Does using latest technology impact new venture innovation? A contingency based view of institutional environments.

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Abstract

Drawing on resourced based theory and institutional theory, we develop a multi-level model on the outcomes of early-stage entrepreneurs employing latest technologies in their ventures. Essentially, we argue that the effects of using latest technologies on new venture innovation are moderated by the nature of a country's regulative, conducive, normative and cognitive environments. Results indicate that the entrepreneur who employs higher levels of latest technology usage in a country exhibit higher innovation as compared to others as regulatory and conducive environments of the country strengthen. These results contribute to the literature examining international comparative entrepreneurship determinants of productive entrepreneurship.

Keywords: technology; new venture innovation; institutional theory; resource-based theory; national institutional environments; multi-level analysis.

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Introduction

Although innovation has always been a central theme in entrepreneurship research, what determines successful innovation in new ventures remains relatively unexplored[2]. There is no doubt that new ventures' innovations are engines for regional development, job creation, and entrepreneurship. While one of the central questions in entrepreneurship once concerned why some new ventures succeed, and others fail, now the question concerns why some new ventures are more innovative than others. Gilbert et al. (2006) point out that new ventures' growth rates vary more than those of established firms do, so determining what factors influence the innovation in new ventures that drive growth has implications for prospective entrepreneurs, their advisors, and their potential investors.

In dynamic and uncertain environments innovation acts as an avenue for firms to become creative and experiment in the development of new products, services, processes and business models that increase competitiveness (Gassmann 2006; Parida and Örtqvist, 2015). Research identifies various predictors of new ventures' success (Hopp and Sonderegger, 2015) and growth (Aparicio et al., 2016), but limited attention has been paid to new ventures' innovations, especially as it intersects with the technological capabilities that are essential to business success in the twenty-first century.

Influenced by the evolution of digital technologies, we are witnessing the dramatic transformation of established industries and the global business landscape. Technology plays a vital role in converting firms' capabilities into competencies that contribute to innovation and firm performance (Real et al., 2006, Sambamurthy and Zmud, 2000), increasing interest in exploring technologies' impact on organizational performance (e.g. Kane and Alavi, 2007, Real et al., 2006, Tippins and Sohi, 2003). Research demonstrates the benefits of technologies on creating business value (e.g., Bharadwaj, 2000, Weill et al., 2002), improving business processes (e.g., Levy et al., 2001), and sustaining competitive advantage (e.g., Bruque and Moyano, 2007), but empirical

[2] Based on our systematic literature review of articles published on the emergence of new ventures.

evidence on technologies' direct impact on innovation is still limited (Jean and Sinkovics, 2010, Dewett and Jones, 2001), especially in the context of new ventures' performance (Nguyen et al., 2015).

Innovation and sustainable competitive advantage often rely on a firm's internal resources and ability to skilfully manage its resources (Barney, 1991). In pursuit of a competitive advantage, companies invest in the latest technologies to facilitate innovation (Fleming and Sorenson, 2001). However, as new ventures face internal (e.g., financial and human resources) and external (e.g., uncertain environments) barriers to innovation (McKelvie et al., 2018, Haeussler et al., 2012), simply investing in latest technologies is unlikely to provide competitive advantage (Boothby et al., 2010). On other hand, some scholars argue that investment in the latest technologies is often not beneficial to new ventures because of ambiguity regarding their value and financial, technical, and managerial challenges, that result in their unsuccessful implementation and use (Levy et al., 2001, Morgan et al., 2006). We aim to contribute to this debate by providing empirical evidence of the impact of technology on innovation in new venture context.

Entrepreneurs create value through optimal combination of resources. Shane (2009) argues that most entrepreneurial activities are not in pursuit of high-quality business opportunities because of the high opportunity costs associated with innovation. As a consequence, determining whether to invest in latest technology is one of entrepreneurs' key decisions (Siqueira and Bruton, 2010). Drawing on the resource-based view (RBV), we suggest and empirically examine the positive impact of entrepreneur's use of latest technology on innovation.

In addition, little is known about the effect of the institutional environment on the relationship between new ventures' use of the latest technology and innovation. We draw on the literature on the national context of entrepreneurship to propose that the relationship between entrepreneurs' use of latest technology and innovation is not uniformly positive but depends on institutional contexts. In line with (Barney et al., 2001), we believe that the value of a firm's resource should be understood in the wider environment in which the firm is embedded. Building on institutional theory (Scott,

2001), we argue that institutional environments, which consist of formal and informal rules, norms, and value systems, play an important role in how entrepreneurs' use of latest technology affects innovation. Adding another level of analysis, our study examines the moderating effect of four institutional environments—regulatory, conducive, normative, and cognitive—on the relationship between entrepreneurs' use of the latest technology and innovation. By doing so we respond to calls for moving away from single level organizational studies to multi-level analysis in innovation literature through institutional theory (Hinings et al., 2018, Zietsma et al., 2017).

To test our model, we utilised data from the Global Entrepreneurship Monitor (GEM) survey (Reynolds et al., 2005), gathered through interviews from more than 57,000 individuals in sixty-seven countries over a six-year period (2006-2012). The GEM data resource is highly appropriate for the study of institutional conditions' and technological capability's influences on new ventures' innovation. Hence, individual-level data from the GEM dataset are combined with country-level data from the World Bank Doing Business Database, the Index of Economic Freedom, the Global Competitiveness Index and the GEM's national expert survey to analyse the cross-level interaction effects of technological capabilities and institutional conditions on new ventures' innovation.

Our study makes several distinctive contributions to the nascent literature on technology-based entrepreneurship (Laplume et al., 2014). First, it examines empirically the impact of entrepreneurs' use of the latest technology on innovation and assesses how regulatory, normative, cognitive, and conducive institutional conditions moderate this relationship. According to Bruton et al. (2010) and Jennings et al. (2013), institutional theory is an appropriate framework for an investigation of the institutional embeddedness of entrepreneurship. Second, the study responds to several recent calls for the development and examination of multi-level theoretical models in technological entrepreneurship (Yoon et al., 2018, Ben Youssef et al., 2018) and innovation research (Van de Ven, 2017). This study is the first to examine country-level moderating effects on the individual-level relationship between technological capabilities and new ventures' innovation. By employing a multi-level analytical approach instead of single-country data, which typically exhibit low variation

in institutional conditions, our investigation contributes to developing a more generally applicable theory of RBV in the entrepreneurship context (Parida and Örtqvist, 2015). Third, our institutional conditions context falls within the remit of a national system of innovation (De Clercq et al. 2013; Stenholm et al., 2013) and helps to explain variances in new ventures' innovation and to inform policy decisions related to fostering productive entrepreneurship (Baumol, 1996). Finally, our work extends previous entrepreneurship research (Jones et al., 2011), by locating the causes of young firms' innovation at the firm level and institution level in a meaningful way.

The following sections present the theoretical background, hypotheses, method, analysis, results, discussion of implications, and limitation and future research direction.

Theory and Hypotheses Development

Building on the RBV and Institutional theory, we develop hypotheses regarding the relationship between entrepreneurs' use of latest technologies and innovation. Having latest technology might change the nature of entrepreneurial activity as it affects value generation activities and the entrepreneur-customer relationship (Parida and Örtqvist, 2015). We argue that the ability of entrprenuers to leverage latest technologies to enable cost-effective business processes for diverse purposes, allow them to capture value through efficient management of existing and new relationships with all stakeholders. In line with the Global Competitiveness Index (2018), we propose that latest technology use as *capability of new venture to fully leverage latest technologies in business activities and production processes for increased efficiency and enabling innovation for competitiveness*. The relationship between new technology adoption and firm innovation in medium and large firms is well exploited (Bartel et al., 2007, Hempell and Zwick, 2008, Engelstätter and Sarbu, 2013, Kleis et al., 2012, Stoneman and Kwon, 1996). However, research on the relationship between technological capabilities and firm performance is lacking for new ventures (Walter et al., 2006, Nguyen et al., 2015).

Technology plays an integral role in enhancing new ventures' operations and performance (Nguyen et al., 2015, von Briel et al., 2018). Because new ventures are often handicapped in their ability to compete with large, well-endowed competitors, using latest technologies allows new ventures with less resources to 'level the playing environment' and outclass competitors (Nambisan, 2017). Small firms with enhanced technological capabilities can also acquire important and valuable market information, improving their ability to understand customers' needs and adapt products to specific customer segments through improved internal processes (Polo Peña et al., 2011, Parida and Örtqvist, 2015). New ventures that enter the market armed with innovation and the latest technologies can have a competitive advantage in pursuing economic opportunities (Baumol, 1996).

The pursuit of innovation through the use of the latest technology is a fundamental aspect of digital entrepreneurship (Nambisan, 2017), but research on the intersection of technology, institutional condition, and entrepreneurship is missing. Research suggests that countries vary in terms of their rates of entrepreneurial activity because of differences in institutional conditions (Levie and Autio, 2008, Stenholm et al., 2013). Thefore, institutional conditions affect the perception of uncertainty that encourages or constrains entrepreneurial pursuits and affect how entrepreneurial actions unfold midst such uncertainty (McKelvie et al., 2011, Schumpeter, 1934). An extensive literature seeks to explain entrepreneurial occupational choice, but much less is said about new ventures' quality of entrepreneurship such as innovation (Autio and Acs, 2010). Thus, our research is different from the majority of existing research in entrepreneurship which does not assume entrepreneurial activity is multi-level context dependent (Hayton et al., 2002, Jack and Anderson, 2002, Thornton, 1999) and attempts to predict entry into generalized entrepreneurship as form of quantity (Boudreaux et al., 2019) rather than quality of entrepreneurship forms such as innovation driven-entrepreneurship (Shane and Venkataraman, 2000, Phan, 2004).

When entrepreneurs exploit their resources (e.g., technology) to advance their goals, they must decide how much of those resources to invest into growing their venture. Such decisions are not

easy to make, as they tend to be path-dependent and become progressively complex over time. Hence, the decision of entrepreneurs to create a new venture with the latest technologies is rarely made without carefully evaluating the related trade-offs. In such circumstances, it is highly likely that institutional conditions will influence individual-level entrepreneurial considerations associated with resource exploitation (Hoskisson et al., 2011).

The findings from the previous literature have shown that simply investing in new technologies is unlikely to provide a competitive advantage and it is contingent on other factors (Boothby et al., 2010). We still know relatively little about the factors that increase entrepreneurs' use of new technology in their ventures which will in return enables innovation. Entrepreneurs choosing latest technology may be affected more severely by institutional environment in which they operate as institutions govern the access to resources they need (Teece, 1986, Acs and Sanders, 2008). We propose that the full benefits of new technologies are only realized when there are supporting institutional environments. In a nutshell, latest technology adoption and new venture innovation relationship is contingent on internal and external pressures, thus requiring a multi-level theoretical and empirical approach (Laplume et al., 2014).

Institutions, technology and entrepreneurship

Recently, there has been an increased interest among scholars in understanding institutions, technology and entrepreneurship (Laplume et al., 2014, Pathak et al., 2013, Brown and Mason, 2014). Based on cross-country evidence, Pathak et al. (2013), have found that the association between Intellectual Property Rights (IPR) protection and new technology use in entrepreneurship was positive in countries where democratic and high pirate parties are prevalent. Research shows that firms' investment in technology and the financial return of technology investment is contingent on environmental contexts (Hoskisson et al., 2011). For example, studies revealed that the positive effect of new technology adoption is moderated by external forces such as the investment climate of a country (Correa et al., 2010), and the degree of trust among stakeholders (Chang and Wong,

2010). Therfore, the growing realization of the potential impact of technology on innovation and the importance of understanding how environmental context enable countries and firms to capitalize on technology has led many scholars to examine the nexus between technology, innovation and institutional contexts (Nambisan, 2013). More specifically innovation scholars have tried to study the innovation ecosystem to understand drivers of innovation success (Chesbrough, 2006, Adner and Kapoor, 2010).

Countries aim to create policies to promote innovative activities through technology policy (Brown and Mason, 2014). Country's institutional contexts and formal policies impact the strategic decision of firms in terms of acquisition of resources and pursuing innovation strategies to sustain their competitiveness. For instance, Parente and Prescott (1994), argue that legal constraints, corruption, violence or threats create barriers to technological adoption. Therfore, by defining standards and rules, institutions enforce desirable behaviour in a country (Griffiths and Zammuto, 2005). To stimulate entrepreneurship and innovation, governments issue policies aimed at protecting the ability of firms to acquire resources and utilize them to create value (Holmes et al., 2016). Thus, policies relating to providing a technological infrastructure have a great impact on innovation (Di Stefano et al., 2012). Nevertheless, there has been a debate about the impact of different institutional policies on entrepreneurship and innovation (Holmes et al., 2016). For example, within technology and innovation literature, policies such as IPR protection and government funding of research have different impact in differnt contexts (Holmes et al., 2016). Therefore, the emphasis on institutions in understanding the relationship between technology and innovation is imperative. Institutional context not only affects how firms access and employ resources (Oliver, 1997), but also the ability of firms to appropriate the investment in innovation (Holmes et al., 2016).

In our study, we aim to extend the institutions, technology, innovation and entrepreneurship literature by understanding how different institutional environments strengthen or weaken the

impact of latest technology use on new venture innovation. We aim to empirically examine how different institutions interact with technology to drive new venture innovation. Our findings advance knowledge of the crucial role of institutions in strengthening the prospective of using technology in fostering innovative entrepreneurship which has become an increasingly important engine for economic growth (Autio et al., 2014). Figure 1 shows the theoretical model of this study.

Figure 1 about here

Impact of technological capabilities on new ventures' innovation

Technology is a critical resource and a strategic tool that increases organisational value and firms' competitiveness (Karanja and Bhatt, 2014). Adopting the latest technologies positively influences the processes of knowledge creation and organizational learning (Lopez-Nicolas and Soto-Acosta, 2010). When investment in technology is aligned with a firm's strategic objectives, it creates conditions that affect firm's performance, innovation (Arvanitis et al., 2013), and sustainable competitive advantage (Yunis et al., 2017).

Literature suggests a positive relationship between the level of a firm's technological capability and performance (e.g., Bayo-Moriones et al., 2013). Sin Tan et al. (2010) provide an extensive literature review and discussion of the benefits and barriers of Internet-based technologies and adoption. They suggest that the benefits of firms' adoption of technology include reduced operating costs and enhanced efficiency, communication, productivity, customer service, information flow, and international market exposure. Firms are more likely to adopt the latest technologies when they are involved in innovation and R&D activities and collaborations and are supported by skilled personnel and visionary leadership in a decentralised decision-making structure (Giotopoulos et al., 2017). Adopting the latest technologies increases firms' ability to develop close relationships with

customers and suppliers through improved communication and exchange of information (Bayo-Moriones et al., 2013).

Studies also demonstrate that technology capability is a primary driver of new product development (Bharadwaj, 2000, Verona, 1999). Firms' ability to adopt and exploit the latest technologies can also support new product development and create competitive advantage (Sambamurthy and Zmud, 2000). Entrepreneurs are usually proactive in adopting and implementing advanced information technology to find new ways of creating value for their customers ahead of their competitors. Therefore, we expect that the ability to use the latest technologies enables entrepreneurs to create innovative new ventures. Hence,

Hypothesis1: There is a positive relationship between an entrepreneur's use of the latest technology and innovation.

The moderating role of institutional environments

The moderating role of the regulatory environment

The regulatory environment, consisting of the laws, regulations, and government policies that are designed to promote a supportive business environment has become a key focus among researchers in their effect to explain entrepreneurial behaviour (Manolova et al., 2008, Stenholm et al., 2013). While some researchers argue that the regulatory environment has limited, if any, influence on new firm entry and development (van Stel et al., 2007, Capelleras et al., 2007), a favourable regulatory environment in terms of business-related legislation, procedures, and venture capital increases the probability that individuals will undertake entrepreneurial activities (Urbano and Alvarez, 2014).

The regulatory infrastructure may support or hinder entrepreneurs' decisions to invest in the latest technology and to innovate. Regulatory costs deter opportunity-driven entrepreneurship (Ho and Wong, 2007), while regulatory complexity increases the rate of entrepreneurial failure (García-Ramos et al., 2017). Costly regulations impede the formation of new firms by forcing new entrants to be larger than they would have to be otherwise and causing them to experience slower growth

paths (Klapper et al., 2006). The dynamism of new ventures may slow down while new entrepreneurs learn the rules and regulations (Estrin et al., 2013). Heavily regulated environments may impose significant entry barriers and deter entrepreneurs from investing in technology and bringing new innovations to market. Entrepreneurs may face prohibitive regulatory costs in the form of time spent in dealing with bureaucratic procedures and lengthy paperwork and reporting requirements to an extensive network of government institutions (van Stel et al., 2007, Yousafzai et al., 2015).

High-growth entrepreneurial firms benefit from strong government in terms of enforcement of property rights (Estrin et al., 2013). Chen and Puttitanun (2005) show that innovation in developing countries is positively influenced by IPR protection and is dependent on a country's level of development in terms of technological ability. Smeets and de Vaal (2016) also provide evidence that increased IPR protection results in increased knowledge-sharing with local suppliers. In environments with strong IPR protection and other supportive regulatory policies, the influence of the use of the latest technology on new innovation is stronger. Entrepreneurs may invest and use new technology more effectively to innovate when regulatory conditions are favourable (Baumol and Strom, 2007, Lim et al., 2016). By contrast, in countries characterised by weak IPR protection or increasing bureaucratic burdens, the relationship between the use of the latest technology and new innovation is weaker. Since regulations impact the link between the use of the latest technology and new ventures' innovation, we propose the following hypothesis:

Hypothesis2: The country's regulatory environment moderates the relationship between entrepreneurs' use of the latest technology and innovation such that this relationship is stronger in countries with a highly supportive regulatory environment.

The moderating role of a conducive environment

In an attempt to broaden the dimensions of the institutional contexts that affect the entrepreneurship rate and type, Stenholm et al. (2013) introduce the conducive dimension. This dimension relates to the institutional arrangements required to support growth and innovation-

oriented entrepreneurship (Anokhin and Schulze, 2009). The conducive dimension emphasizes the types of institutions that facilitate the emergence of high-impact firms that pursue innovation and knowledge-driven growth (Autio and Acs, 2010). The factors that contribute to a conducive environment include spending on research and development, capacity for innovation, sophisticated production processes, quality of scientific research institutions, and availability of scientists and engineers (Schillo et al., 2016, Stenholm et al., 2013). These factors accentuate the substantial economic benefits of publicly funded research (Salter and Martin, 2001) and firms' investment in research and development (Edquist and Henrekson, 2017). A highly conducive environment contributes to creating a context rich in knowledge and ideas, which stimulates entrepreneurs' investment in resources needed to pursue innovation (Acs et al., 2013).

Stenholm et al. (2013) argue that a conducive environment explains the relationship between the institutional environment and the *type* of entrepreneurial activities by means of the interplay among innovation, skills, and resources. Strong, knowledge-driven institutions can foster innovation by enabling individuals acess resources, take strategic action and pursue innovation-driven entrepreneurship (Acs et al., 2008, Stenholm, 2011). Entrepreneurs in such environments can build on the advanced knowledge context and the dissemination of technological discoveries to exploit a distinct type of entrepreneurial activity (Acs et al., 2014). We reason that, while technological capability could enable innovation (Acs and Gifford, 1996), this outcome might be difficult to attain if the institutional environment is not conducive to innovation (Stenholm et al., 2013). A highly conducive environment reflects the role of institutions in creating an infrastructure to integrate knowledge, acquire latest technologies and provide incentives for innovation. Such environment strengthens the impact of using latest technology on innovation by providing a rich context of knowledge, skills, and resources (Stenholm et al., 2013).Therefore, we posit that:

Hypothesis3: A conducive environment moderates the relationship between entrepreneurs' use of the latest technology and innovation such that this relationship is stronger in highly conducive environments.

The moderating role of the normative environment

The normative environment refers to the beliefs, values, and social norms that explain human behaviour (Scott, 1995, Busenitz et al., 2000). According to Scott (1995), values refer to desired goals or standards, while norms refer to the accepted means by which to achieve those goals. Therefore, the normative environment explains the influence of socially shared norms leading to human behaviour in a specific domain (Urbano and Alvarez, 2014). Research in the entrepreneurship literature incorporates insights related to the normative environment to explain the values and norms that underpin the social desirability of pursuing entrepreneurial activities (Parboteeah et al., 2008, De Clercq et al., 2010, Urbano and Alvarez, 2014, Schillo et al., 2016). This stream of literature advocates that close social reference groups', national culture and media's consideration of entrepreneurship as a desirable career choice has a positive influence on entrepreneurial intentions (Krueger et al., 2000, Lounsbury and Glynn, 2001).Values and norms that favour entrepreneurship also help to break down legal limitations that hamper entrepreneurial activity and facilitate access to the essential resources for starting new ventures (Stenholm et al., 2013).

Following literature on cultural psychology (Howard, 2000, Sussman, 2000, Tyler et al., 2000); and information systems (Gallivan and Srite, 2005, Karahanna et al., 2005, Srite and Karahanna, 2006), it is known that norms and values influence technology adoption through perceived usefulness of the internalization effect. This represents the human tendency to interpret information according to the context in which they operate (Schepers and Wetzels, 2007). This is in line with the research concluded by Bygrave and Minniti (2000) where they emphasized the social and structural relationships based embeddedness of entrepreneurship and suggested that entrepreneurship is a self-reinforcing process.

Norms also determine which methods and activities are preferred in achieving a desired outcome (Bruton et al., 2010), so firm's choice to use latest technology is profoundly influenced by the

normative institution (Munir, 2002). In an environment full of uncertainty, entrepreneurs may not be able to confidently forecast market conditions and probably less compelled to invest their energy and resources into an uncertain entrepreneurial endeavour (McMullen and Shepherd, 2006). In such normative environments, entrepreneurs may postpone investment in the latest technology and create new innovations with other alternative means i.e. using existing technology or pursuing technology alliances (Steensma et al., 2000), because there is no guarantee that using latest technology will bring innovative outcomes. However, innovative entrprenuers are those who challenge existing norms, values and business processes to create unfamiliar products and services. Therefore, we anticipate that a high normative context with strict roles for certain behaviour might lessen the opportunity of entrprenuers to take advantage of latest technology to innovate. Therefore, we put forward the following:

Hypothesis4: A country's normative environment moderates the relationship between entrepreneurs' use of the latest technology and innovation such that this relationship is stronger in countries with low normative environments.

The moderating role of the cognitive environment

The cognitive environment is an important institutional environment in entrepreneurship research, as it reflects the degree to which countries create a nurturing environment for entrepreneurship (Bruton et al., 2010). It captures the extent to which educational systems and formal training provide the skills and knowledge that are necessary to create new ventures (De Clercq et al., 2013). Researchers suggest that an entrepreneur's cognitive ability can be shaped by the nature and quality of the national education system, particularly business education, and improving his/her confidence in the ability to create a new ventures (Urbano and Alvarez, 2014, Manolova et al., 2008, Schillo et al., 2016, Levie and Autio, 2008).

A well-developed cognitive environment raises the number of knowledgeable people who can leverage available resources to undertake entrepreneurial ventures (Mitchell et al., 2000, Bowen and

De Clercq, 2008). From an individual perspective, an entrepreneur's cognitive ability enhances his or her ability to recognize entrepreneurial opportunities and judge their feasibility, both of which are positively associated with the decision to create a new venture (Mitchell et al., 2000, Arenius and Minniti, 2005). From an institutional perspective, nations that make business knowledge and skills part of their educational systems are expected to have higher levels of entrepreneurial activity (Urbano and Alvarez, 2014). De Clercq et al. (2010) argue that the cognitive institutional environment enables entrepreneurs not only to recognize opportunities but also to deal with the challenges associated with the creation and management of new ventures. Peterman and Kennedy (2003) demonstrate that access to entrepreneurship education has a positive effect on the individuals' perceptions of entrepreneurship's desirability and feasibility. Bowen and De Clercq (2008), suggest that a country's level of educational capital that is targeted at entrepreneurship has a positive effect on high-growth entrepreneurial activities.

The cognitive institutional environment can facilitate or encumber entrepreneurs' understanding of the opportunities provided by new technologies and how they can be used in innovation. Garud and Rappa (1994) argue that individuals' cognitive abilities support adoption of technology and influence decisions on how to use it. We reason that, because a highly cognitive environment improves entrepreneurs sense-making and self-efficacy (Stenholm et al., 2013), the adoption of a new technology in such environments is more likely to lead to innovation. Therefore, we expect that:

Hypothesis5: A country's cognitive environment moderates the relationship between entrepreneurs' use of the latest technology and innovation such that this relationship is stronger in countries with highly cognitive environments.

Methodology

Data sources

Our theoretically proposed hypotheses are based on a two-level framework consisting of individual-level variables (level 1) and country-level variables (level 2), as shown in Figure 1. We built a cross-sectional panel data set grouped by country and obtained all individual-level data from GEM's adult population survey (APS). The GEM project started in the last decade of the twentieth century to create harmonized data on the perceptions and prevalence of entrepreneurial activity across countries. Every year, private market survey firms collect data through telephonic (or occasionally face-to-face) interviews from a minimum of 2000 individuals (aged 18 to 64 years) in each participating country. Alvarez et al.'s (2014) literature review reveals ninety-five strictly empirical articles that use GEM data for entrepreneurship research between 2000 to January 2012. The GEM data are notably reliable, rich, and valid (Reynolds et al., 2005). Entrepreneurship research on the macro-level characteristics of international business like ours increasingly employs these data (e.g., Lim, Oh, and De Clercq, 2016).

While the individual-level data is obtained from GEM's APS project, the country-level data for the institutional environment is obtained from World Bank's Doing Business Database (The World Bank, 2006-2012), the Index of Economic Freedom (Miller et al., 2006–2012), the Global Competitiveness Report (Sala-i- Martin et al., 2006-2012), and the National Expert Survey (NES) from GEM (2006–2012).

The GEM's APS contains three types of entrepreneurs: nascent, new, and established. Nascent entrepreneurs are in the process of starting a business and have paid wages for not more than three months. New entrepreneurs are owner-managers of new firms and have paid wages for more than three months but not more than forty-two months. Established entrepreneurs are owner-managers of businesses and have paid wages for more than forty-two months. Only nascent and new entrepreneurs are considered "early stage" entrepreneurs in the GEM dataset. Our study focuses on early-stage entrepreneurs, that is, nascent and new entrepreneurs that own or will own an innovation. Combining the GEM dataset with all other data sources results in an overall sample of 57,686 interviews across sixty-seven countries that were surveyed between 2006 and 2012.

Measures

Dependent variable

The dependent variable used in our analysis is the likelihood of an individual's entry into an innovative new venture, derived from GEM's APS. To assess whether a new venture is innovative, we use two questions from the survey of people who succeeded as entrepreneurs. The first question refers to *product innovation*, the customer's determination of whether the product or service offered is new and unfamiliar. The second question refers to *market innovation*, whether the product or service is available in the market by any other competitors. Our dependent variable is operationalized as combination of product and market innovation, coded as dichotomous variable when in either catgory there was an evidence. Of the 57,686 nascent and new entrepreneurs in our sample of adults aged 18-64 years, 16,076 (about 27.9%) qualify as providing new products or services and/or having few or no competitors providing the same product or services (1 = Yes, 0 = No).

The individual-level (level 1) predictor variable

Following the Global Competitiveness Index (2018), latest technology use measures the agility with which a venture adopts latest technologies to improve its performance, with definite importance on its capability to fully leverage technologies in business activities and production process for increased efficiency and enabling innovation.

We derive entrepreneurs' use of the latest technology, an independent variable, from GEM's APS. According to the GEM operationalization, nascent and new entrepreneurs are early-stage entrepreneurs, and our analysis uses only these entrepreneurs. We sample the data for the age of the technologies and procedures used by the identified entrepreneurs: (i) newer than a year ago, (ii) available one year ago but not more than five years old, (iii) more than five years old. The variable is operationalized as a dichotomous variable that is coded 1 if the entrepreneurs confirmed that they

were using technologies and procedures that were not available more than a year ago (6,651 or 11.5% of those in our sample) and zero otherwise (51,035 of 88.5% of those in our sample).

Country-level (level 2) predictor variables

To measure the four institutional environment conditions, we draw on validated scales from the WB Doing Business Database, the Index of Economic Freedom, the Global Competitiveness Report, and GEM's national expert survey, all of which have been used in previous research (e.g., Stenholm et al., 2013). All items are standardized and summed to the relevant institutional environment.

Our first measure, the regulatory environment, is a composite of four aspects of the institutional environment that Stenholm et al. (2013) also employs. The first two aspects, intellectual property protection and business freedom, come from the Heritage Foundation—specifically, data from the Index of Economic Freedom (Miller et al., 2012). Intellectual property protection is a combined measure of various aspects of a country, such as private property, enforcement of property, judiciary systems, and protection against expropriation. Business freedom refers to the degree to which government regulations facilitate individuals' ability to start their businesses and control the outcome. Each participating country in the Index of Economic Freedom was measured on a scale from 0 to 100, where countries labeled "free" scored 80 or higher, those labeled "mostly free" scored 79.9-70, those labeled "moderately free" scored 69.9-60, those labeled "mostly unfree" scored 59.9-50, and those labeled "repressed" scored below 50. The two remaining aspects, starting a business and closing a business, are drawn from the WB Doing Business Database. Starting a business is based on the number of procedures required, the days required to start a business, costs like those for fees and registration, and paid-in minimum capital, such as funds deposited in a bank before registration (percentage of income per capita). Closing a business is measured by the time required to recover debt (in years), the cost for court fees and government levies, recovery for secured creditors, and the strength of the insolvency framework index. A high score in the last measure indicates that the regulatory environment is strictly protected, as is the case in the United

States, and a low score indicates that the regulatory environment is loosely protected, as in the case of Angola.

Our measure of the conducive environment is a composite of five items drawn from the World Economic Forum's Global Competitiveness Report (Sala-i- Martin et al., 2006-2012), a measure that Schillo et al. (2016) also employ. Data were collected from 100 experts from each participating country, using a 7-point Likert-scale. The five items measured companies' spending on research and development ("To what extent do companies in your country spend on R&D?"), capacity for innovation ("In your country, how do companies obtain technology?"), sophistication of the production process ("In your country, how sophisticated are production processes?"), the quality of scientific research institutions ("How would you assess the quality of scientific research institutions in your country?"), and the availability of scientists and engineers ("To what extent are scientists and engineers available in your country?"). A high score indicates that the country has a highly conducive environment, as is the case in Switzerland, and a low score shows that the country's environment is not conducive to business, as in the case of Angola.

Similar to Schillo et al. (2016), we measure normative environment using four items from GEM's national expert survey (2006-2012). GEM's data was collected from experts in each participating country using a 5-point Likert-scale from 1 = "completely false" to 5 = "completely true". The items measure financial success ("The creation of new ventures is considered an appropriate way to become rich"), status ("Successful entrepreneurs have a high level of status and respect"), media attention ("You will often see stories in the public media about successful entrepreneurs"), and agreeable career choice ("Most people think of entrepreneurs as competent, resourceful individuals"). A higher value in this measure indicates that there are more norms in that country, as is the case in Israel, while low values indicate a low level of norms in that country, as in the Czech Republic.

Our measure of our last dimension, cognitive environment, is a composite of three items from GEM's national expert survey (2006-2012), which Schillo et al. (2016) also use. Measured on the

same true-false five-point Likert scale, the items asks about experiential education ("Teaching in primary and secondary education encourages creativity, self-sufficiency, and personal initiative"), economic education ("Teaching in primary and secondary education provides adequate instruction in market economic principles"), and start-up education ("Teaching in primary and secondary education provides adequate attention to entrepreneurship and new firm creation"). High values in this measure indicate a higher-level cognitive environment in that country, as is the case in Singapore, while a low value indicates a low-level cognitive environment, as in the case of Egypt.

Control variables

Consistent with earlier multilevel analysis, we include a set of variables at the individual and country levels to control for entrepreneurship drivers. All individual-level control variables are derived from GEM's APS. At the individual level, we control for seven variables, which is consistent with Pathak, Xavier-Oliveira, and Laplume (2013). Ages between 18 and 64 years were measured as a continuous variable (i.e., number of years). Gender, an important element that affects entrepreneurship, as women tend to exhibit lower rates of entrepreneurial behavior than men, was measured as a binary variable (1 = male, 2 = female). Education, which is associated with entrepreneurial activity, is measured using a five-step categorical scale, where no education = 0, some secondary education = 1, secondary education = 2, post-secondary education = 3, and graduate school = 4. Household income, which is also associated with entrepreneurial activity, is measured on a three-step scale: lower than average income = 1, average income = 2, and above average income = 3. Self-efficacy is a binary variable that indicates whether the respondents have the knowledge, skills, and experience required to start a new business (1 = yes, 0 = no), and perceived opportunity is determined by the answer to the following question: "In the next six months will there be good opportunities for starting a business in the area where you live?" (1 = yes, 0 = no). Social capital is a binary variable coded as 1 if the respondent answers in the positive to the question, "Do you personally know someone who started a business in the past two years?" and 0 otherwise.

Consistent with Levie and Autio (2011), we also control for macroeconomic variables that are associated with entrepreneurial activities because countries' levels of capital are associated with entrepreneurial activity. We use four country-level control variables: GDP per capita (in USD), GDP growth rate, population growth (all obtained from Political Risk Services) and entrepreneurship rate, who are involved in business older than forty-two months (from GEM's APS).

Interaction terms

Our focus is on the moderation effects of institutional environments. Entrepreneurs' latest technology use are correlated with institutional environments to generate four interaction terms with which to test our proposed hypothesis. We used means standardized Z-scores for all processing. Table 1 presents sample's descriptive for all study variables of 67 countries.

Table 1 about here

Results

Table 2 provides the descriptive statistics for the dependent variable and the predictors and controls used in this study, while Table 3 provides the correlation matrices. We perform a variance inflation factor (VIF) test for all of the study's variables to check for multi-collinearity issues. We find that the highest VIF (1.64) and individual VIF (7.81) are less than the cut-off value of 10, so multi-collinearity is not likely to be a concern in this study (Bowerman and O'connell, 1990).

Table 2 about here

Table 3 about here

Table 4 provides the multi-level regression results that predict innovation in new ventures. Model 3 and Model 4 (Table 4) report the odd ratios, while Models 5-8 present beta coefficients and interaction effects. We adopt a three-step strategy to test the hypotheses. In the first step, we add all individual-level predictor and control variables (Table 4, Model 3); in the second step, we add all country-level predictor and control variables to test Hypothesis 1 (Table 4, Model 4); and in the third step, we add all interaction terms to test Hypotheses 2-5 (Table 4, Models 5-8).

For Model 2 (Table 4), we run a null model with no predictor or control variables to determine whether the variance of the intercept resides in new ventures' innovation. We observe that the variance of the intercept continuously decreases from 0.28 (Model 2) to 0.26 (Model 3) and then to 0.21 (Model 4), suggesting that individual-level variables explain 7 percent (((0.28-0.26)/0.28)*100) of the remaining variance in the dependent variable, while country-level variables explain 24 percent (((0.26-0.21)/0.21)*100) of the remaining variance.

Table 4 about here

Our proposed hypotheses are verified in Models 4-8 (Table 4). Model 4 reports the odds ratio (OR), where an OR > 1 indicates a positive relationship, and an OR < 1 indicates a negative relationship. Model 4 shows a positive relationship between individual-level use of the latest technology and new ventures' innovation. Entrepreneurs who use the latest technology are an average of 65 percent (OR = 1.66, $p < 0.001$) more likely to offer innovative products or services than are those who have low use of latest technology, which affirms Hypothesis 1. This study does not hypothesize a direct relationship between country-level institutional environments and individual-level innovation in new ventures. Our findings suggest that new ventures' innovation has a positive relationship with the regulatory (OR = 1.16, $p < 0.05$) and conducive environments (OR =

1.18, $p < 0.01$) and a negative relationship with the normative environment (OR = 0.70, $p < 0.001$). The relationship between new ventures' innovation and the cognitive environment is not significant.

The moderating effects were tested in Models 5-8. Findings suggest that the relationship between individual-level use of the latest technology and new ventures' innovation is positively moderated by the regulatory (Model 5: $\beta = 0.11$; $p < 0.01$) and conducive environments (Model 6: $\beta = 0.15$; $p < 0.001$) and negatively moderated by the normative environment (Model 7: $\beta = 0.18$; $p < 0.05$). However, no significance was observed for the moderating effect of the cognitive environment. Thus, we find support for Hypotheses 2, 3, and 4 but not for Hypothesis 5.

Robsentness analysis:

We conducted number of tests to check the robustness of our results. First, we tested number of control at individual level which might have potential impact on new venture innovation, which included firm age, and number of owners, their inclusion and exclusion had no effect on our main findings. But they did reduce our data so we decided to exclude them. Secondly we also added additional country level controls, cultural values from GLOBE and their presence also had no effect on our main findings, but again number of countries were reduced greatly, so we decided to exclude them. Thirdly, we tested our main model separately on product innovation and market innovation. Our results from these two separate models were in line with our main findings presented in table 4 except that the moderating role of the normative environment hypothesis (H4) was not significant in both models. In addition to our main findings, the moderating role of cognitive environment hypothesis (H5) was significant with product innovation. The full results are available on request from the authors.

Discussion

Our paper empirically examines the impact of entrepreneurs' use of the latest technologies on innovation in an effort to provide evidence that technology is critical to effective entrepreneurship

via innovation (Bower and Christensen, 1996). We find evidence for entrepreneurs' tendency to embrace innovation in the development of new products or services when using the latest technology available, which reflects a country's evolution from the manufacturing-driven stage of economic development to the innovation-driven stage (Wennekers et al., 2005). We also study institutional contingencies that might attenuate or strengthen this relationship. Our findings suggest that the relationship between individual-level use of the latest technology and new ventures' innovation is positively moderated by the regulatory environment and the conducive environment and negatively moderated by the normative environment, while the cognitive environment has no significant moderating effect.

The study's findings provide empirical evidence of the moderating role of the regulatory environment in shaping the strength of the relationship between entrepreneurs' use of the latest technology and innovation. Entrepreneurs are willing to undertake risks in funding the opportunities that the latest technology provides for creating new innovations where they see conditions of favourable regulatory institutional arrangements (Estrin et al., 2013, Urbano and Alvarez, 2014, Lim et al., 2016). Angulo-Guerrero et al. (2017) show that improvements in regulatory systems positively impact entrepreneurship and the likelihood that small, innovative firms will become high-growth firms. Our study also suggests that, in positive regulatory environments, entrepreneurs who seek to create innovative start-ups should consider investing in the latest technology. However, firms that operate in weak regulatory environments (Estrin et al., 2013) may want to settle for lower levels of investment in the latest technology, but doing so will adversely impact innovation.

The study highlights the positive moderating role of a conducive environment in the relationship between entrepreneurs' use of the latest technology and innovation. Stenholm et al.'s (2013) seminal study emphasises the significance of the conducive dimension in creating innovation-oriented new ventures. Since new ventures' innovations are high-impact entrepreneurial activities that require combinations of resources, particularly the latest technology, highly skilled personnel, and high-quality scientific research, entrepreneurs in countries with highly conducive environments

are more likely than those who operate in other environments to use the latest technology to exploit new innovation opportunities.

Our findings also support the moderating effect of the normative dimension on the relationship between using the latest technology and new ventures' innovation, as our results suggest that a strongly perceived normative dimension weakens this relationship. The result supports Stenholm et al.'s (2013, p. 189) argument that "even if entrepreneurship is a socially acceptable choice, pursuing a growth and innovation-oriented new venture is not." Another interpretation of this finding is that opportunity-motivated entrepreneurs (as opposed to necessity-motivated entrepreneurs) who operate in countries with low normative environments may still be willing to use the latest technology to create new venture innovations (Busenitz et al., 2000, Valdez and Richardson, 2013).

While previous studies stress the impact of a strong cognitive environment on entrepreneurial activity (Spencer and Gómez, 2004, Lim et al., 2016, Schillo et al., 2016), we find no support for the moderating role of cognitive environment on the relationship between entrepreneurs' use of the latest technology and new ventures' innovation. An entrepreneur's education and possession of the knowledge and skills necessary to operate a business and to spot new opportunities have no influence on his or her use of the latest technology in a new venture's innovations. This result may find some support in the study of Stenholm et al. (2013), who conclude that the cognitive dimension has no association with the rate and type of entrepreneurial activity.

Contribution to theory

Our study makes several important contributions to the literature on the interactions between individual and institutional contexts that shed light on variances observed in cross-country entrepreneurial activity (De Clercq et al., 2013, Estrin et al., 2013, Stenholm et al., 2013, Urbano and Alvarez, 2014). First, we draw on the RBV and the institutional theory to determine the impact of the use of advanced technology on innovation across many countries. Second, we focus on new ventures' innovation, as much of the literature on the impact of information technologies on innovation is based in medium to large companies. By focusing on new ventures, we provide

empirical evidence of the value to new ventures' innovation of investing in advanced technology. Therefore, our study contributes to the ongoing debate on the "Age of Digitization" (Jean and Kim, 2017) by providing insights into how the latest technologies affect small businesses' marketing strategies (in our case, product and market innovation). Third, no previous study, as far as we are aware, attempts to model the moderating effects of institutional environments on the technology-innovation relationship in new ventures. Whereas previous research draws on institutional theory as a theoretical framework to explain the adoption of practices by entrepreneurs (Heugens and Lander, 2009), our study suggests that institutional theory is also useful in identifying the consequences of new ventures' adopting the latest technologies for innovation in a variety of countries. Including the analyses of the four institutional environments in our model provides valuable insights into how and when the latest technologies can lead to innovation. The entrepreneurship literature has paid little attention to the effect of institutional differences on the adoption of advanced technologies and its impact on new ventures' innovation. Our study suggests that these institutional environments can at least partly explain how they moderate the technology-innovation relationship in new ventures. Thus, our study contributes to filling a gap in the literature on the contingency view of the effect of technological capability on firm performance (Davis-Sramek et al., 2010).

Contribution to practice

Our study has practical implications. Innovation is not limited to the most advanced economies but has become a global phenomenon that affects all sectors of every economy. Our findings reveal a positive relationship between entrepreneurs' use of the latest technology and new ventures' innovation, suggesting that investment in the latest technologies enables entrepreneurs to develop innovations that are superior to those of the competition. Therefore, even in the context of new ventures, technology plays a crucial role in the process of converting capabilities into the competencies (Real et al., 2006) that contribute to innovation and growth (Sambamurthy and Zmud, 2000, Bharadwaj, 2000). The study also identifies macro-level institutional factors that can moderate this relationship, as certain institutional conditions offer firms that adopt the latest

technology more supportive environments for innovation. Therefore, firms that operate in such institutional environments may be encouraged to have digital strategy in place. Having built clear digital strategy requires change at the field level. Accordingly, it is recommended that entrepreneurs build their knowledge through interactions with regulators and professional associations to better understand the changes and advancements in technology- related regulations, conducive policies, cognitive support and changing traditional norms of the society and industry

Contribution to policy

Our study contributes to the policy literature by recognizing the importance of institutional policies' influences on innovation-oriented entrepreneurship (Busenitz et al., 2000). Innovation entails the mobilization of expensive resources, including the latest technologies, but many countries struggle to invest in new technologies. As a result, they try to decrease their reliance on imported technologies in favour of developing their own technologies domestically. Such countries are confronted with huge challenges which may be resolved with policies that influence innovation (Pathak et al., 2013). Policymakers in these nations should work toward creating an optimum institutional environment (Capelleras et al., 2007, Schillo et al., 2016) that facilitates new ventures' innovations by investing in the latest technologies in an effort to bring new products and services to market and increase the growth rates of new ventures. Policy makers should also design technology policy which enables new venture's access to free space for theorizing and experimenting with novel digital technologies (Svahn et al., 2017). Such policy will build entrprenuers' confidence and will improve their perception regarding digital technologies' usefulness. From an innovation policy perspective, policy makers should also provide cognitive support by developing digital training programmes for new ventures where they can get hand-on experience on latest digital technologies. Organizing networking events to deals with digital transformation, where policy makers could interact with entrepreneurs that will educate with them changing institutional environment and will bring positive effect to the normative context of the industry's traditional professional practices.

Having a supportive institutional environment will encourage firms' adoption of technology and innovative entrepreneurship (Anokhin and Wincent, 2012).

Limitations and Future Research Directions

Our study has several limitations. First, technological resources are not the only important antecedent of new venture innovation; other resources and capability factors should be included in the model to explain fully the mechanisms that trigger new ventures' innovation. Second, the study is limited in terms of how we measure entrepreneurs' technology use, so we encourage future studies to use broader measures of entrepreneurs' technological capabilities. Furthermore, researchers can compare the impact of entrepreneurs' use of latest technology on innovation in developed versus developing countries. Third, the moderation analysis performed in our study evaluates contingencies and not the mechanisms by which institutions propel new venture innovation, so future research could examine these mechanisms. Finally, due to the limitation of our secondary data, we were not able to capture internal factors impacting technology and innovation relationship. Further research can explore internal challenges faced by new ventures in adopting latest technologies. Factors such as perceived usefulness of the technology, entrepreneurial identity, personal values and level of autonomy will be interesting venues for future research.

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Figure 1: Conceptual model

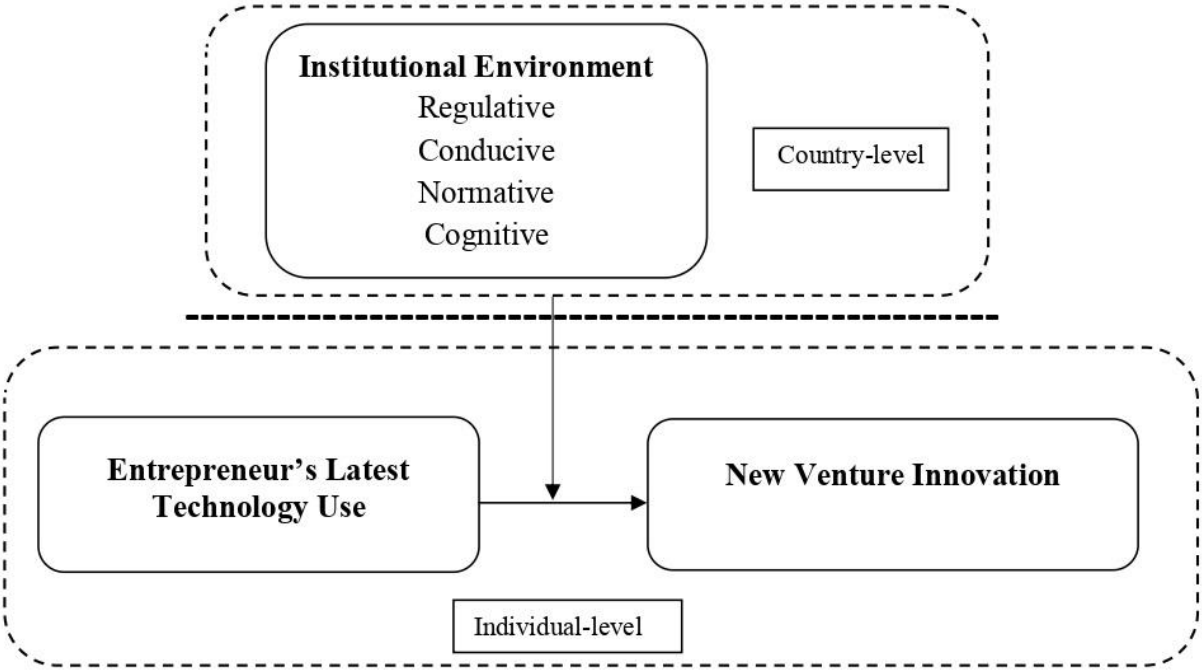

Table 1. Sample descriptive.

Country	*N*[a]	NVI[a] = 0	NVI[a] = 1	% NVI[a]	LT[a] = 0	LT[a] = 1	% LT[a]	Regulative [b]	Conducive [d]	Normative [e]	Cognitive[e]
Algeria	378	313	65	17%	305	73	19%	46.94	2.58	3.53	2.28
Angola	325	257	68	21%	259	66	20%	28.86	2.38	3.61	1.89
Argentina	877	563	314	36%	783	94	11%	42.6	3.55	3.02	2
Australia	271	184	87	32%	253	18	7%	76.7	4.64	3.71	2.44
Austria	238	149	89	37%	223	15	6%	67.99	5.14	3.39	1.73
Bangladesh	231	215	16	7%	225	6	3%	54.68	2.88	3.81	2.19
Belgium	218	153	65	30%	177	41	19%	73.94	5.28	3.27	2.15
Bolivia	1519	1272	247	16%	1404	115	8%	35.87	2.73	2.94	1.69
Botswana	316	241	75	24%	291	25	8%	59.5	3.25	3.65	2.03
Brazil	2949	2812	137	5%	2862	87	3%	53	4.04	3.71	1.56
Chile	3876	1711	2165	56%	3267	609	16%	62.45	3.93	3.63	1.7
China	1066	894	172	16%	973	93	9%	43.37	4.08	4.18	1.83
Colombia	5846	3825	2021	35%	4780	1066	18%	58.96	3.41	3.58	2.08
Costa Rica	484	386	98	20%	456	28	6%	48.15	4.23	3.32	2.06
Czech Republic	206	138	68	33%	152	54	26%	57.31	4.54	2.65	1.99
Denmark	537	337	200	37%	495	42	8%	76.41	5.49	3.5	2.61
Dominican Republic	548	450	98	18%	507	41	7%	44.2	2.96	3.98	1.83
Ecuador	1348	1016	332	25%	1279	69	5%	38.04	2.86	3.38	1.85
Egypt	497	426	71	14%	392	105	21%	50.39	3.44	3.35	1.3
Finland	579	427	152	26%	520	59	10%	77.37	5.75	3.32	2.42
France	261	151	110	42%	224	37	14%	69.04	5.14	3.31	1.77
Germany	1004	713	291	29%	949	55	5%	72.73	5.68	3.09	1.98
Ghana	1155	1001	154	13%	1099	56	5%	52.72	3.16	3.85	2.13
Greece	704	514	190	27%	569	135	19%	52.75	3.59	3.04	1.84
Guatemala	886	601	285	32%	840	46	5%	42.15	3.34	3.36	1.81
Hong Kong	158	117	41	26%	144	14	9%	74.94	4.55	4.22	2.17
Hungary	542	435	107	20%	507	35	6%	63.6	3.96	2.91	1.8
India	215	172	43	20%	174	41	19%	47.1	4.76	4.22	2
Indonesia	293	224	69	24%	197	96	33%	39.88	3.87	3.59	2.39
Iran	779	704	75	10%	736	43	6%	45.1	3.61	2.94	1.41
Ireland	633	413	220	35%	593	40	6%	76.76	4.9	4.09	2.27
Israel	286	205	81	28%	221	65	23%	62.96	5.48	4.45	2.22
Italy	197	142	55	28%	172	25	13%	60.43	4.12	3.51	1.84
Jamaica	240	209	31	13%	200	40	17%	61.78	3.11	4.16	2.19
Japan	95	72	23	24%	88	7	7%	82.64	5.9	3.07	1.57
Kazakhstan	134	122	12	9%	126	8	6%	47.33	3.57	3.7	2.46
Korea	612	479	133	22%	563	49	8%	66.25	4.97	3.64	2.16
Malaysia	536	442	94	18%	478	58	11%	55.83	4.73	3.86	2.16
Mexico	845	614	231	27%	776	69	8%	72.82	3.37	3.56	1.88
Netherlands	671	456	215	32%	616	55	8%	72.49	5.27	3.63	2.75
Nigeria	716	570	146	20%	634	82	11%	53.3	3.44	3.93	2.12
Norway	623	432	191	31%	556	67	11%	75.16	4.94	3.25	2.54
Pakistan	497	364	133	27%	444	53	11%	60.56	3.48	3.63	1.91
Panama	736	543	193	26%	612	124	17%	54.92	3.41	3.68	1.53
Peru	2941	1770	1171	40%	2624	317	11%	46.53	3.14	3.53	1.96
Philippines	370	335	35	9%	292	78	21%	40.38	3.34	3.95	2.19
Poland	302	205	97	32%	291	11	4%	55.12	3.7	3.31	1.85
Portugal	243	176	67	28%	220	23	9%	67.71	4.16	3.25	1.8
Romania	146	101	45	31%	131	15	10%	52.97	3.34	3.16	2.14
Russia	287	235	52	18%	270	17	6%	54.88	3.55	3.17	2.26
Saudi Arabia	271	210	61	23%	138	133	49%	55.96	4.34	3.58	1.71
Singapore	332	250	82	25%	283	49	15%	78.08	5.2	3.84	2.83
Slovakia	394	298	96	24%	313	81	21%	58.72	3.49	2.97	2.04
South Africa	590	384	206	35%	448	142	24%	56.45	3.95	3.81	2
Spain	6347	4672	1675	26%	5731	616	10%	61.74	4.14	3.23	1.82
Sweden	184	143	41	22%	166	18	10%	76.75	5.78	3.48	2.33
Switzerland	383	265	118	31%	357	26	7%	68.95	5.92	3.65	2.28
Syria	129	94	35	27%	123	6	5%	41.04	3.03	3.55	1.59
Thailand	1137	910	227	20%	961	176	15%	57.29	3.68	3.81	1.94
Tunisia	18	14	4	22%	18	0	0%	58.46	4.23	3.81	1.87
Turkey	729	539	190	26%	675	54	7%	54.66	3.76	3.86	2.09
United Arab Emirates	601	419	182	30%	428	173	29%	48.35	4.06	4.01	2.43
United Kingdom	3568	2483	1085	30%	3309	259	7%	75.42	5.26	3.75	2.23
United States	1299	893	406	31%	1208	91	7%	90.32	5.66	4.34	2.21
Uruguay	940	627	313	33%	862	78	8%	55.12	3.43	2.82	1.86
Venezuela	249	212	37	15%	211	38	15%	29.47	2.83	3.39	1.74
Zambia	1099	911	188	17%	855	244	22%	48.05	3.32	3.53	2.1

Notes: *N* is the total number of observations in particular country.

NVI = 0 represent the individuals in particular country have not considered as new venture innovation.
NVI = 1 represent the individuals in particular country have considered as new venture innovation.
% NVI shows the percentage of individuals per country identified as new venture innovation.
LT = 0 represent the individuals in particular country have not considered as using latest technologies.
LT = 1 represent the individuals in particular country have considered as using latest technologies.
% LT shows the percentage of individuals per country identified as using latest technologies.
Regulative, Conducive, Normative and Cognitive institutions shows aggregated scores for year 2006-2012.
[a] Source: Adult Population Survey (APS) from Global Entrepreneurship Monitor (GEM) 2006 – 2012.
[b] Sources: WB Doing Business Database 2006-2012 for starting a business and ease of closing a business; Index of Economic Freedom (IEF) 2006 – 2012 for intellectual property rights and business freedom.
[d] Source: Global Competitiveness Report (GCR) 2006-2012.
[c] Source: National Expert Survey (NES) from Global Entrepreneurship Monitor (GEM) 2006 – 2012.

Table 2. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Individual level					
New venture innovation	57,686	0	1	0.28	0.45
Latest technology use	57,686	0	1	0.12	0.32
Age	57,686	18	64	37.41	11.31
Gender	57,686	1	2	1.41	0.49
Educational level	57,686	0	4	2.14	1.11
Household income	57,686	1	3	2.22	0.79
Self-efficacy	57,686	0	1	0.85	0.36
Perceived opportunity	57,686	0	1	0.63	0.48
Social capital	57,686	0	1	0.63	0.48
Country level					
Regulative	67	28.86	91.45	58.33	12.23
Conducive	67	2.38	5.97	3.97	0.83
Normative	67	2.53	4.63	3.54	0.37
Cognitive	67	1.28	3.10	1.97	0.32
Established e-ship rate	67	0.40	37.70	9.34	6.21
GDP per capital (USD)	67	714.00	103582.00	18590.67	18178.30
GDP growth	67	-8.50	14.10	3.57	3.46
Population growth	67	-0.30	16.09	1.23	1.29

Table 3. Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Individual level																	
New venture innovation	1																
Latest technology use	.086**	1															
Age	-.004	-.046**	1														
Gender	-.009*	.003	.000	1													
Educational level	.107**	.022**	-.026**	-.059**	1												
Household income	.035**	.008*	-.005	-.095**	.193**	1											
Self-efficacy	.044**	-.003	.035**	-.060**	.084**	.055**	1										
Perceived opportunity	.065**	.023**	-.059**	-.005	-.017**	.029**	.113**	1									
Social capital	.044**	.012**	-.075**	-.074**	.111**	.098**	.122**	.133**	1								
Country level																	
Regulative	.092**	-.002	.164**	-.059**	.303**	.013**	.029**	-.048**	-.021**	1							
Conducive	.030**	-.040**	.163**	-.056**	.267**	-.074**	.004	-.079**	.011**	.711**	1						
Normative	-.016**	.009*	.008	.023**	.009*	-.031**	-.030**	.102**	.025**	.069**	.202**	1					
Cognitive	.024**	.018**	.064**	-.019**	.139**	-.015**	.001	.087**	.037**	.434**	.362**	.303**	1				
Established e-ship rate	-.095**	-.039**	-.057**	.089**	-.215**	-.015**	-.044**	.035**	-.047**	-.339**	-.327**	.089**	-.087**	1			
GDP per capital (USD)	.040**	-.035**	.169**	-.063**	.298**	-.032**	.040**	-.084**	.006	.730**	.804**	.018**	.416**	-.330**	1		
GDP growth	.006	.027**	-.100**	.058**	-.112**	-.059**	-.019**	.164**	.034**	-.392**	-.354**	.236**	.017**	.178**	-.459**	1	
Population growth	-.017**	.067**	-.078**	-.027**	-.046**	-.007	.025**	.073**	.028**	-.245**	-.226**	.201**	.099**	.030**	-.076**	.117**	1

N = 57,686 for gauging pairwise correlations between individual-level and country-level variables; *N* = 67 for gauging pairwise correlation between country.

Table 4. Multilevel regression results predicting new venture innovation.

	1	2	3	4	5	6	7	8
Control variables (Individual-level)								
Age			1.00**(0.00)	1.00**(0.00)	-0.00**(0.00)	-0.00**(0.00)	-0.00**(0.00)	-0.00**(0.00)
Gender			1.00(0.02)	1.00(0.02)	-0.02(0.02)	-0.01(0.02)	-0.01(0.02)	-0.01(0.02)
Educational level			1.16***(0.01)	1.15***(0.01)	0.14***(0.01)	0.14***(0.01)	0.14***(0.01)	0.14***(0.01)
Household income			1.03(0.01)	1.01(0.01)	0.02(0.01)	0.01(0.01)	0.02(0.01)	0.02(0.01)
Self-efficacy			1.13***(0.03)	1.14***(0.03)	0.13***(0.03)	0.13***(0.03)	0.13***(0.03)	0.13***(0.03)
Perceived opportunity			1.27***(0.03)	1.28***(0.03)	0.25***(0.02)	0.25***(0.02)	0.25***(0.02)	0.25***(0.02)
Social capital			1.14***(0.02)	1.14***(0.02)	0.13***(0.02)	0.13***(0.02)	0.14***(0.02)	0.13***(0.02)
Control variables (Country-level)								
Established e-ship rate				0.99(0.01)	-0.00(0.01)	-0.00(0.01)	-0.00(0.01)	-0.00(0.01)
GDP per capital (USD)				0.99(0.05)	-0.01(0.08)	-0.01(0.05)	-0.01(0.05)	-0.01(0.05)
GDP growth				1.00(0.01)	-0.00(0.01)	-0.00(0.01)	-0.00(0.01)	-0.00(0.01)
Population growth				1.05*(0.02)	0.05*(0.02)	0.05*(0.02)	0.05*(0.02)	0.05*(0.02)
Main Effect (Individual-level)								
Latest technology use	**H1**		1.65***(0.05)	**1.65***(0.05)**	0.51***(0.03)	0.56***(0.03)	.45**(0.02)	0.47**(0.02)
Main Effects (country-level)								
Regulative				1.16*(0.07)	0.13*(0.06)	0.15**(0.06)	0.15*(0.06)	0.15*(0.06)
Conducive				1.18**(0.06)	0.17**(0.05)	0.14**(0.05)	0.17**(0.05)	0.17**(0.05)
Normative				0.70***(.04)	-0.35***(0.06)	-0.35***(0.06)	-0.38***(0.06)	-0.35***(0.06)
Cognitive				0.94(0.05)	-0.05(0.06)	-0.05(0.06)	-0.05(0.06)	-0.06(0.06)
Cross-level interaction terms								
Latest technology use X Regulative	**H2**				**0.11**(0.04)**			
Latest technology use X Conducive	**H3**					**0.15***(0.03)**		
Latest technology use X Normative	**H4**						**0.18*(0.08)**	
Latest technology use X Cognitive	**H5**							**0.04(0.09)**
Random part estimates								
Variance of intercept		0.28(0.05)	0.26(0.05)	0.21(0.04)	0.21(0.04)	0.21(0.04)	0.21(0.04)	0.23(0.05)
Model fit statistics								
Number of observation		57,686	57,686	57,686	57,686	57,686	57,686	57,686
Number of group (countries)		67	67	67	67	67	67	67
Degree of freedom (number of variables)		0	8	16	17	17	17	17
Chi-square			820.26	895.64	904.10	917.85	900.34	895.82
Probability > chi-square			***	***	***	***	***	***
Log likelihood		-32,279	-31,863	-31,823	-31,819	-31,812	-31,820	-31,823
Likelihood ratio (LR) test for goodness of fit		***	***	***	***	***	***	***

Notes: Standard errors are in parentheses. Bold values indicate variables testing the hypotheses. ***p < 0.001; **p < 0.01; *p < 0.05, ORs in columns 3 and 4, above 1 represent a positive relationship, ORs below 1 represent a negative relationship; columns 5–8 explained beta coefficients needed to plot the interactions.