which dynamic capabilities can be build, referring to ordinary capabilities and organizational innovation as intricate processes.

The most important implication for managers and the practical world, is the importance of organizational innovation to expand the frontiers of the firm's overall capabilities. The definition of dynamic capabilities use on this study emphasizes the importance of managerial decisions for organizational change, implying that dynamic capabilities emerges when there is 'wisdom' in the organization. (Zahra et al., 2006).

Understanding the process on which organizational innovation emerges is crucial to help firms adapt to environmental constraints and to overcome productivity problems. This is an important issue not only for managers but also for policy makers in order to design proper mechanism for development.

Chapter 4. Innovation complementarities and firm's performance

4.1 Introduction

Firms' innovative behavior involves arranging activities and comprises of developing new products, improving processes and complementing these activities with organizational innovations. Research on the relationship between non-technological and technological innovations recognizes that competitive advantage can be attributed to both types of innovations (Crossan & Apaydin, 2010).

Organizational innovation involves the adoption of new methods for organizing routines, new methods for distributing and structuring responsibilities and new ways of organizing external relations (OECD, 2005a). These activities convey an iterative process within an organization which has an impact on its operating routines and hence contributes to its performance (Helfat & Peteraf, 2003). This distinctive nature of organizational innovations makes them non-technological processes.

Several authors have addressed the bias towards technological innovations (Ganter & Hecker, 2014), indicating the limited attention that has been paid to organizational innovations in literature (Lin et al., 2016). However, organizational innovations are relevant to the business context as they offer a long lasting source of competitive advantages (Hamel, 2006) and allow the creation of tacit knowledge (Damanpour & Aravind, 2011). Various common business practices are seen as organizational innovations including knowledge sharing and learning within a firm, organization restructuring, distributing its activities and collaborating with external entities (OECD, 2005a).

Empirical literature indicates two directions in which the relationship between organizational and technological innovations can move. One stream of research shows that organizational innovations enable technological innovations (for example, Min et al., 2015; Mothe et al., 2015) while another has the opposite perspective (for example. Schmidt & Rammer, 2007; Wang & Ahmed, 2004). These studies are qualitative in nature and even though they offer detailed insights about innovations, they are constrained to their specific context and analytical

techniques, thus limiting the possibilities of being able to observe the complex interactions between variables that influence innovative behavior (Ganter & Hecker, 2014).

Černe et al., (2016) did an analysis of non-technological innovations and suggest that there is a need to understand the complementarities between non-technological and technological innovations following an integrated perspective. Further, most of the studies on organizational innovations are only descriptive with only a handful invoking specific theories (Crossan & Apaydin, 2010).

My study addresses this problem by recalling the dynamic capabilities view of a firm and by using the fuzzy-set qualitative comparative analysis (fsQCA) to explore the relationship between organizational and technological innovations following a holistic perspective.

Dynamic capabilities are defined as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997). This provides a

theoretical framework for understanding how organizations achieve a competitive advantage. Organizations achieve better performance by creating difficult-to-replicate tangible and intangible assets.

Using fsQCA it is possible to discover different configurations of multiple inter-related variables leading to the same desired output (Kraus et al., 2018). This enables wider interpretations of the intrinsic relationship between the two as compared to traditional regression techniques. fsQCA has not received wide attention in the field of innovation; there are only minor exceptions (for example, Ali et al., 2016; Crespo & Crespo, 2016; Ganter & Hecker, 2014; Ordanini et al., 2014). Moreover, fsQCA is suitable for exploring and pragmatically organizing multiple complementarities among the variables of interest in explaining a desire outcome.

My study provides a holistic perspective of a firm's innovative behavior by answering the following questions: first, what is the relationship between organizational and technological innovations? and second what are the complementarities between these innovations that explain a firm's performance?

The rest of the chapter is organized as follows: Section 4.2 presents the research model and theoretical background of fsQCA applied on innovation research. Section 4.3 describes the research model and data. Section 4.4 provides the research findings and Section 4.5 gives the conclusion.

4.2 Research Model

My study uses the fuzzy-set comparative qualitative analysis to identify configurational paths of organizational and technological innovations and other firm attributes with a firm's performance. Firm attributes are size and education (Ganter & Hecker, 2013; Mol & Birkinshaw, 2009), while innovation types are organizational, product and process innovations (OECD, 2005a). The model also includes business inhibitors to capture a firm's barriers to innovative activities. The model described in Figure 4 determines the causal relationship between a firm's innovative behavior and its performance.

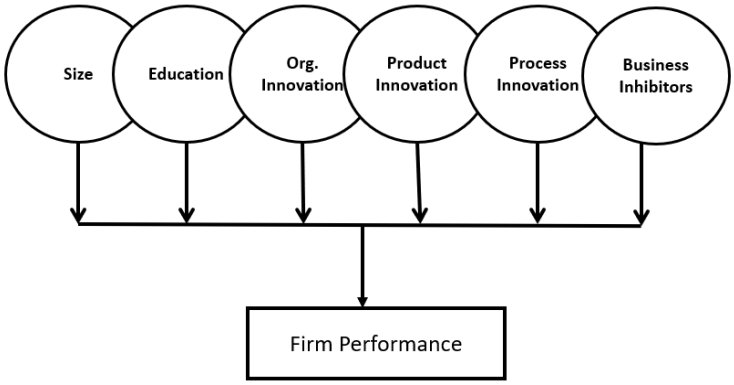

Figure 4. Research model for the fsQCA analysis

4.2.1 Fuzzy-set qualitative comparative analysis (fsQCA)

Through the use of Boolean algebra and the set-theoretic method fsQCA allows assessing multiple causal conditions or their combination that lead to an outcome. Fuzzy-set QCA is an approach and a useful technique for a cross-case analysis (Kan et al., 2016). Rather than investigating the net effect of the independent variables, fsQCA identifies the relationship between an outcome and all possible

combinations of the variables of interest. Therefore, it is possible to observe equifinality of different combinations of independent variables in reaching the same outcome.

fsQCA also helps differentiate between necessary and sufficient causal conditions of organizational innovations in explaining a firm's performance (Fiss, 2011; Ganter & Hecker, 2014). The necessary causal conditions are firm-specific attributes, while sufficient causal conditions indicate possible alternative combinations of these attributes.

Literature discusses fsQCA's potential benefits vis-à-vis its counterpart traditional statistical techniques. First, it allows us to investigate the causal conditions and establish analytical research in a middle ground between quantitative and qualitative techniques (Kraus et al., 2018). Second, most correlation based research analyzes the effects of the variables in isolation, while a regression analysis estimates the fitness of a single path to an outcome (García et al., 2013; Ragin, 2009). Third, fsQCA is an appropriate technique to supplement a regression

analysis when the relationships between the conditions and the outcome are asymmetric (Kraus et al., 2018).

4.2.1.1 fsQCA in innovation research

Scientific articles that apply the fuzzy-set qualitative comparative analysis fsQCA to business and management research have been increasing in the last few decades (Kraus et al., 2018). This research generally focuses on investigating the internal environment of an organization, its entrepreneurship activities, processes and organizational structure related to specific organizational outcomes. Only about 10 percent of the fsQCA research strictly deals with innovations (see Kan et al., 2016).

Even though it is outside the scope of this study to provide a complete literature review, I present the most recent studies on innovations. Ganter and Hecker (2014) explore configurational paths in explaining the adoption of organizational innovations. They demonstrate the complex complementarities among the organizational context and technological innovation variables in predicting high organizational

innovation adoption. Hervas-Oliver et al., (2015) use different combinations of a firm's attributes, R&D investments and technological innovations in explaining four possible effects of organizational innovations on its performance. Ali et al., (2016) show the causal effect of absorptive capacity in combination with technological and management innovations in high performance firms. Ordanini et al., (2014) studied new service innovations based on organizational adoption drivers. Reichert et al., (2016) found that different configurations of firm-level capabilities led to high innovation performance. Other articles have studied country-level innovation behavior. For example, Coduras et al., (2016) studied social and individual attributes in countries associated with high entrepreneurial activity. Crespo and Crespo (2016) discuss several causal conditions considering macro innovation drivers leading to high innovation performance in high and low-income countries (Table 8).

Table 8. Recent evidence of fsQCA in innovation research

Author	Context of interest	Findings
Ganter and Hecker (2014)	Antecedents of organizational innovation adoption	Four configurational paths leading to organizational innovation adoption considering size, education, information sources, competition and technological innovations as antecedent conditions.
Hervas-Oliver et al., (2015)	Antecedents of organizational innovation performance	Three configurational paths leading to differing organizational innovation performance considering size, R&D intensity, product and process innovation as antecedent conditions.
Ali et al., (2016)	Antecedents of a firm's performance	Four configurational paths leading to high firm performance considering absorptive capacity, product, process and management innovations as antecedent conditions.
Ordanini et al., (2014)	Antecedents of service innovation	Three configurational paths leading to new service adoption considering five adoption drivers as antecedent conditions.
Reichert et al., (2016)	Antecedents of high innovative performance	Two configurational paths leading to high innovative performance considering development capability, operational capability, management capability and transaction capability as antecedent conditions.
Coduras et al., (2016)	Antecedents of high entrepreneurial activity	Six configurational paths leading to high total entrepreneurial activity considering six country-level social and individual attributes as antecedent conditions.
Crespo and Crespo (2016)	Antecedents of innovations for high and low-income countries	Four configurational paths leading to innovation success in high income countries and four configurational paths leading to innovation success in low income countries considering four macro-innovation enablers as antecedent conditions.

4.3 Data and methods

My study uses the Enterprise Survey (ES) of the manufacturing sector conducted by the World Bank in the Latin American region in 2010 covering the period 2007-09. This dataset was selected because it includes business development services indicators as a measure of organizational innovation activities at the firm level; these measures are not collected in other periods of the survey. The data is further reduced to deal with missing information. Responses that were marked by the survey administrator as ‘spontaneous’ or ‘unfamiliar’ were deleted from the sample as were firms that were established after 2007. Additionally, to avoid disturbances during data analysis, following Mohnen et al., (2006) firms reporting a sales growth of over 260 percent and below -60 percent were deleted from the sample. A total of 3,997 pooled observations were considered for the analysis.

4.3.1 Organizational context

For firm size my study uses the number of full time employees during the last fiscal year (2009).

Education is a variable that measures the education level of labor as a percentage of workers who has at least a bachelor's degree of total workforce.

Business inhibitors is a variable that measures the environment's effect on firm behavior. In my study, business inhibitors are those that limit firms' flexibility and independence in effective business functioning. Operationalization of this variable refers to the degree of perceived obstacles in different aspects. The possible answers are 'No obstacle,' 'Minor obstacle,' 'Moderate obstacle,' 'Major obstacle' and 'Very severe obstacle.' The environmental factors considered for this variable are 'Practices of competitors in the informal sector,' 'Access to finance,' 'Tax rate,' 'Economic/political instability,' 'Customs and trade regulations,' 'Labor regulations' and 'Inadequate labor force.' In each case, we coded any degree of obstacle as '1' and no obstacle as '0.' The

number of cases result in a measure between ‘0’ and ‘7’ (Ganter & Hecker, 2013).

4.3.2 Innovation modes

Product innovation is a dummy variable created to see whether a firm has introduced any new or significantly improved products.

Process innovation is a dummy variable created to see whether a firm has introduced new or significantly improved processes for producing or supplying products.

The operationalization of the variable organizational innovation is extracted from the ‘Business Development Services’ section of the Enterprise Survey. Establishments were asked whether they had implemented any of the following four activities over the last three years: first, improving quality control or training to obtain quality certification. This indicator captures the implementation of practices to prepare the firm for obtaining certifications to improve the quality of its products. Examples include local or regional standards, ISO certification, safety and sanitary certifications or verifying quality management systems.

Second, developing business alliances with other suppliers or clients. Alliances refer to promoting interactions with other firms with the objective of improving the business' functioning and tapping opportunities. Examples include participation in competitive programs, cluster promotion programs or supplier development programs or others seeking business partnerships. Third, promoting exports. Here activities designed specifically for supporting exports were considered. Examples include market identification, participation in trade fairs, coordination with overseas trade offices or human resource development to enhance export capacity. Fourth, using any programs, technical assistance or training on information technology, management, accounting or other functions such as marketing and logistics. This category considers the back-office operations of a firm used for its proper functioning, relying on information technologies and other technical implementation. Examples include software for exports, accounting, human resources, inventory or management control systems (the World Bank, 2010). Each item from the four responses was coded as '1' for implemented and '0'

otherwise. Therefore, a categorical variable was created by counting the number of activities introduced by the firm in a scale from ‘0’ to ‘4.’

4.3.3 Firm performance

Firm performance is the dependent variable on which configurational paths are measured. My study used an objective and a subjective measure. The subjective measure captures the effect of introducing organizational innovations in three dimensions (Hervas-Oliver et al., 2015). The market dimension involves whether a firm reported benefits or ‘increased sales in the domestic market’ and ‘opened a new foreign market.’ The product involves whether a firm reported benefits in an ‘increase in the number of goods offered by it,’ ‘improved quality of goods and services’ and ‘obtained quality or export certifications.’ The production efficiency dimension involves whether the firm reported benefits on ‘reduced unit production costs’ and ‘reduced energy consumption.’ The number of cases where respondents gave positive answers were coded as 1, resulting in a measuring scale from 0 to 7.

The objective variable is based on Mol and Birkinshaw (2009) and represents productivity growth between 2007 and 2009 to include a time lag in the model. Therefore, productivity growth is computed as 2009 sales/employees 2009 / 2007 sales/employees 2007 – 1.

4.4 Analytical method

This study uses fsQCA and data calibration relies on the package fuzzy-for Stata 13.0. Data calibration was done in two steps: identifying the target set and data transformation. The independent variables were calibrated using the rank transformation rule (stdrank) that rank orders the variables and then standardizes this ranking to range from 0 to 1 (Longest & Vaisey, 2008). The standardization consists of subtracting the rank value with the minimum rank and dividing the outcome by the difference between the maximum and minimum ranks.

The focus of my study is on a set of firms with high performance as a result of implementing organizational innovations. Its objective is to use performance indicators to rate the degree of membership in this set.

Two individual analyses were done for both the subjective and objective measures of a firm's performance,

To calibrate the dependent variables, my study used the direct method (see Ragin, 2007). The direct method uses three qualitative anchors to structure calibration: the threshold for full membership, the threshold for full non-membership and the cross-over point (Ragin, 2000). The data is calibrated in terms of deviations from the cross-over point. Once these values have been properly identified, it is possible to allocate the degree of membership in the target set. The anchors of the dependent variables are based on: productivity growth and firm performance as variables that are transformed into a fuzzy-set following García et al., (2013) using the 25th, 50th and 75th quantiles for the threshold of full non-membership, cross-over point and threshold of full membership respectively. In other words, the target set (high performers) are firms that reported at least four firm performance improvements in the first analysis, and firms with productivity growth greater that 18 percent in the second analysis.

Data calibration generates a truth table used by the fuzzy algorithm to observe all possible combinations (cases) of independent variables (predictors) explaining that a particular outcome is consistent with a cut-off value of 0.8 (Ragin, 2000). The algorithm shows optimal reduction sets leading to the outcome. The method relies on the values of consistency and coverage to observe reliability of the results. Consistency is comparable to a correlation, it expresses the number of cases consistent with the outcome (Hervas-Oliver et al., 2015). Coverage is comparable to a coefficient of determination, it assesses the empirical relevance of the condition being viewed (Ganter & Hecker, 2014). The calculation of the fuzzy-set theoretic coverage and consistency follows the equation (Longest & Vaisey, 2008; Ragin, 2000):

$$Consistency\ (X\ \in Y) = \frac{\sum \min(x_i, y_j)}{\sum x_i} \quad \text{Eq. (4)}$$

$$Converage\ (X\ \in Y) = \frac{\sum \min(x_i, y_j)}{\sum y_i} \quad \text{Eq. (5)}$$

Where xi is the degree of membership of predictor i in configuration Y and yi is its degree of membership to outcome Y (García et al., 2013).

4.5 Results and discussion

Table 9 gives the correlation, mean and standard deviations of relevant variables while table 10 presents the minimum, first quartile, median, third quartile and maximum value of the variables presented in the research model and its corresponding transformation into fuzzy-sets following the methods previously mentioned.

Table 9. Mean, standard deviation and correlation among variables. N = 3997

	Variables	Mean	SD	1	2	3	4	5	6	7	8
1	Firm performance	2.79	2.14	1.00							
2	Productivity growth	0.16	0.45	0.01	1.00						
3	Organizational innovation	1.71	1.32	0.73	0.00	1.00					
4	Product innovation	0.59	0.49	0.28	0.02	0.28	1.00				
5	Process innovation	0.49	0.50	0.32	0.00	0.31	0.39	1.00			
6	Size	158.85	623.74	0.18	-0.02	0.17	0.08	0.07	1.00		
7	Education	14.38	17.88	0.22	0.01	0.27	0.08	0.09	0.06	1.00	
8	Business inhibitors	5.36	1.62	0.17	0.00	0.17	0.16	0.11	0.06	0.05	1.00

The analysis is done in two parts: First it evaluates all possible solutions explaining improvements in a firm's performance (Table 11) and second, a subsequent analysis to understand productivity growth (Table 12).

Table 10. Uncalibrated data and transformation for fuzzy-set QCA analysis

Variable	Statistics									
	Min		First quantile		Median		Third quantile		Max	
	Uncalibrated	Transformation	Uncalibrated	Transformation	Uncalibrated	Transformation	Uncalibrated	Transformation	Uncalibrated	Transformation
Productivity Growth	-0.5938	0.0013	-0.2669	0.0851	-0.0083	0.4990	0.1790	0.9296	2.5855	1
Firm performance	0	0	0	0	2.2561	0.3378	4	0.6247	7	1
Firm size	2	0	9.220	0.1363	25.670	0.3873	74.6281	0.6270	21955	1
Education	0	0	0.2728	0.0379	6.8174	0.3755	17.2240	0.6800	100	1
Business Inhibitors	0	0	0	0	3.84	0.2444	6	0.6654	7	1
Product Innovation	0	0	0	0	1	1	1	1	1	1
Process Innovation	0	0	0	0	1	1	1	1	1	1
Organizational Innovation	0	0	0.4610	0.1285	2	0.5527	3	0.8156	4	1

N= 3997

Table 11 shows the results of fsQCA in high firm performance. This solution table presents three optimal solutions – the black circles indicate a high presence of a particular condition while white circles indicate low presence of a particular condition and blank spaces indicate the absence of a particular condition. Additionally, the solutions are grouped following Fiss (2011) by identifying innovation behavior. Based on the analysis, Solution 1 indicates only organizational innovations as an important predictor of performance, while Solutions 2a and 2b are firms that rely only on technological innovations (that is, product and process innovations) to achieve higher performance.

The three solutions shown in Table 11 increase a firm's performance in 86.6 percent of the cases and cover 74.6 percent of the observations. Solution 1 indicates that 89 percent of the firms with high organizational innovations achieved high performance. This result is not surprising given the high correlation between organizational innovations and their effect on performance as seen in Table 9. Interestingly, Solutions 2a and 2b indicate that firms pursuing the development of new products and introducing new processes achieved high performance.

Table 11. Configurations explaining high firm performance

	Solution		
Configuration	1	2a	2b
Size			●
Education		●	
Organizational Innovation	●		
Product Innovation		●	●
Process Innovation		●	●
Business Inhibitors		●	
Raw Coverage	0.692	0.218	0.317
Unique Coverage	0.396	0.01	0.033
Consistency	0.896	0.883	0.882
Overall solution coverage	0.746		
Overall solution consistency	0.866		

Black circles indicate high presence of the antecedent condition predicting the outcome in a particular configuration. White circles indicate low presence of the antecedent condition predicting the outcome in a particular configuration. Absence indicates that the antecedent condition does not figure in a particular configuration. N=3.997

Table 11 provides three configurational paths of predictors leading to the same outcome, in other words all these combinations of a firm's attributes and innovation activities are equifinal and organizations with such attributes achieve high performance. The coverage among these solutions ranges between 21 and 69 percent, indicating the share of the outcome explained by a particular configuration.

Solution 1 implies that the firms actually improved their business functioning by adopting organizational innovations. This also supports

the notion that the implementation of organizational innovations enables the creation or modification of operating routines (Van de Ven, 1993; Zaltman et al., 1973). These configurations mainly capture business owners' perceptions about the firm's improvements which provides meaningful evidence of the positive effect of organizational innovations and other firm attributes. Additionally, it is possible to observe a substitution between the relationship between firm size, education and business inhibitors in Solutions 2a and 2b. This indicates that smaller firms, facing greater business inhibitors and with high technological innovations, belong to the set of high performers. This suggests the importance of employee creativity and employee involvement in achieving the organization's goals to increase its innovation capabilities (Ganter & Hecker, 2014; Mol & Birkinshaw, 2009).

Table 12 gives the results of the second analysis by considering productivity growth as an outcome to provide more adequate evidence about the effect of innovation complementarities in a firm's performance. This solution table contains four configurational paths and explains the combination of antecedents that lead to high productivity

growth. Based on these configurational paths it is possible to determine typologies of firms in terms of innovation activities.

Table 12. Configurations explaining high productivity growth

	Solution			
Configuration	1	2	3a	3b
Size	●	○	●	○
Education		●	○	○
Organizational Innovation		○	○	●
Product Innovation	●	●	●	●
Process Innovation	○	●		
Business Inhibitors	○	○	○	●
Raw Coverage	0.066	0.061	0.113	0.144
Unique Coverage	0.018	0.015	0.017	0.078
Consistency	0.807	0.834	0.836	0.836
Overall solution coverage	0.229			
Overall solution consistency	0.815			

Black circles indicate high presence of the antecedent condition predicting the outcome in a particular configuration. White circles indicate low presence of the antecedent condition predicting the outcome in a particular configuration. Absence indicate that the antecedent condition does not figure in a particular configuration. N=3.997

Solution 1 is typified as 'technological innovators.' This solution explains 80.7 percent of the outcomes and indicates that product innovation is the core activity of larger sized firms which are also supported by process innovations. Solution 2 is 'complex innovators.' This characteristic is attributed to smaller firms with high-educated workforces that rely on high technological innovations and are supported

by organizational innovations. These types of firms are not affected by business inhibitors. This solution explains 83.4 percent of the outcomes.

The third typology is ‘hybrid innovators’ represented in Solutions 3a and 3b. These types of firms achieve high productivity through product innovations supported by organizational innovations. These solutions explain 83.6 percent of the outcomes. We observed a trade-off between size, organizational innovations and business inhibitors. This implies that smaller firms facing stronger business inhibitors complement the development of new products with the adoption of organizational innovations. Or, as explained by Mol and Birkinshaw (2009), larger firms are closer to the productivity frontier with fewer opportunities for improvements, while smaller firms are more flexible in introducing new business practices or organizational innovations. Additionally, the results also corroborate the findings that business inhibitors trigger the implementation of organizational innovations as seen in Solution 3b to overcome environmental rigidities that can alter proper business functioning (Ganter & Hecker, 2013).

It is possible to determine which solution is the most relevant by analyzing the unique coverage (empirical relevance of each solution) of the four solutions given in Table 12 (the overall unique coverage ranges between 1.8 and 7.8 percent). My study found that hybrid innovators (Solution 3b) represented 7.8 percent of the cases (out of 22.9 percent in the total coverage) in explaining the outcome. This supports the evidence that organizational innovations are an important determinant of performance (Damanpour & Aravind, 2011; Ganter & Hecker, 2013; Mol & Birkinshaw, 2009).

Product innovation is a condition present in all solutions, indicating that the development of new products is an important condition for achieving high productivity growth. This supports earlier findings in literature that firms increase sales as a direct response to competitive factors by improving the products that they offer in the market (Černe et al., 2016; Evangelista & Vezzani, 2010; Gunday et al., 2011).

Other solutions incorporate a high presence of organizational and process innovations as important preconditions for achieving

productivity growth. This corroborates the discrepancies found in previous literature applying econometric techniques. A summary of the findings is presented in Table 13.

Table 13. fsQCA receipts on sufficient configurations for achieving high performance

Model 1: High performance as a result of adopting of organizational innovations
- A configuration of a highly educated workforce, with high organizational and product innovations and facing stronger business inhibitors is sufficient for predicting high firm performance. - A configuration of large size, with high organizational and product innovations and facing stronger business inhibitors is sufficient for predicting high firm performance. - A configuration of a highly educated workforce, large size and with high organizational innovations is sufficient for predicting high firm performance. - A configuration of high organizational and process innovations is sufficient for predicting high firm performance.
Model 2: High productivity growth
- A configuration of small size, a highly educated workforce, low organizational innovations, high product and process innovations and facing lower business inhibitors is sufficient for predicting high productivity growth. - A configuration of large size, lower education, low organizational innovations, high product innovations and facing lower business inhibitors is sufficient for predicting high productivity growth. - A configuration of small size, lower education, high organizational innovations, high product innovations and facing stronger business inhibitors is sufficient for predicting high productivity growth. - A configuration of large size, high organizational innovations, low process innovations and facing lower business inhibitors is sufficient for predicting high productivity growth.

Overall, these configurations provide interesting insights into the differences and commonalities found in combinations of a firm's attributes leading to different levels of performance, allowing a broader perspective on the 'receipts' for business success. Moreover, this finding contributes to an understanding of complementarities between technological and organizational innovations and their effects on a firm's performance.

Figure 5 present a plot of productivity growth for the four solutions given in Table 3. This figure is important as it shows the asymmetric relationship between causal conditions and productivity growth as an asymmetric relationship in the graphs. We find a clustering of observations in the top left quarter of the plot, indicating that there are no causal paths to the outcome, instead several alternative causal paths lead to productivity growth (Ganter & Hecker, 2014). The graphs also indicate the effect of asymmetric modeling which is an important premise of fsQCA. Causal asymmetry explains sufficient but not necessary conditions explaining an outcome. Following Ali et al., (2016) plotting the complex combinations of the solutions found in Table 3,

suggests the predictive validity of the fsQCA analysis as all four solutions are highly consistent and above the threshold of 0.8 as suggested in literature (Fiss, 2011; Ragin, 2000).

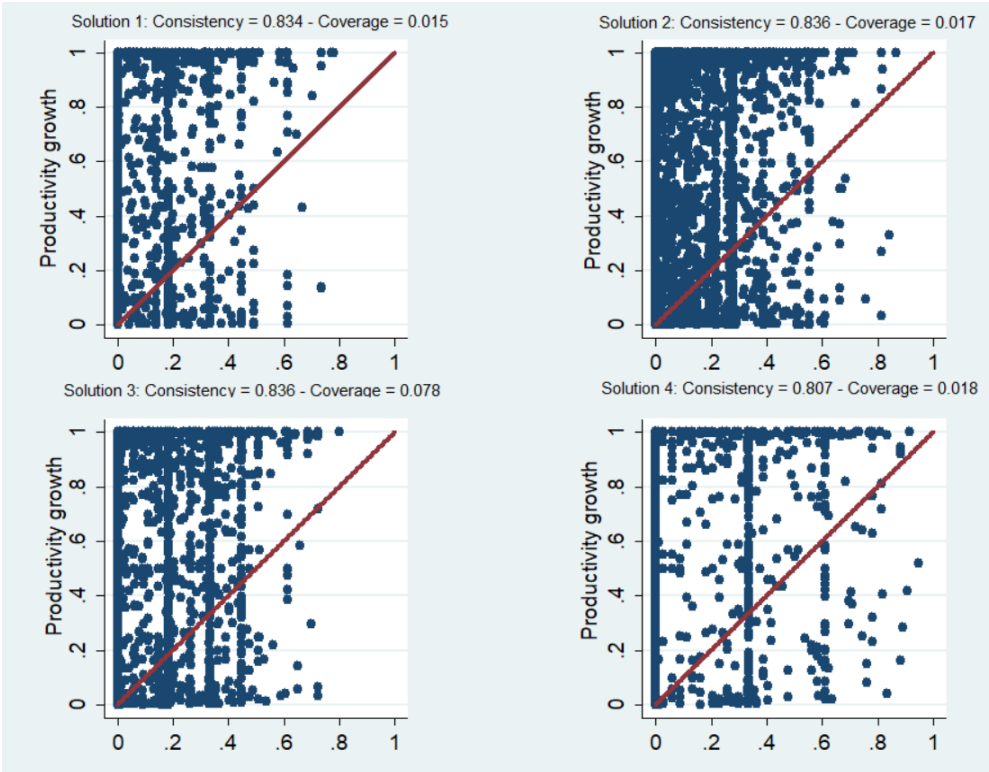

Figure 5. Fuzzy plots of high productivity growth

4.6 Sub-conclusions

Today there is more evidence on the complementarities of organizational and technological innovations in the management field. However, there are several discrepancies with arguments about the complementarities divided in literature.

My study approaches this intrinsic relationship between organizational and technological innovations from a holistic perspective using the fsQCA analysis in a large sample of manufacturing firms in Latin America to find complex causal interdependencies between different types of innovations and how their effects contribute to high firm performance.

These results show several equifinal combinations of antecedents leading to a firm's performance, thus providing evidence about the complex interaction between firm attributes and innovations.

The importance of my methodological approach and the results of my study avoid the tendency to analyze the effects of organizational or

technological innovations in isolation. Additionally, my study contributes to literature on innovation using the fsQCA analysis, thus complementing previous quantitative and qualitative results in research on organizational innovations.

Chapter 5. An evaluation of the fitness landscape for organizational innovation adoption

5.1 Introduction

Dynamic capabilities have received a lot of attention in the field of management science in the last 20 years and thousands of publications have used this theory for business research. The field has been dominated by theoretical and empirical approaches aiming to explore the role of a firm's capabilities in its competitive advantages. To begin with, dynamic capabilities were defined as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997). This groundbreaking theory explained that sources of competitive advantage were not only attributable to tangible assets but also to difficult-to-replicate intangible assets.

Over the years, the study of dynamic capabilities has evolved and moved in different directions. One main research stream seeks to understand the evolution of dynamic capabilities in a firm (for example, Winter, 2003; Zahra et al., 2006; Zollo & Winter, 2002). This stream explains that the emergence of dynamic capabilities corresponds mainly with a firm's ability to modify and create new operating routines. Another stream provides vast evidence on the effect that different ordinary dynamic capabilities have on a firm's performance through the intervention of an intermediate outcome, typically using measures corresponding to operating capabilities and technological innovations (for example, Mu, 2017; Pavlou & El Sawy, 2011; Protogerou et al., 2011; Zhou et al., 2017). However, the theoretical perspective of dynamic capabilities is now taking a new direction in literature with studies claiming that it is necessary to explore the theory from different points of view.

Teece (2018) suggests that researchers should explore dynamic capabilities from a system theory perspective and adds that 'dynamic capabilities studies have not explicitly invoked systems theory.' My

study addresses this knowledge gap by combining empirical data with a complexity science approach, the NK Model.

The study continues as follows. Section 5.2 presents the research model and theoretical perspective of the adoption of organizational innovations. Section 5.3 describes the data. Section 5.4 and 5.5 provides the research findings and Section 5.6 concludes this study.

5.2 Model description

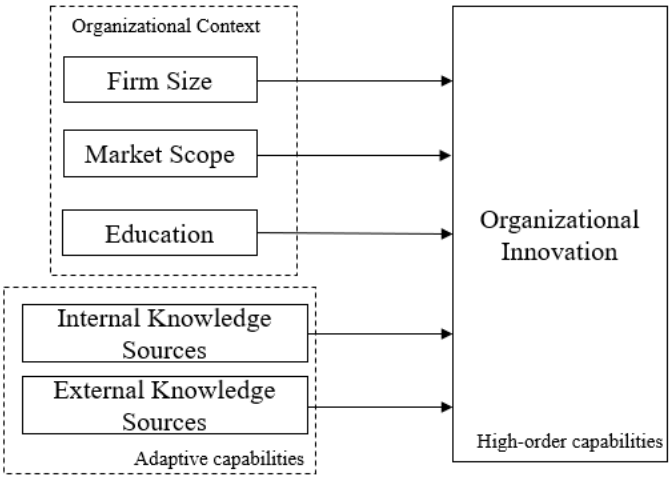

Figure 6. Model for the adoption of organizational innovations

The model that I use is built on Mol and Birkinshaw's (2009) study of the organizational context and search for knowledge sources as important determinants of organizations adopting innovations. An organizational context comprises of firm size, market scope and the education levels of its workforce. For knowledge sources, my model consider internal sources as training carried out by the firm and external sources which are cooperation with external entities in innovation activities (Ganter & Hecker, 2013). The model presented in figure 6 explores the effect of these variables in the implementation of organizational innovations.

5.2.1 Systemic view of dynamic capabilities

My study contributes to Teece's (2018) suggestion that researchers should explore dynamic capabilities from a system theory perspective. This section describes the systemic view of dynamic capabilities presented by Teece (2018) to explain the hierarchical framework and the interdependencies of a firm's capabilities.

First, ordinary capabilities refer to the processes that use resources or as Winter (2003) says, 'how we earn a living now.' The second level of the capabilities hierarchy is 'micro foundations' which refer to more sophisticated routines that provide and entail a higher coordination and integration of resources such as developing new products. The final and even higher level of the hierarchy refers to activities that channel other capabilities. These are divided into sensing, seizing and transforming. The use of all these capabilities allows firms to achieve external fitness.

Sensing capabilities: These cover a wide range of possible activities. Sensing and shaping opportunities are scanning, learning, creative and interpretive activities; usually investments in R&D are complementary to these activities. Opportunities can be found in different sources of information and in existing and new knowledge. Organizations must scan local and remote markets and technologies to identify and shape these opportunities. However, using this capability can be constrained by regulations, laws and social and business ethics, in other words the existence of inhibitors can potentially change the rules of decision making and competition.

To assess the market and technological developments, enterprises have to undertake activities so that they can recognize potential opportunities. These opportunities are created by stable organizational processes that allow the flow of information among the organization's individuals and decision makers. Hence, sensing opportunities requires 'search' activities to find out what is going on in the business ecosystem (Teece, 2007). This search must consider potential collaborators (customers, suppliers and complementors) as they are key sources for new ideas. My study emphasizes the importance of search in the creation of new products and processes and how a systemic approach should be followed which complements existing innovations to respond to customer needs. In previous research, Lin et al., (2016) found that sensing capabilities positively influenced the adoption of organizational innovations, implying that adoption of new business practices was initiated when managers pursued necessary changes based on observing external environmental conditions.

Seizing capabilities: These are timely responses to opportunities that have been sensed and can be achieved through new products,

processes or services. These activities require specific investments and must be complemented by organizational innovations and the creation of a business model.

Transforming capabilities: Involve redeployment and reconfiguration of business assets, specifically business units as a response to technological and market opportunities through decentralization and decomposability, co-specialization and knowledge management.

The last two components of the framework are resources and strategies. Strategies are fundamental for surviving in strong market competition and turbulent environments.

Further, Teece (2018) also mentions that each hierarchical level represents a sub-system which organizations need to manage. Following this conceptualization, an organizational innovation is defined as high-order dynamic capabilities which correspond to a sub-system within the organization representing a bundle of tasks and routines embedded in the firm's capabilities.

5.2.2 Organizational innovation and search

The influential work of Mol and Birkinshaw (2009) introduced the concept of search in the field of organizational innovation. According to this thinking, the introduction of new management practices is a consequence of a firm's necessity to adopt practices that can be learnt from other parties and relations. The concept of search represents managerial activities intended to seek new information. Information can be gathered from different internal sources and also from external knowledge sources such as competitors, customers and suppliers (Mol & Birkinshaw, 2009). According to Cohen and Levinthal (1990) searching for alternatives outside the organization is fundamental to overcoming failure in performance. Zahra and George (2002) state that new ideas are discovered around a firm's search zone and they are represented by external relations from which new knowledge can be gathered, transformed and assimilated by an organization. Teece (2000) discusses the creation of intangible assets and how they respond to a firm's ability to identify 'best practices' depending on the organizational context.

Firms differ greatly in the rate at which they adopt innovations. This is partly because organizations tend to observe other firms' practices. However, a firm's choices are limited to its reference group. Studies have suggested that the reference group is an unobservable concept (for example, Massini et al., 2005; Mol & Birkinshaw, 2009), which is used to inter-relate the organizational context and a firm's propensity to emulate or imitate its peers.

My study uses the concept of search to represent the activities undertaken by organizations to find new ideas and business practices that can be implemented for improving their performance.

5.2.3 The NK Model

The original NK Model was introduced by Kauffman (1993). The model describes a system which comprises of a string of elements (N). My study reinterprets this model to represent an organization. Each element is a new business practice (organizational innovation). For every element there is a possible state described as A. Every state is represented

by ‘1’ if a new business practice is implemented and ‘0’ otherwise. Therefore, A contains two possible states. With this parameter the design space is created with A^N. Given that my study considers four types of organizational innovations (business alliances, export promotion, implementation of IT systems, quality control), the landscape represents 2^4 possible new business practices where each choice configuration is assigned a random fitness value between 0 and 1. The total fitness value f(x) is calculated as the average contribution of each element of the system $f_i(x)$ as represented by (Kauffman, 1993):

$$f(x) = \frac{1}{N}\sum_{i=1}^{N} f_i(x) \quad \text{Eq. (6)}$$

The characteristics of the landscape are determined by the degree of interdependency of each element denoted as K. This suggests that the implementation of one business practice may be influenced by the execution of another. The K parameter in the NK Model can range between 0 and N-1. With K=0 the resultant space is simple and smooth with one local optima of maximum fitness suggesting that only one business practice dominates the landscape. As the interdependencies

among the elements of the system increase, the complexity of the landscape also changes. With K=N-1 the resultant landscape has several local peaks representing maximum fitness, indicating that a variety of new business practices and their combinations are available.

The NK Model is suited for describing the concept of organizational innovations and search. As McCarthy (2004) says, 'strategic change is assumed to be a process of moving from one strategy to another in search of an improved fitness.'

My study also applied the NK Model to simulate agent-based decision making. It simulated a super-agent process in which an agent was represented by an organization. According to Tesfatsion and Judd (2006) super-agent processes 'provide a mechanism to substitute for modelling the agents who actually make the decisions.'

Several authors have used agent-based modeling to evaluate a firm's capabilities, strategies and knowledge management. In particular, Frenken (2001) and Ganco and Hoetker (2009) use the NK Model to explain organizations' innovative behavior by focusing on technological

innovations. Zhang and Wang (2016) used this methodology to simulate the adaptation of employee creativity. Fan and Lee (2012) explain innovation performance by considering intellectual capital as the driver. McCarthy (2004) represents manufacturing strategies using the NK Model. Xia and Gui-long (2007) created a fitness landscape representing technological innovations. Other researchers have implemented agent-based modeling to investigate organizational learning and knowledge diffusion within an organization (Koohborfardhaghighi & Altmann, 2014, 2017) to explain the process of knowledge transfer and creation attributed to an interaction among individuals considering various hierarchical organizational structures. However, previous literature has not modelled organizational innovations using the NK Model. My study addresses this gap in literature.

5.3 Data and methods

My study uses the Enterprise Survey (ES) of the manufacturing sector conducted by the World Bank in the Latin American region in 2010, covering the period 2007-09. I selected this dataset because it

includes business development services' indicators as a measure of organizational innovation activities at the firm-level; these measures are not collected in the other periods of the survey. The data was further reduced to deal with missing information. Responses that were marked by the survey administrator as 'spontaneous' or 'unfamiliar' were deleted from the sample as were firms that were stablished after 2007. After this exercise there were 5,717 pooled observations left for the analysis. The data was divided into industries following the classification of the manufacturing sector based on technology intensity (OECD, 2005b). This sub-section describes the variables included in the analysis.

5.3.1 Dependent variable

Organizational innovation is a measure obtained from four business practices: i) quality control or training to obtain quality certification. This indicator captures the implementation of practices to prepare a firm for obtaining certifications to improve the quality of its products. Examples include local or regional standards, ISO certification, safety and sanitary certifications or verifying quality management systems; ii) business

alliances with other suppliers or clients. Alliances refer to promoting interaction with other firms with the objective of improving the business' functioning and opportunities. Examples include participation in competitive programs, cluster promotion programs or supplier development programs or others seeking business partnerships; iii) promoting exports. Here the activities that are specifically designed to support exports are considered. Examples include market identification, participation in trade fairs, coordination with overseas trade offices and human resource development to enhance export capacity; iv) implementing any program, technical assistance or training on information technology, management, accounting or other functions such as marketing and logistics. This category considers back-office operations which help in running the establishment properly and relying on information technologies and other types of technological implementation. Examples include software for exports, accounting, human resources, inventory or management control systems (the World Bank, 2010).

We coded each item from the four responses as ‘1’ for implemented and ‘0’ otherwise, resulting in an ordinal variable ranging from 0 to 4.

5.3.2 Independent variables

For firm size my study uses the number of full time employees during the last fiscal year (2009).

Education is a variable that measures the education levels of the labor force as a percentage of workers who have at least a bachelor’s degree in the total workforce.

Market scope measures the largest market in which the establishment sold its main product and is coded as ‘0’ (local), ‘1’ (national), or ‘2’ (international).

Export intensity is an indicator which is included as the percentage of export sales. This variable reflects a firm’s reaction to international competition since it has to focus on intensifying its innovation activities.

Innovation support is a dummy variable denoting if the firm had received any type of support for improving its new products or production processes. Innovation support can be guidance, assistance or financial aid that is provided by external public or private entities. Group is a dummy variable if the firm is part of a larger firm.

Market competition implies the number of competitors for the firm's main product and is coded as none (0), one (1), between two and five (2), more than five (3).

Product innovation is a dummy variable created to find out whether a firm introduced any new or significantly improved products.

Process innovation is a dummy variable created to find out whether a firm introduced new or significantly improved processes for producing or supplying products.

Internal source is a variable that indicates if a firm has offered any type of training to its employees in the last three years.

External source is a variable that indicates if a firm has cooperated with other enterprises or science and technology institutes in the last three years.

Business inhibitors is a variable that measures the effect of the environment on a firm's behavior. In my study business inhibitors are those that limit firms' flexibility and independence in pursuing effective business functioning. Operationalization of this variable refers to the degree of perceived obstacles in different aspects. The possible answers are 'No obstacle,' 'Minor obstacle,' 'Moderate obstacle,' 'Major obstacle' and 'Very severe obstacle.' The environmental factors considered for this variable are 'Practices of competitors in the informal sector,' 'Access to finance,' 'Tax rate,' 'Economic/political instability,' 'Customs and trade regulations,' 'Labor regulations,' and 'Inadequate labor force.' In each case, we coded any degree of obstacle as '1' and no obstacle as '0.' The number of case results is a measure between '0' and '7' (Ganter & Hecker, 2013).

5.4 Analytical method

With the intention of observing the effect of organizational context and information sources which are seen as important determinants in the adoption of organizational innovations, we implemented an ordered logistic regression model. The dependent variable (organizational innovations) is categorical and ranges from 0 to 4.

The ordinal regression model is presented as a latent variable model where y^* is a latent variable given as:

$$y_i^* = \beta X_i + \varepsilon_i$$

Where Xi is the set of explanatory variables and ε_i is a random error (Long & Freese, 2006). Therefore, the equation of the model implemented is as follows:

$$ORG_i^* = \beta_1 X_{size} + \beta_2 X_{scope} + \beta_3 X_{educ} + \beta_4 X_{internal} + \beta_5 X_{external} + \beta_6 X_{export} + \beta_7 X_{support} + \beta_8 X_{group} + \beta_9 X_{product} + \beta_{10} X_{process} + \beta_{11} X_{bussiness} + \varepsilon_i \quad \text{Eq. (7)}$$

The model divides y^* into M ordinal categories:

$$y_i = m \; if \; \theta_{m-1} \leq y_i^* < \theta_m \; for \; m = 1 \; to \; M$$

Where the cut points θ_1 to θ_{M-1} are estimated. Given that the dependent categorical variable M = 4, then the observed responses for each category are:

$$y_i = \left\{ \begin{array}{c} 0 \; if \; \theta_0 = -\infty \leq y_i^* < \theta_1 \\ 1 \; if \; \theta_1 \leq y_i^* < \theta_2 \\ 2 \; if \; \theta_2 \leq y_i^* < \theta_3 \\ 3 \; if \; \theta_3 \leq y_i^* < \theta_4 = \infty \end{array} \right\}$$

5.5 Results and discussion

This analysis has two parts. First, my study explores the effect of information sources on the adoption of organizational innovations through an ordered logistic regression. Second, I implement a simulation of a fitness landscape based on the NK Model to evaluate firms' adaptive processes in four industries in the manufacturing sector.

5.5.1 Empirical results

The results of the ordered logistic regression on the adoption of organizational innovations for Low-Tech, Med Low-Tech, Med High-Tech and High-Tech industries for the manufacturing sector in Latin America is presented in Table 14.

Several differences are found among the four types of industries all of which actively introduced organizational innovations. The results support the findings that alliances (for example, Cohen & Levinthal, 1990; Supriyadi; Teece, 2007), export promotion (for example, Harris & Li, 2008; Hitt et al., 1997), quality certification (for example, Naveh & Erez, 2004; Terziovski & Guerrero, 2014) and information technologies (for example, Gera & Gu, 2004; Sher & Lee, 2004) are categorized as organizational innovations. High-Tech firms achieved better performance through quality certification and export promotion only.

When it comes to the organizational context, only firm size and education of the workforce increased the likelihood of a firm adopting organizational innovations. The exception is High-Tech firms in which

firm size is an important predictor of the implementation of new business practices.

Table 14. Ordered logistic regression predicting organizational innovations in four industries of the manufacturing sector

	Organizational Innovation			
VARIABLES	Low-Tech	Med Low Tech	Med High-Tech	High-Tech
Firm size	0.353***	0.342***	0.306***	0.345***
	(0.0285)	(0.0449)	(0.0535)	(0.115)
Education	0.0162***	0.0106***	0.0118***	0.00852
	(0.00225)	(0.00303)	(0.00301)	(0.00600)
Market scope	0.0998	0.0179	-0.162	0.0220
	(0.0708)	(0.0993)	(0.130)	(0.299)
Internal sources	1.218***	1.408***	1.392***	1.029**
	(0.0814)	(0.124)	(0.155)	(0.434)
External sources	-0.0243	-0.000995	-0.206***	-0.170
	(0.0225)	(0.0327)	(0.0767)	(0.107)
Export intensity	0.00910***	0.0105***	0.0125***	0.000214
	(0.00164)	(0.00258)	(0.00356)	(0.00794)
Innovation support	0.478***	0.799***	0.365**	0.838**
	(0.107)	(0.181)	(0.184)	(0.367)
Group	-0.0264	0.225	0.250	0.139
	(0.0966)	(0.142)	(0.173)	(0.402)
Product innovation	0.530***	0.399***	0.526***	0.428
	(0.0771)	(0.110)	(0.151)	(0.315)
Process innovation	0.797***	0.721***	0.666***	0.759***
	(0.0761)	(0.109)	(0.137)	(0.292)
Business inhibitors	0.109***	0.0816***	0.0983**	0.338***
	(0.0222)	(0.0303)	(0.0400)	(0.0836)
Observations	2,967	1,407	883	196
Wald Chi2	7598.299(***)	3728.906(***)	2385.816(***)	524.667(***)
Log-likelihood	-3799.149	-1864.453	-1192.908	-262.333
McKelvey and Zavoina's Pseudo R2	0.416	0.403	0.374	0.321

Coefficients and robust standard errors in parentheses. *** significant at 0.01, ** significant at 0.05, * significant at 0.1. All calculations include country dummies.

The results on the effect of knowledge sources show that internal sources improved the likelihood of adopting organizational innovations; this finding is similar to Mol and Birkinshaw's (2009). Interestingly, external sources (cooperation with external entities) fail to predict the adoption of organizational innovations.

My results represent the reality of Latin American countries where the main engine of the economy is the manufacturing sector with minor technological intensity. However, Reichert et al., (2016) explain the misconception regarding Low-Tech firms and innovative activities. Even though such firms are less likely to rely on R&D investments for developing new products, our results show that organizational innovations play a fundamental role in explaining a firm’s performance. These findings suggest that the categorization of the manufacturing sector based on R&D intensity is not adequate for organizational innovations given that the adoption of new business practices responds to non-technological processes and also because it is less capital intensive.

To assess the measure of fit, my study included McKelvey and Zavoina's Pseudo R^2 available for logistic regression models. The R_{MZ}^2 offers superior properties as compared to other measures of fit (Long & Freese, 2006). The models show a measure of fit that ranges between 32 and 41 percent.

5.5.2 Simulation results

The second analysis of my study consists of simulating firms' adaptation processes through a landscape represented by new business practices (organizational innovations) using the NK Model.

The objective of the simulation is to represent the process which a firm follows to seek out new business practices. Previous studies point out that external entities play a critical role in the early stages of introducing organizational innovations (Kaplan, 1998). Literature also suggests the influence of external parties on providing information about new business practices. Thus, firms mimic their competitors by implementing management practices that appear progressive (Mol & Birkinshaw, 2009). My simulation intends to recreate the process

following which organizations interact with other entities with the intention of discovering and implementing new business practices.

The simulation is based on a program developed by Padget et al., (2009) and is called the Sendero project.[1] The software is taken from Stuart Kauffman's NK original model using REPAST (Java based simulation module) as an agent based-modeling environment. Using this module, it is possible to input the desired parameters to run the desired simulation.

Following Zhang and Wang (2016) and Fan and Lee (2012) the K parameter expressing interdependencies among new business practices can be extracted from empirical data by observing the correlation coefficients among the variables as shown in Table 15. Therefore, the simulation parameters are: N=4, A=2 and K=3 (for Low-Tech, Med Low-Tech and Med High-Tech) and K=2 (for High-Tech).

[1] Simulation software available at https://wiki.bath.ac.uk/display/sendero

The fitness of an organization is taken as an average of all its characteristics. The adaptive walk is configured as fitted dynamics; an organization chooses a new location from a set of near neighbors but if the fitness of the new location is not better than the current location then the search continues until a better variant is found or all neighbors have been checked (Padget et al., 2009). To simulate real firms' behavior, organizations are allowed to jump across the landscape once a local peak is reached to find the best possible position in the landscape.

The results are shown in Figures 7 and 8. The graphs represent the average fitness obtained over time through the adaptive walk in a landscape of 100 organizations. The analysis indicates that High-Tech firms take longer to reach fitness convergence; this can be concluded as the landscape is less rugged (K=2) and it contains less local peaks of highest fitness. In contrast, if the number of local peaks is more it shows that Low-Tech and Med-Tech firms reach fitness convergence faster. This difference implies that organizations in the Low-Tech and Med-Tech manufacturing sector implement more organizational innovations as compared to High-Tech firms. Therefore, an agent moving in this

landscape is more likely to identify a preferable position faster than the others.

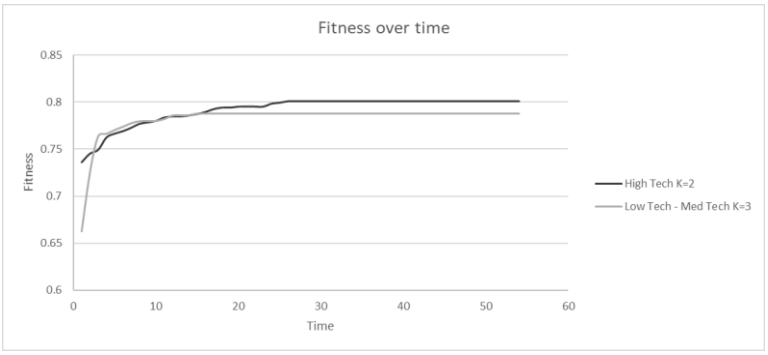

Figure 7. Adapting in the fitness landscape

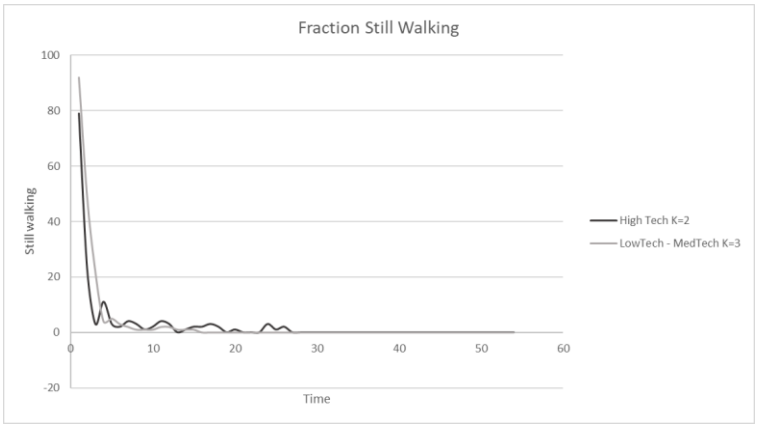

Figure 8. Long jumps over the fitness landscape

Table 15. Correlation coefficients between new business practices

	Alliances	Quality certification	Export promotion	Information Technologies
	Low-Tech			
Alliances	1			
Quality certification	0.2806*	1		
Export promotion	0.2896*	0.2843*	1	
Information technologies	0.3527*	0.3793*	0.3004*	1
	Med Low-Tech			
Alliances	1			
Quality certification	0.2861*	1		
Export promotion	0.2987*	0.2572*	1	
Information technologies	0.3647*	0.4077*	0.3019*	1
	Med High-Tech			
Alliances	1			
Quality certification	0.2271*	1		
Export promotion	0.2581*	0.2802*	1	
Information technologies	0.3221*	0.3694*	0.2477*	1
	High-Tech			
Alliances	1			
Quality certification	0.1375	1		
Export promotion	0.3002*	0.2617*	1	
Information technologies	0.1900*	0.2374*	0.3066*	1

* $p<0.05$

5.6 Sub-conclusions

My study contributes to the dynamic capabilities framework and integrates it with the scope of complex adaptive systems by extracting information from empirical data. After capturing real firms' behavior, it translates that information into simulation techniques. Existing research suggests that this methodological approach has not been generally implemented (Fan & Lee, 2012; Zhang & Wang, 2016).

The NK Model allows us to simulate and observe firms' adaptation processes in a landscape consisting of organizational innovation activities where the search algorithm gives a procedure which agents follow in the existing landscape based on states that exhibit greatness fitness (hill climbing).

My study analyzed the process of adaptation followed by firms belonging to Low, Medium and High-Tech manufacturing sectors in Latin America in a landscape representing new business practices. The adaptation process emulated the search activities that managers undertake to explore and identify new business ideas. The results show

that Low-Tech and Med-Tech firms' landscape is dominated by fitter choice configurations as compared to High-Tech firms' landscape.

Chapter 6. Overall conclusions

6.1 Summary of results

The focus of my study is on organizational innovations under the dynamic capabilities framework. Building on previous research, it undertook three studies using a large sample of manufacturing firms in Latin America. My study recognizes the importance of organizational learning for the creation and evolution of a firm's dynamic capabilities and also the intensity with which organizational innovations are adopted. Learning allows the emergence of tacit experience accumulation through information assimilation, knowledge articulation and codification, which are necessary elements for adopting organizational innovations. The results provide a major contribution to literature in the Latin American region about the relevance of organizational innovations as a contributing factor in a firm's performance and financial growth.

The first study in Chapter 3 explored the relationship between organizational innovations and dynamic capabilities and a firm's performance. It followed a multi-dimensional approach and classified

organizational innovations as high-order capabilities and lower-order capabilities called ordinary capabilities. The research followed the following steps: first, it investigated a firm's antecedent conditions that forced it to implement new business practices or methods. The antecedent conditions are organizational context (size, market scope and workforce's educational levels) and ordinary capabilities. Following Wang and Ahmed (2007), I take ordinary capabilities to be absorptive and innovative capabilities. My results show that the organizational context only partially affected the rate of adoption of organizational innovations. On the other hand, ordinary capabilities explain the likelihood of organizations implementing new business practices more. Hence, my study proves that the relationship between organizational innovations and dynamic capabilities relies on a firm's ability to modify, use and reconfigure its ordinary capabilities. My analysis also found that the effect of ordinary capabilities was more in firms with lower organizational innovation intensity. Second, my study also found a positive effect of organizational innovations on a firm's performance and productivity growth. Additionally, the impact of ordinary capabilities on

performance was mitigated by organizational innovations. This implies that successfully implementing organizational innovations is a direct source of competitive advantage. A further analysis of the relation between ordinary and high-order capabilities found a substitution effect among the variables, indicating that firms with higher organizational innovation intensity for sustaining a competitive advantage must develop new dynamic capabilities.

The definition of dynamic capabilities that I use helped understand the emergence of high-order dynamic capabilities by considering two conditions: new organizational methods implemented when environmental conditions limit business functioning and when there is wisdom in the organization. This indicates the fundamental role that managers and decisions makers have to perform to properly establish new strategic directions. Strategic management involves the execution of non-technological processes that transform current operating routines into new capabilities for a firm which over time increase its knowledge base.

The second study in Chapter 4 examined the interdependencies between organizational and technological innovations in explaining a firm's performance. The analysis used contextual factors (size, education and business inhibitors) and innovative activities (organizational, product and process innovations) to identify and understand the complex causal relationship among these contributing factors and a firm's performance.

My results found several equifinal combinations of antecedents leading to a firm's performance and hence to its productivity growth. For the latter, the chapter described four solutions or configurational paths leading to the same outcome. Based on this analysis, the study identified three organizational archetypes which are based on a firm's innovative behavior: 'technological innovators,' 'hybrid innovators' and 'complex innovators.' In general, my research found that product innovation was a condition in all solutions, indicating that the development of new products was an important antecedent in achieving high productivity growth. This supports earlier studies which concluded that that there was an increase in firms' sales as a direct response to competitive factors

when they improved the products that they were offering in the market. However, the presence of organizational innovations in the 'complex innovators' typology represents a core condition leading to high productivity growth. As expected, this indicates the importance of organizational innovations in achieving superior performance.

In general, these configurational paths provide interesting insights about the differences and commonalities in the combination of firm attributes leading to different levels of performance thus allowing a broader perspective about the 'receipts' for business success.

The third and final study in Chapter 5 investigated how firms adopted organizational innovations by considering organizational context (size, market scope and the education levels of the workforce) and knowledge sources (internal and external). I did the analysis in two stages. First, I assessed the effect of different knowledge sources on the adoption of organizational innovations in four industries in the manufacturing sector in Latin America. I found that only internal sources of information positively impacted the implementation of new business practices. Hence, organizations must rely on knowledge sources to

discover new ideas and innovations. In its second stage the analysis used the NK Model to simulate a landscape of new business practices to represent the process which firms follow to scan their environment and thus interact with external entities to recognize new organizational methods that they can imitate. These findings provide further evidence on the importance of knowledge-search activities that organizations must take up to gather more knowledge and information.

6.2 Managerial and policy implications

Based on the results of my study, I draw implications relevant for managing organizational innovations as also for future organizational innovation research. Several European studies have also come to the same conclusions about the discrepancies in innovative firm behavior (for example, Battisti & Stoneman, 2010; Ganter & Hecker, 2013; Mol & Birkinshaw, 2009) as have those in the Latin American region. The discrepancies point to differences in the underlying institutional environment. Due to complementarities between external institutions

and internal innovation processes such differences are important considerations for the efficient organization and management of innovation activities (for example, Coriat & Weinstein, 2002; Love & Roper, 2009). For managers, this result means that various country-specific efficiency paths exist at least for organizational innovations which they can adopt. In particular, the simple transnational transfer of management methods and ‘best practices’ may be problematic and managers should proceed cautiously with their application. By extension, multinational enterprises should appreciate organizational contexts that are sufficiently flexible to accommodate cross-border differences in the adoption of the activities' antecedents. These might include decoupling adoption decisions and processes for different countries (for example, Ansari et al., 2010; Jensen & Szulanski, 2004; Kostova & Roth, 2002).

These regional differences are a gap in studies done so far on innovation. They show a need for further comprehensive comparative studies. Such studies will not only make a contribution in validating theories and insights for larger and more varied samples, but also extend our understanding of innovation systems by explaining and elaborating

on underlying interactions between firm-level activities and country-level institutions.

For Latin American firms my results suggest an important complementarity between organizational innovations with product and process innovations consequently becoming a source of competitive edge for firms that adopt them. This advantage is particularly relevant for dynamic markets. This finding implies that managers acting in dynamic innovation-intensive environments and facing greater business inhibitors can derive benefits from speedy and extensive adoption of organizational innovations. Firms can keep pace with their competitors by staying abreast of state-of-the-art management practices or adopting organizational innovations that have already spread in the industry. However, firms will attain a competitive edge only when they use organizational innovations which are not only new to the firm but those that are also new to the industry. This finding suggests building capabilities and institutionalizing processes to systematically explore and exploit opportunities for first-time implementation of advantageous organizational processes. This is a significant factor for managing

enterprises in dynamic industries. This insight raises questions on what precise generative mechanisms and processes enable organizational innovations, and what levers the managers possess for stimulating and steering these mechanisms. A recent process model of organizational innovation by Birkinshaw et al., (2008) proposes an answer. Their approach points to the management's use of internal and external knowledge-based relations and the interaction between internal and external change agents. Collectively, studies on this subject underline the relevance of knowledge-based relations as a source of organizational innovations.

Although there is vast literature on the adoption and diffusion of innovations, only a very limited part of it considers the joint adoption of a range of innovations My study explores the relationship between organizational and technological innovations. This finding is of particular importance as even though there has been extensive focus in innovation literature on technological innovations, what I find is that 'wide' or organizational innovations play a major role in innovative activities in Latin American firms. This indicates that innovations based

around technical aspects of the delivery of final products though important tell only part of the story of a firm's innovative efforts.

6.3 Limitations and future research

Though the findings and conclusions of my research have far reaching implications for Latin American firms, my dissertation has some limitations. First, the definition that I use is based on the OECD definition of organizational innovations which considers implementation of new organizational methods in a firm's business practices, workplace organization and external relations. The measure of organizational innovation that I use only considers new methods in a firm's business practices and external relations and does not include activities implemented in a firm's workplace organization. The 2010 Enterprise Survey of the Latin American region offers no information on this type of organizational method.

Second, the findings of my research are based on the cross-sectional nature of the data. The operationalization of the variables belongs to the same period of time and the survey questions were answered only by one

respondent. Additionally, the scope of my study was evaluating firm level characteristics in a large sample of the manufacturing sector in Latin America. Hence, I included fixed effects variables representing country differences which means that the interpretation of the results is context dependent. My study does not use the random effects model. Bryan and Jenkins (2013) urge caution in multilevel models as a low number of groups (n=19 in this study) can produce biased estimators. This leads to an important consideration for future investigations as most studies in the field of non-technological innovations are country specific. The value of organizational innovations is in economic growth (Černe et al., 2016; Sanidas, 2004). Therefore, further investigations could consider random effects models in a large sample of countries to determine the impact that organizational innovations have on economic growth.

Third, the regression models in Chapters 3 and 5 do not consider variables explaining the potential costs attributed to the adoption of organizational innovations or any other measure of capital intensity.

Fourth, the model in Chapter 3 does not include measures of a firm's performance that represent sales or growth after the implementation of organizational innovations even though prior sales are included. Models predicting productivity growth have a low explanatory value. A similar situation can be found in previous studies using productivity measures (for example, Mol & Birkinshaw, 2009).

Fifth, the components of dynamic capabilities that I use follow the commonalities identified by Wang and Ahmed (2007) and comprise of adaptive, absorptive and innovative capabilities. My study examines only two of these. Future research could continue exploring the relationship between dynamic capabilities and organizational innovations based on different measures or approaches.

Sixth, the results of the study in Chapter 4 not only foster a scientific understanding of the complex relationship between technological and organizational innovations but the study also considers firm specific factors (firm size, education levels of the workforce and business inhibitors) that are relevant for innovative behavior and how these factors combine to facilitate a firm's performance. The study also

demonstrates the usefulness of fsQCA in a study of organizational innovations. Such results represent only a first approach and some of the limitations of this first effort point to possible future avenues of research. Future studies can include additional factors potentially influencing innovation behavior at the firm level like absorptive capacity (Ali et al., 2016) and characteristics of the top management team at the industry level (for example, a comparison across industries based on knowledge intensity) and at the country-level (for example, characteristics of the institutional environment) as these will be instructive.

Seventh, the study in Chapter 5 which explores the concept of search as an important determinant for the adoption of organizational innovations, is limited to the data provided by the Enterprise Survey, 2010. My analysis considers internal and external sources of information, while previous studies evaluate broader sources of external information in the management innovation process. Future research in the context of the Latin American region should consider investigating the effect of information sources on the adoption of organizational innovations

further to find out the degree to which firms rely on external agents to gain access to complementary knowledge.

Addressing these limitations will provide deeper evidence of organizational innovations in Latin American companies leading to a more comprehensive understanding of innovative behavior and its policy and practical implications.

Bibliography

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics letters, 80*(1), 123-129.

Albort-Morant, G., Leal-Rodríguez, A. L., Fernández-Rodríguez, V., & Ariza-Montes, A. (2017). Assessing the origins, evolution and prospects of the literature on dynamic capabilities: A bibliometric analysis. *European Research on Management and Business Economics*. doi:10.1016/j.iedeen.2017.06.004

Ali, M., Seny Kan, K. A., & Sarstedt, M. (2016). Direct and configurational paths of absorptive capacity and organizational innovation to successful organizational performance. *Journal of Business Research, 69*(11), 5317-5323. doi:10.1016/j.jbusres.2016.04.131

Armbruster, H., Bikfalvi, A., Kinkel, S., & Lay, G. (2008). Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys. *Technovation, 28*(10), 644-657. doi:10.1016/j.technovation.2008.03.003

Arndt, F., & Bach, N. (2015). Evolutionary and ecological conceptualization of dynamic capabilities: Identifying elements of the Teece and Eisenhardt schools. *Journal of Management and Organization, 21*(5), 701.

Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. *International Business Review, 26*(2), 324-336. doi:10.1016/j.ibusrev.2016.09.002

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management, 36*(1), 256-280. doi:10.1177/0149206309350776

Battisti, G., & Stoneman, P. (2010). How innovative are UK firms? Evidence from the fourth UK community innovation survey on

synergies between technological and organizational innovations. *British Journal of Management, 21*(1), 187-206.

Birkinshaw, J., Hamel, G., & Mol, M. J. (2008). Management innovation. *Academy of management review, 33*(4), 825-845.

Bloom, N., Genakos, C., Sadun, R., & Van Reenen, J. (2012). Management practices across firms and countries. *The Academy of Management Perspectives, 26*(1), 12-33.

Breznik, L., & Hisrich, R. (2014). Dynamic capabilities vs. innovation capability: are they related? *Journal of Small Business and Enterprise Development, 21*(3), 368-384. doi:10.1108/jsbed-02-2014-0018

Bryan, M. L., & Jenkins, S. P. (2013). Regression analysis of country effects using multilevel data: A cautionary tale.

Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research, 67*(1), 2891-2902. doi:10.1016/j.jbusres.2012.06.004

Černe, M., Kaše, R., & Škerlavaj, M. (2016). Non-technological innovation research: evaluating the intellectual structure and prospects of an emerging field. *Scandinavian Journal of Management, 32*(2), 69-85. doi:10.1016/j.scaman.2016.02.001

Chen, C. J. (2004). The effects of knowledge attribute, alliance characteristics, and absorptive capacity on knowledge transfer performance. *R&D Management, 34*(3), 311-321.

Coduras, A., Clemente, J. A., & Ruiz, J. (2016). A novel application of fuzzy-set qualitative comparative analysis to GEM data. *Journal of Business Research, 69*(4), 1265-1270. doi:10.1016/j.jbusres.2015.10.090

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.

Crespi, G., Tacsir, E., & Vargas, F. (2016). Innovation dynamics and productivity: Evidence for Latin America. In *Firm Innovation and Productivity in Latin America and the Caribbean* (pp. 37-71): Springer.

Crespo, N. F., & Crespo, C. F. (2016). Global innovation index: Moving beyond the absolute value of ranking with a fuzzy-set analysis. *Journal of Business Research, 69*(11), 5265-5271.

Crossan, M. M., & Apaydin, M. (2010). A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. *Journal of Management Studies, 47*(6), 1154-1191. doi:10.1111/j.1467-6486.2009.00880.x

Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of management journal, 21*(2), 193-210.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of management journal, 34*(3), 555-590.

Damanpour, F. (1992). Organizational size and innovation. *Organization studies, 13*(3), 375-402.

Damanpour, F., & Aravind, D. (2011). Managerial innovation: Conceptions, processes, and antecedents. *Management and Organization Review, 8*(2), 423-454.

Damanpour, F., & Evan, W. M. (1984). Organizational innovation and performance: the problem of" organizational lag". *Administrative science quarterly*, 392-409.

Damanpour, F., Szabat, K. A., & Evan, W. M. (1989). The relationship between types of innovation and organizational performance. *Journal of Management Studies, 26*(6), 587-602.

Delios, A., & Beamish, P. W. (1999). Geographic scope, product diversification, and the corporate performance of Japanese firms. *Strategic management journal*, 711-727.

Dess, G. G., & Robinson, R. B. (1984). Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerate business unit. *Strategic management journal, 5*(3), 265-273.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic management journal*, 1105-1121.

Evangelista, R., & Vezzani, A. (2010). The economic impact of technological and organizational innovations. A firm-level analysis. *Research Policy, 39*(10), 1253-1263. doi:10.1016/j.respol.2010.08.004

Fan, I. Y., & Lee, R. W. (2012). Design of a weighted and informed NK model for intellectual capital-based innovation planning. *Expert Systems with Applications, 39*(10), 9222-9229.

Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of management journal, 54*(2), 393-420.

Fosfuri, A., & Tribo, J. (2008). Exploring the antecedents of potential absorptive capacity and its impact on innovation performance. *Omega, 36*(2), 173-187. doi:10.1016/j.omega.2006.06.012

Frenken, K. (2001). *Modelling the organisation of innovative activity using the NK-model.* Paper presented at the Nelson and Winter Conference, Aalborg.

Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). Common methods variance detection in business research. *Journal of Business Research, 69*(8), 3192-3198. doi:10.1016/j.jbusres.2015.12.008

Ganco, M., & Hoetker, G. (2009). NK modeling methodology in the strategy literature: Bounded search on a rugged landscape. In *Research methodology in strategy and management* (pp. 237-268): Emerald Group Publishing Limited.

Ganter, A., & Hecker, A. (2013). Deciphering antecedents of organizational innovation. *Journal of Business Research, 66*(5), 575-584.

Ganter, A., & Hecker, A. (2014). Configurational paths to organizational innovation: qualitative comparative analyses of antecedents and contingencies. *Journal of Business Research, 67*(6), 1285-1292.

García, R., Aguilera, R. V., & Ariño, M. A. (2013). Bundles of firm corporate governance practices: A fuzzy set analysis. *Corporate Governance: An International Review, 21*(4), 390-407.

George, G. (2005). Learning to be capable: patenting and licensing at the Wisconsin Alumni Research Foundation 1925-2002. *Industrial and corporate change, 14*(1), 119-151. doi:10.1093/icc/dth046

Gera, S., & Gu, W. (2004). The effect of organizational innovation and information technology on firm performance. *International Performance Monitor, 9*(3), 37-51.

Grant, R. M. (1999). The resource-based theory of competitive advantage: implications for strategy formulation. In *Knowledge and strategy* (pp. 3-23): Elsevier.

Gray, C. (2006). Absorptive capacity, knowledge management and innovation in entrepreneurial small firms. *International Journal of Entrepreneurial Behavior & Research, 12*(6), 345-360.

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics, 133*(2), 662-676. doi:10.1016/j.ijpe.2011.05.014

Hamel, G. (2006). The why, what, and how of management innovation. *Harvard business review, 84*(2), 72.

Haned, N., Le Bas, C., Mothe, C., & Nguyen, U. (2012). Firm technological innovation persistence: Organizational innovation matters.

Harris, R., & Li, Q. C. (2008). Exporting, R&D, and absorptive capacity in UK establishments. *Oxford economic papers, 61*(1), 74-103.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2009). *Dynamic capabilities: Understanding strategic change in organizations*: John Wiley & Sons.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic management journal, 24*(10), 997-1010.

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic management journal, 32*(11), 1243-1250.

Hervas-Oliver, J.-L., Sempere-Ripoll, F., & Arribas, I. (2015). Asymmetric modeling of organizational innovation. *Journal of Business Research, 68*(12), 2654-2662. doi:10.1016/j.jbusres.2015.04.005

Hervas-Oliver, J.-L., Sempere-Ripoll, F., & Boronat-Moll, C. (2014). Process innovation strategy in SMEs, organizational innovation and performance: a misleading debate? *Small Business Economics, 43*(4), 873-886. doi:10.1007/s11187-014-9567-3

Hitt, M. A., Hoskisson, R. E., & Kim, H. (1997). International diversification: Effects on innovation and firm performance in product-diversified firms. *Academy of management journal, 40*(4), 767-798.

Kan, A. K. S., Adegbite, E., El Omari, S., & Abdellatif, M. (2016). On the use of qualitative comparative analysis in management. *Journal of Business Research, 69*(4), 1458-1463.

Kauffman. (1993). *The Origins of Order: Self Organization and Selection in Evolution.* New York: Oxford University Press.

Kim, L. (1998). Crisis construction and organizational learning: Capability building in catching-up at Hyundai Motor. *Organization Science, 9*(4), 506-521.

Kimberly, J. R., & Evanisko, M. J. (1981). Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of management journal, 24*(4), 689-713.

King, N. (1992). Modelling the innovation process: An empirical comparison of approaches. *Journal of Occupational and Organizational Psychology, 65*(2), 89-100.

Koellinger, P. (2008). The relationship between technology, innovation, and firm performance—Empirical evidence from e-business in Europe. *Research Policy, 37*(8), 1317-1328. doi:10.1016/j.respol.2008.04.024

Koohborfardhaghighi, S., & Altmann, J. (2014). *How structural changes in complex networks impact organizational learning performance*. Retrieved from

Koohborfardhaghighi, S., & Altmann, J. (2017). How Organizational Structure Affects Organizational Learning. *Journal of Integrated Design and Process Science, 21*(1), 43-60.

Kraus, S., Ribeiro-Soriano, D., & Schüssler, M. (2018). Fuzzy-set qualitative comparative analysis (fsQCA) in entrepreneurship and innovation research–the rise of a method. *International Entrepreneurship and Management Journal, 14*(1), 15-33.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual review of sociology, 14*(1), 319-338.

Lin, H.-F., Su, J.-Q., & Higgins, A. (2016). How dynamic capabilities affect adoption of management innovations. *Journal of Business Research, 69*(2), 862-876. doi:10.1016/j.jbusres.2015.07.004

Long, J. S., & Freese, J. (2006). *Regression models for categorical dependent variables using Stata*: Stata press.

Longest, K. C., & Vaisey, S. (2008). fuzzy: A program for performing qualitative comparative analyses (QCA) in Stata. *Stata Journal, 8*(1), 79.

Massini, S., Lewin, A. Y., & Greve, H. R. (2005). Innovators and imitators: Organizational reference groups and adoption of organizational routines. *Research Policy, 34*(10), 1550-1569.

McCarthy, I. P. (2004). Manufacturing strategy: understanding the fitness landscape. *International Journal of Operations & Production Management, 24*(2), 124-150. doi:10.1108/01443570410514858

Min, W. Z., Ling, K. C., & Piew, T. H. (2015). The Effects of Technological Innovation, Organizational Innovation and Absorptive Capacity on Product Innovation: A Structural Equation Modeling Approach. *Asian Social Science, 12*(1), 199. doi:10.5539/ass.v12n1p199

Mohnen, P., Mairesse, J., & Dagenais, M. (2006). Innovativity: A comparison across seven European countries. *Economics of Innovation and New Technology, 15*(4-5), 391-413.

Moksony, F. (1999). Small is beautiful. The use and interpretation of R2 in social research. *Review of Sociology*, 130-138.

Mol, M. J., & Birkinshaw, J. (2009). The sources of management innovation: When firms introduce new management practices. *Journal of Business Research, 62*(12), 1269-1280. doi:10.1016/j.jbusres.2009.01.001

Mothe, C., Nguyen-Thi, U. T., & Nguyen-Van, P. (2015). Complementarities in organizational innovation practices: evidence from French industrial firms. *Economics of Innovation and New Technology, 24*(6), 569-595.

Mowery, D. C., Oxley, J. E., & Silverman, B. S. (1996). Strategic alliances and interfirm knowledge transfer. *Strategic management journal, 17*(S2), 77-91.

Mu, J. (2017). Dynamic Capability and Firm Performance: The Role of Marketing Capability and Operations Capability. *IEEE Transactions on Engineering Management*, 1-12. doi:10.1109/tem.2017.2712099

Muscio, A. (2007). The impact of absorptive capacity on SMEs' collaboration. *Economics of Innovation and New Technology, 16*(8), 653-668.

Naveh, E., & Erez, M. (2004). Innovation and attention to detail in the quality improvement paradigm. *Management science, 50*(11), 1576-1586.

OECD. (2005a). *The measurement of scientific and technological activities OSLO Manual Proposed guidelines for collecting and interpreting innovation data*

(3rd ed.): EUROSTAT.

OECD. (2005b). *Stan Indicators*. Retrieved from

Ordanini, A., Parasuraman, A., & Rubera, G. (2014). When the recipe is more important than the ingredients: A qualitative comparative analysis (QCA) of service innovation configurations. *Journal of Service Research, 17*(2), 134-149.

Padget, J., Vidgen, R., Mitchell, J., Marshall, A., & Mellor, R. (2009). Sendero: an extended, agent-based implementation of Kauffman's NKCS Model. *Journal of Artificial Societies and Social Simulation, 12*(4), 824-844.

Pai, F.-Y., Chang, H.-F., & City, H. (2013). The effects of knowledge sharing and absorption on organizational innovation performance–A dynamic capabilities perspective. *Interdisciplinary Journal of Information, Knowledge, and Management, 8*, 83-97.

Pavlou, P. A., & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision sciences, 42*(1), 239-273.

Peteraf, M., Di Stefano, G., & Verona, G. (2013). The elephant in the room of dynamic capabilities: Bringing two diverging conversations together. *Strategic management journal, 34*(12), 1389-1410.

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2011). Dynamic capabilities and their indirect impact on firm performance. *Industrial and corporate change, 21*(3), 615-647.

Ragin, C. C. (2000). *Fuzzy-set social science*: University of Chicago Press.

Ragin, C. C. (2009). *Redesigning social inquiry: Fuzzy sets and beyond*: University of Chicago Press.

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management, 34*(3), 375-409.

Reichert, F. M., Zawislak, P. A., & Arundel, A. (2016). Exploring innovation success recipes in low-technology firms using fuzzy-set QCA. *Journal of Business Research, 69*(11), 5437-5441.

Sanidas, E. (2004). Technology, technical and organizational innovations, economic and societal growth. *Technology in Society, 26*(1), 67-84.

Schmidt, T., & Rammer, C. (2007). Non-technological and technological innovation: strange bedfellows?

Sher, P. J., & Lee, V. C. (2004). Information technology as a facilitator for enhancing dynamic capabilities through knowledge management. *Information & management, 41*(8), 933-945.

Shim, D., Kim, J. G., & Altmann, J. (2016). Strategic management of R&D and marketing integration for multi-dimensional success of new product developments: an empirical investigation in the Korean ICT industry. *Asian Journal of Technology Innovation, 24*(3), 293-316.

Siemsen, E., Roth, A., & Oliveira, P. (2010). Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational research methods, 13*(3), 456-476.

Song, M., Droge, C., Hanvanich, S., & Calantone, R. (2005). Marketing and technology resource complementarity: An analysis of their interaction effect in two environmental contexts. *Strategic management journal, 26*(3), 259-276.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic management journal, 17*(S2), 45-62.

Supriyadi, R. E. The Effect of Strategic Partnership On Innovation Capability and Business Performance Of Garment Industry In West Java-Indonesia.

Teece, D. (2000). Strategies for managing knowledge assets: the role of firm structure and industrial context. *Long range planning, 33*(1), 35-54.

Teece, D. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal, 28*(13), 1319-1350.

Teece, D., & Pisano, G. (1994). The dynamic capabilities of firms: an introduction. *Industrial and corporate change, 3*(3), 537-556.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 509-533.

Teece, D. J. (2018). Dynamic capabilities as (workable) management systems theory. *Journal of Management & Organization*, 1-10. doi:10.1017/jmo.2017.75

Terziovski, M., & Guerrero, J.-L. (2014). ISO 9000 quality system certification and its impact on product and process innovation performance. *International Journal of Production Economics, 158*, 197-207.

Tesfatsion, L., & Judd, K. L. (2006). *Handbook of computational economics: agent-based computational economics* (Vol. 2): Elsevier.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management science, 32*(5), 590-607.

Van de Ven, A. H. (1993). Managing the process of organizational innovation. *Organizational change and redesign: Ideas and insights for improving performance*, 269-294.

Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: an exploratory study of continuous product innovation. *Industrial and corporate change, 12*(3), 577-606.

Wall, T. D., Michie, J., Patterson, M., Wood, S. J., Sheehan, M., Clegg, C. W., & West, M. (2004). On the validity of subjective measures of company performance. *Personnel psychology, 57*(1), 95-118.

Wang, C. L., & Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European journal of innovation management*, *7*(4), 303-313.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, *9*(1), 31-51. doi:10.1111/j.1468-2370.2007.00201.x

Williams, R. (2006). Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *Stata Journal*, *6*(1), 58.

Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *The Journal of Mathematical Sociology*, *40*(1), 7-20.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic management journal*, *24*(10), 991-995. doi:10.1002/smj.318

World Bank. (2010). *World Bank's Enterprise Survey: Understanding the Questionnaire*. Retrieved from

World Bank. (2017). Survey Methodology. Retrieved from http://www.enterprisesurveys.org/methodology

Wu, Q., He, Q., Duan, Y., & O'Regan, N. (2012). Implementing dynamic capabilities for corporate strategic change toward sustainability. *Strategic Change*, *21*(5-6), 231-247. doi:10.1002/jsc.1906

Xia, F., & Gui-long, Z. (2007). *Technological Innovation Management of Enterprise Based on Fitness Landscapes.* Paper presented at the Management Science and Engineering, 2007. ICMSE 2007. International Conference on.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of management review*, *27*(2), 185-203.

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. *Journal of Management Studies*, *43*(4), 917-955.

Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations*: John Wiley & Sons.

Zhang, M., & Wang, J. (2016). Exploring the Process of Adaption of Employee Creativity. *International Journal of Enterprise*

Information Systems, 12(3), 18-37. doi:10.4018/ijeis.2016070102

Zhou, S. S., Zhou, A. J., Feng, J., & Jiang, S. (2017). Dynamic capabilities and organizational performance: The mediating role of innovation. *Journal of Management & Organization*, 1-17.

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science, 13*(3), 339-351. doi:10.1287/orsc.13.3.339.2780

Appendix

Appendix A: Enterprise Survey 2010 Data description

Indicators	Description	Explanations based on (World Bank, 2010)
Organizational innovation	a) Use of services or programs to improve quality control or training to obtain quality certification. (dummy)	Quality certification involves assessing and verifying the compliance with specific requirements and standards. Examples are the ISO certifications, local or regional industrial standards, food safety, phytosanitary certifications or related to attest quality management systems, resource management, and measurement and improvements to sell products in the domestic market or for exporting overseas. In this regards services and programs are those that specifically aim to prepare the firm to attain certification.
	b) Use of services or programs to make business alliances with other suppliers or clients. (dummy)	Alliances are defined as formal or informal business partnerships facilitated by a public service or programs in order to overcome obstacles to business functioning and/or improve business opportunities. Examples are competitiveness programs, cluster promotion programs, suppliers' development programs or others that promote interactions among firms with the specific purpose of increasing sales, improving productivity or business functioning.
	c) Use any services or programs to	Export promotion services and programs are activities specifically

	promote exports. (dummy)	aimed to support exporting. Examples include product certification, market identification, participation to trade fairs, trade visits with potential clients, coordination with trade offices overseas (sometimes related with the Embassy or foreign missions), or human resource development to enhance export capacity such as training in packaging, food safety standards or market research. Services or programs that directly support these activities to establish new exports or increase existing exports should be included here.
	d) Use any programs, technical assistance or training on information technology, management, accounting or other functions as marketing, logistics etc. (dummy)	This category includes Back-Office tasks necessary to run the establishments itself, information technology, accounting and human resource development for functioning activities are typical components. Marketing activities include, for example, company branding and product promotion strategies and techniques. Logistics includes activities dedicated to improve communications, shipping, transport, and comprises training to implement software for exports, inventory and management control.
	It takes the value of 0 if firms do not engage in that kind of activity and 1 otherwise. This ordinary variable captures the breadth of organizational innovation adoption counting	

	the number of activities introduced by the firm in a scale from 0 to 4.
Firm size	For firm size this study uses the number of employees in 2009 presented in logarithmic form
Degree	Education/degree measures the education level of labor as a percentage of workers of the total workforce who have at least a bachelor's degree
Market scope	Market Scope measures the largest market in which the establishment sold its main product and is coded as '0' (local), '1' (national), or '2' (international).
Absorptive Capabilities	For absorptive capabilities, the firm's training activities are considered. An ordinary variable is created from '0' to '3' on whether a firm executed the following types of training: a) in-house training promoted by the establishment to its employees; b) any type of external training offered by the establishment; or c) any type of external training offered by the government.
Innovative Capabilities	Innovative capabilities are considered as technological innovations. An ordinary variable is created from '0' to '3' on whether a firm have introduced any of the following innovations: a) introduced any new or significantly improved products (goods or services); b) introduced new or significantly improved process for producing or supplying products? or; c) introduced new or significantly improved products new to establishment's market?
Firm Performance	For firm performance this study used an objective and subjective measure, the subjective measure captures the effect of the introduction of organizational innovation on the firm from the following possible benefits: 'increase sales in domestic market', 'opened new foreign market', 'improved quality of goods and services', 'obtained quality or export certification', 'increase number of goods or services offered by establishment', 'reduced unit production costs', 'reduced energy consumption'. The number of cases were respondents gave positive answers are coded as 1, resulting in a measure scale from 0 to 7. The objective variable is based on Mol and Birkinshaw (2009) and represented as productivity growth between 2007 and 2009, in order to include a time lag to the model. Therefore, productivity growth is computed as (2009 sales/employees 2009) / (2007 sales/employees 2007) – 1.

Export intensity	Export Intensity is an indicator included as the percentage of sales that comes from exports.	
Business Inhibitors	Business inhibitors is a variable that measures the effect of the environment on firm behavior. Business inhibitors in this study are those that limit firms' flexibility and independence in order to pursue effective business functioning. Operationalization of this variable refers to the degree of perceive obstacles in different aspects. The possible answers are 'No obstacle', 'Minor obstacle', 'Moderate obstacle', 'Major obstacle' and 'Very severe obstacle.' Environmental factors considered for this variable are 'Practices of competitors in the informal sector, 'Access to finance', 'Tax rate', 'Economic/Political instability', 'Customs and trade regulations', 'Labor regulations', and 'Inadequate labor force'. In each case, we coded any degree of obstacle as '1' and no obstacle as '0'. The number of cases results in a measure between '0' and '7'.	
Innovation support	Use any services or programs to support innovation provided by either public or private sector organizations.	By services or programs to support innovation we mean any type of support (financial or other assistance and advice) towards the improvement or introduction new products or production processes and provided by either public or private sector organizations. This also includes financial support via tax credits or deductions, grants, subsidized loans and loan guarantees. Participation in services or programs to support innovation might be either on individual or collective bases.
Market Competition	This ordinal variable implies number of competitors faced by the firm's main product and is coded as none (0), one (1), between two and five (2), more than five (3)	
Industry dummy	Industrial sector dummies are included at 2-digit level following the classification of manufacturing industries based on	ISEC REV 3.0 1 Low tech: 15-16, 17-19, 20-22, 36-37 2 Med-Low Tech: 351, 23, 25-26, 27-28 3 Med-High Tech: 31, 34, 24 but (2423), 352 + 359, 29

	technology 4 High Tech: 353, 2423, 30, 32, 33 (OECD, 2005b).
Country dummy	The scope of this study is firm-level analysis, however in order to avoid possible endogeneity problems by omitted variables, country fixed effects are included as binary indicators variables representing the effect of unobserved factors that are shared within each country (Bryan & Jenkins, 2013).

Appendix B: Simulation parameters

The following commands represents the parameter file used for the simulation following the instructions of Padget et al. (2009):

```
runs: 100

N_size_of {
    set_list: 4
    {
        runs: 1
        K_size_of {
            set_list: 2
            {
                runs: 1
                A_size_of {
                    set_list: 2
                }
            }
        }
    }
}
```

```
data_collection_file_name {
set_string: NKoutputTEST.txt
}

fitness_range_dp {
set: 2
}

A_identical_or_random {
set: 0
}

jump_J {
set: 0
}

K_identical_or_random {
set: 1
}

K_neighbours_or_random {
set: 0
}

fitness_method {
set: 1
}

organizations_no_of {
set: 100
}

fitness_threshold {
set: 0
}
```

```
jump_successful_limit {
set: 1
}

jump_search_time_limit {
set: 50
}

organization_walk_type {
set: 0
}

fitness_method_averaging_weightings {
set: 0
}

comms_network {
set_boolean: false
}

comms_network_type {
set: 0
}

comms_network_change {
set_boolean: false
}

comms_network_change_chance {
set: 0
}

comms_network_change_frequency {
set: 0
}
```

```
comms_network_small_world_connect_radius {
set: 0
}

life_and_death {
set_boolean: false
}

life_and_death_threashold {
set: 0
}

life_and_death_new_org_method {
set: 0
}

comms_network_connection_probability_percentage {
set: 0
}

comms_network_rewire_probability_percentage {
set: 0
}

collect_data {
set: 2
}

simulation_halt {
set: 2500
}
```

Abstract (Korean)

조직혁신, 동적역량과 기업성과 간의 관계 탐구: 라틴 아메리카를 중심으로

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조직혁신은 성공적인 비즈니스 정착과 경제 성장을 위하여 기술혁신만큼 중요한 역할을 한다. 조직혁신에 대한 이전 연구들에서도 확인할 수 있듯이, 조직혁신연구는 기업의 지속적인 경쟁우위를 유지할 수 있는 핵심 자원으로 여겨졌다. 또한

조직혁신연구는 환경적 불확실성을 극복하고 경영 원칙 및 기업 효율성을 향상시킬 수 있다는 장점이 있다.

동적역량은 환경적 적합성을 획득하기 위하여 자원과 역량을 적절하게 변화시키는 조직 역량으로 볼 수 있다. 조직 변화를 설명할 수 있는 포괄적인 프레임워크를 제공하기 때문에 동적역량은 경영과학에서 널리 다루어져 왔다.

본 연구는 일반 역량, 상위개념의 역량을 바탕의 다차원 접근 방식으로 동적역량과 조직혁신간의 관계를 설명한다. 본 연구는 라틴 아메리카의 기업 데이터를 이용하여 일반 역량과 조직혁신 간의 대체 효과를 살펴보고, 조직혁신 수용을 통해 기업성과에 대한 동적역량이 긍정적 효과를 미친다는 결과를 확인하였다.

조직혁신과 기술혁신 간의 관계, 이들 각각이 기업성과에 미치는 영향은 오랫동안 주목 받아 왔다. 최근의 연구들은 조직혁신과 기술혁신 간의 본질적 관계를 설명하기 위해 전체론적 접근방법을 제시하였다. 본 연구는 라틴 아메리카 기업 샘플

데이터를 이용한 fsQCA 분석을 통해 기업 특성과 혁신 유형 간의 복잡한 인과관계를 설명하고 기업성과를 향상시킬 수 있는 설명한다. 특히, 성공적인 비즈니스로 나아가기 위한 여러 솔루션들을 제시하였다.

마지막으로 본 연구는 NK 모델을 사용하여 적합도 지형를 통해 조직의 적응 프로세스를 확인하기 위해 시뮬레이션 분석을 진행하였다. 분석에서는 비즈니스 관행과 밀접하게 연관된 여러 활동들을 고려함으로써, 동적역량 하에서 조직의 적응 프로세스를 확인하였다.

주요어:동적역량, 조직혁신, 기업성과

학 번: 2015-30758