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*Determinants of Graduates' Start-Ups Creation across a Multi-Campus Entrepreneurial University: The Case of Monterrey Institute of Technology and Higher Education**

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Individual and organizational entrepreneurial activity varies across regions/countries. Universities have increasingly become knowledge-intensive environments that support entrepreneurship. Extant studies demonstrate the need to explore graduate start-ups using different levels of analysis an across economies. This paper explores individual and university determinants of graduates' start-ups creation from a multi-campus entrepreneurial university in a transition economy. A proposed model was tested with 11,569 graduates from 30 campuses across 21 Mexican cities. Results show that specific individual determinants are the most relevant determinant of graduate entrepreneurship as well as that some university mechanisms (incubators and research parks) have limited impact on graduates' entrepreneurship.

Introduction

The literature on entrepreneurship recognizes that environmental factors influence individuals' decisions and help to explain variations in entrepreneurial activity rates across regions and countries (Audretsch et al. 2002; Baker, Gedajlovic, and Lubatkin, 2005; Fritsch 2004; Fritsch and Mueller 2004; Klapper et al. 2010, 2011; Rocha and Sternberg 2005; Wennekers et al. 2010; Zahra 1993). Every region and country has entrepreneurially oriented individuals and organizations characterized by innovativeness, proactiveness, and risk-taking behavior (Antoncic and Hisrich 2001; Armington and Acs 2002; Parker 2011). Noteworthy among existing organizations that have changed into fertile, knowledge-intensive environments oriented toward entrepreneurship are universities (Audretsch 2014), which provide graduates with various employment alternatives such as becoming self-employed (entrepreneurs) or entrepreneurial employees (intrapreneurs) (Guerrero and Urbano 2012). In this regard, entrepreneurial universities invest resources and develop capabilities to generate the necessary infrastructures, mechanisms, and programs to support the

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exploration and/or exploitation of entrepreneurial ideas by the university community[1] (Grimaldi and Grandi 2005; Guerrero, Cunningham, and Urbano 2015; Wright 2007). Incubation, research parks, and accelerator infrastructures have been identified as effective university supports for the creation and survival of new ventures (Barbero et al. 2014; Guerrero, Urbano, and Gajón 2014; McAdam and McAdam 2008).

Extant studies have explored why some universities in developed countries create more start-ups than others (Di Gregorio and Shane 2003; O'Shea, Chugh, and Allen 2008; Shane 2004; Wright, Birley, and Mosey 2004), but only a few studies have analyzed entrepreneurial universities in transitional economies and of the majority of them have not examined graduate entrepreneurship (Guerrero and Urbano 2015; Guerrero, Urbano, and Gajón 2014). In this regard, if we compare developed economies and transitional economies, we observed some similarities and differences. For instance, improving the performance of youth in the labor market, the productive potential of the economy, and social cohesion are common objectives in most developed and transitional economies (Quintini and Martin 2014, p. 9). Despite these common goals, previous studies (Berryman 2000; Dlouhá, Peter, and Barton 2017; Du, Kim, and Aldrich 2016; Estrin and Mickiewicz 2010; Kim, Aldrich, and Keister 2006; Quintini and Martin 2014; Souto-Otero and Whitworth, 2017) have highlighted how the challenges faced by both types of economies are somewhat different in terms of demographic trends (e.g., for transitional economies the challenge is generating many more productive and rewarding jobs while for most developed economies the smaller youth cohorts require more opportunities and skills); labor market (e.g., in developed economies, the quality of entry jobs for youth is a major issue; while informal employment is the key challenge in transitional countries); educational enrollment (e.g., transitional economies often facing low enrollment rates in education compared to developed economies); formal institutions supporting youth entrepreneurship (e.g., developed economies focused on sustainability and efficiency in the development of policies and use of public resources to enhance youth entrepreneurship and reduce the young unemployment rates, while transitional economies are more oriented to reinforce their weak institutions with continuous changes under uncertainty scenarios); informal institutions supporting youth entrepreneurship (e.g., social attitudes are notably oriented to reinforce entrepreneurship such a good professional choice in developed economies, while culture and social attitudes are notably rebuilding in transitional economies); and the quality vs. the quantity of entrepreneurship rates (e.g., developed economies are characterized by higher rates of entrepreneurship by opportunity, while in transitional economies are characterized by higher rates of entrepreneurship necessity such as self-employment mixed with higher levels of informality). In sum, the conditions for graduate entrepreneurship differ significantly between developed and transitional economies.

These arguments further highlight and affirm the need to examine the creation of start-ups by graduates across countries at different socio-economic stages and in particular in transitional economies. First, previous studies that have been undertaken in developed economy contexts have only focused on the university as a whole unit of analysis and have not considered its entrepreneurial activities across campuses or departments (Philpott et al. 2011). This is due to the complexity and difficulty of obtaining the necessary data and the challenge with choice of variables with limited data availability. Moreover, they have not analyzed the simultaneous effect of certain individual/university characteristics on individuals' entrepreneurial decisions (Hessels, Van Gelderen, and Thurik 2008; McMullen and Shepherd 2006). Furthermore, no empirical studies have been undertaken across regions in transition economies using multiple campuses as the unit of analysis of graduate entrepreneurship. Therefore, this research gap represents an opportunity to contribute to the academic debate about the emerging models of multi-campus entrepreneurial universities in the new social and economic landscape of transitional economies (Guerrero et al. 2017). Second, this type of study helps to better understand the role of education in the development of skills and competences that are required during the employment choices of young people such as start-up creation in transitional countries. In particular, the individual values, motivations and aspirations also help to explain their entrepreneurial preferences and the adequate support measures that they require, as well as the

[1]The university community comprises professors, staff, students, and alumni.

influence of certain environmental conditions on their behavior (Mueller 2006). It is relevant taking into account that informal factors such as attitudes, values, and perceptions about entrepreneurship in transitional economies are weak (Berryman 2000; Estrin and Mickiewicz 2010), therefore, those attitudes, values, and perceptions could be reinforced and supported via entrepreneurship educational programs. Therefore, exploring the creation of start-ups by graduates using different levels of analysis in a transition economy contributes to the academic debate about the role of entrepreneurship education on start-up creation (Bae et al. 2014) as well as the emergence of opportunities across the interaction of individual and organizational dimensions (Busenitz et al. 2014). Therefore, this exploratory study aims to provide a better understanding of the individual and university determinants of the number of start-ups created by graduates from a multi-campus university located in a transition economy.

Using data from 11,569 graduates from the 30 campuses of the Monterrey Institute of Technology and Higher Education (ITESM), located across 21 cities in Mexico,[2] this paper makes two main contributions. Our first contribution is we confirm the roles of a combination of individual conditions—prior experiences, skill/knowledge, and aspiration—on the number of start-up created by graduates in a transition economy across regions. Our second contribution is that university support mechanisms—incubators and research parks—have only a modest effect on graduate start-ups across regions in transitional economy. Finally, from a practice perspective this paper raises implications for student and graduates and university managers in how to support and encourage graduate entrepreneurship in transitional economies.

The paper is organized as follows: The second section develops the conceptual framework, particularly the determinant factors involved in graduates' entrepreneurial decisions. The third section presents the methodology used in the study. The fourth section presents the results obtained in this exploration of the ITESM. Finally, the fifth section presents the main conclusions of the study, the discussion, the implications for decision makers, and future lines of research.

Understanding the Individual and University Determinants of Graduates' Start-up Decisions

Entrepreneurship is essentially an individual behavior aimed at pursuing and exploiting opportunities (Shane and Venkataraman 2000). From this perspective, any entrepreneurial action demands feasibility (what can be achieved in the way it is envisioned) and desirability (whether its achievement will accomplish the reason for seeking it) (McMullen and Shepherd 2006). Extant studies have revealed that most university students consider it desirable to create new firms even when they do not have a positive perception of the feasibility (Guerrero, Rialp, and Urbano 2008; Guerrero, Urbano, and Gajón 2014; Shinnar, Pruett, and Toney 2009). Universities give priority attention to strategies that may be useful to create an entrepreneurial environment and reinforce the students' ability to succeed (Gately and Cunningham 2014a; Heriot and Simpson 2007; Pittaway and Hannon 2008; Shane 2004; Wright, Birley, and Mosey 2004) and, in this environment, the graduates' involvement in start-up actions will depend on their risk aversion and their expectations (Arenius and Minniti 2005); their education, experience and skills (Bates 1990; Becker 1964); and their access to the necessary resources/capabilities to develop entrepreneurial initiatives (Audretsch et al. 2002; Audretsch, Lehmann and Warning 2005; Baker, Gedajlovic, and Lubatkin 2005; Cunningham and Harney 2006; Klapper, Amit, and Guillén 2010; Philpott et al. 2011). The combination of these individual and university characteristics helps to explain why some graduates make the decision to become entrepreneurs and others do not (Di Gregorio and Shane 2003; O'Shea, Chugh, and Allen 2008; Shane 2004; Wright, Birley, and Mosey 2004).

[2]According to the World Bank Indicators, Mexico's economy, politics, and society have rapidly changed from an efficiency-driven economy into an innovation-driven economy. In this sense, Mexico is a transitional economy characterized by investment in productive/innovative/entrepreneurial capacity and the desire to achieve a stage of higher economic development and greater well-being for its citizens (Meyer et al. 2009; Wright et al. 2005). Nevertheless, this transformation process has also been accompanied by growing levels of violence within the country.

Individual Level Determinants of Graduates' Start-Up Decisions

In the case of graduates, the decision to become entrepreneurs is influenced by their personal abilities to organize/execute the activities required to create/manage entrepreneurial initiatives and by their personal economic aspirations (Bandura 1991). Human capital theory distinguishes between the generic and specific dimensions of human capital (Becker 1964) that seem to influence entrepreneurial action (Pennings, Lee, and van Witteloostuijn 1998). Human capital is "embodied in the skills and knowledge acquired by individual" (Coleman 1988) and in essence, human capital theory argues that individuals who have higher levels of knowledge, skills, and other characteristics will realize better performance outcomes (Ployhart and Moliterno 2011). Human capital theory has been the focus of studies across different fields such as education (Becker 1964), foreign direct investment (Noorbakhsh, Paloni, and Youssef 2001) and human resources (Hayton 2003). The interest in human capital in the entrepreneurship field has led to a large body of studies and variables focusing on human capital and predications of entrepreneurial success (Unger et al. 2011). For example, studies of human capital in the entrepreneurship field have found that human capital has an effect on nascent technology entrepreneurship (Davidsson and Honig 2003), is vital to innovation radicalness for technology entrepreneurs in a university setting (Marvel and Lumpkin 2007) and can influence the survival and growth of new businesses (Cooper, Gimeno-Gascon, and Woo 1994) particularly technology-based firms (Colombo and Grilli 2005). Generic human capital is primarily associated with the general knowledge/skills acquired through education, while specific human capital refers to more specialized knowledge/skills acquired through training/experience (Parker 2011). Dickson, Solomon, and Weaver (2008) found positive and supporting evidence between education and decisions to become an entrepreneur in their meta-analysis of entrepreneurship education outcomes and human capital in entrepreneurship. Martin, McNally, and Kay (2013) also found positive relationships, particularly with entrepreneurial related human capital assets. The managers of entrepreneurial universities develop strategies to build a strong graduate human capital and reinforce the desirability/feasibility of entrepreneurial activity (Hornsby et al. 2013).

Various studies have demonstrated the positive effect of certain individual experiences (entrepreneurial, managerial, investment, and job experiences) on start-up creation and, according to their perspective, a good combination of prior experiences has a positive impact on the number of enterprises created by individuals (Autio and Acs 2007; Arenius and De Clercq 2005; Arenius and Minniti 2005; Maula, Autio, and Arenius 2005). Regarding graduates' entrepreneurs, extant studies have evidenced diverse effects of prior experiences and entrepreneurship. For example, Kolvereid and Moen (1997) found a positive relationship between prior work experience and start-up created by graduates. Peterman and Kennedy (2003) found that graduates that not having previous experience (regarding entrepreneurship) increased their perceived feasibility and desirability more. Previous studies also recognized that networks are important resources for business development, particularly in transition economies (Smallbone and Welter 2001). In these scenarios, previous experiences (labor, entrepreneurial, managerial) could contribute that individual be able to use her/his contacts/networks to help to develop their businesses (Arenius and De Clercq 2005). Thereby, a combination of prior individuals' experiences has implications in the individual's attitudes/motivations toward starting, running, or investing in new businesses, management training, and use external assistance (Maula et al. 2005). Based on these arguments, we hypothesize that:

H1a: A combination of various prior individual experiences (entrepreneurial, managerial, and job experiences) has a positive effect on the number of start-ups created by graduates.

Conversely, various authors have examined the positive influence of higher education and entrepreneurship training on the creation (Davidsson and Honig 2003; Gately and Cunningham 2014a) and development of entrepreneurial initiatives (Galloway and Brown 2002). Specifically, they have studied the significant role that educational programs play in the development of certain individuals skills/knowledge required for these initiatives, such as teamwork, leadership, innovation/creativity, the ability to work under pressure, self-directed learning, and ethics, among others (Kirby 2004; Peterman and

Kennedy 2003; Pittaway and Hannon 2008). Participation and exposure to entrepreneurial education also increases the desirability and feasibility of entrepreneurship post education (Peterman and Kennedy 2003). For instance, Galloway and Brown (2002) have shown that entrepreneurship training programs help not only to improve the quality and growth of graduate businesses, but also to expand the range of industry sectors covered. Phan et al. (2005) in their large study of university students in Singapore results showed that introducing students early to entrepreneurship had a positive effective with respect to attitudes and beliefs. In such cases, it also means that students acquire the necessary knowledge early to start-up their own venture. In their study of Irish graduate entrepreneurs Fenton and Barry (2011) conclude graduate levels do benefit from entrepreneurial education and this can be enhanced through experiential learning. In some transition economies, a lack of previous experiences combined with the labor demands in the market, encourages individuals with higher educational attainment to seek other job alternatives instead of creating their own start-up (Smallbone and Welter 2001). According to Guerrero and Urbano (2014), the conversion process of an entrepreneurial idea into a market' value generation have several individual, organizational and environmental filters. Following these ideas, transition economies are characterized by certain informal and formal environmental conditions that defined the actions/behaviors among the several agents (government, market, investors, universities, etc.) involved in the entrepreneurial ecosystem (Wright et al. 2005). In transitional economic context, it is required more than the individuals' skills/knowledge/education (Koellinger 2008); therefore, having previous experiences allow individuals have information about the market and connections with several agents involved in the entrepreneurial ecosystem (Arenius and De Clercq 2005; Smallbone and Welter 2001). Based on these arguments, we hypothesize that:

H1b: The individual skills/knowledge acquired at the university has less influence on the number of start-ups created by graduates than their prior experiences.

A recent study has tried to explain the profile of individuals with substantial growth expectations (Autio and Acs 2010). In this context, predominantly, growth-oriented entrepreneurs tend to be relatively young, male, highly educated, and wealthy in terms of household income (Terjesen and Szerb 2008). Therefore, household income is linked with growth aspirations. Furthermore, growth aspirations go together with aspirations in terms of innovation and the estimated size of the start-up capital required for starting the firm. Not surprisingly, positive perceptions to entrepreneurship are also linked with aspirations in terms of job-growth expectations. Moreover, according to Douglas and Shepherd (2002), an individual's choice to become an entrepreneur can be represented as a utility-maximizing decision based on various employment characteristics, such as level of income, work effort, risk, independence, and other working conditions, and other studies have found a positive correlation between business creation and individual aspirations, such as the expectation of financial rewards and independence (Wiklund and Shepherd 2003; Wiklund, Davidsson, and Delmar 2003). The main reasoning is that higher aspirations are related to access to more resources with a certain level of risk, but that the existence of these resources allows for the development of more initiatives. Individuals, especially those, whose growth aspirations are high, must raise capital, bear risks, and enter new markets (Estrin, Korosteleva, and Mickiewicz 2013). Undoubtedly, the configuration of each entrepreneurial ecosystem affects the aspirations of individuals (Hessels, Van Gelderen, and Thurik 2008) as well as the entrepreneurship rates across universities (Di Gregorio and Shane 2003; Guerrero, Cunningham, and Urbano 2015; O'Shea, Chugh, and Allen 2008; Shane 2004). Based on these arguments, we hypothesize that:

H1c: Higher individual economic aspirations increase the number of start-ups created by graduates.

University-Level Determinants of Graduates' Start-Up Decisions

Environmental factors influence individual decisions. Within the university context, entrepreneurial activity is affected by both formal (educational programs and support mechanisms, among others) and informal factors (favorable entrepreneurial attitudes and positive role models, among others) (Guerrero and Urbano 2012). In this section, we focus on the role of support mechanisms such as incubators, research parks,

and accelerators in the creation of start-ups by graduates. Intuitively, with the establishment of campus-wide support programs, all university students have similar opportunities to access the same types of support.

First, within the context of an entrepreneurial university, an incubator is a nonprofit organization that not only provides services—such as rent reductions, access to capital, shared office or laboratory space, technology transfer services, and faculty consultants—for students, faculty staff, and alumni, but also reinforces an entrepreneurial culture at all university levels (Urbano and Guerrero 2013). Effective incubator support can support the developed of an entrepreneurial culture (Aernoudt 2004). In transitional economies such as Brazil and Iran, universities have taken different approaches to support entrepreneurship and incubation (Almeida 2008; Karimi et al. 2010). Undoubtedly, the quality, effectiveness, and diversity of services and support provided by university incubators will be dependent on the availability of financial, physical, commercial, and social capital (Di Gregorio and Shane 2003; O'Shea, Chugh, and Allen 2008). Several authors have emphasized the positive and statistically significant relationship between support mechanisms and the level of universities' entrepreneurial activity (Powers and McDougall 2005). Van Rijnsoever et al. (2017) found that incubators do have positive effects with respect attracting the amount of funding start-up and the capacity to seek funding for banks and other formal investors. However, other studies of incubators have also found no effect or negative of incubators (Schwartz 2008, 2013). However, an undergraduate student can benefit from a pool of resources that can help him or her to evaluate ideas and develop them into innovative enterprises (Souitaris, Zerbinati, and Al-Laham 2007). For non-business graduates, participating in entrepreneurial programs supports their interest, belief, confidence and ambition, and openness to failure (Vij and Ball 2009). Additionally, an undergraduate student can use networking events to access practitioners for recruitment or advice. In addition, in the literature we observe that the number of graduates' start-ups constitutes the appropriate measure of performance for a business university incubator (Barbero et al. 2014; Phan, Siegel, and Wrigh 2005). Therefore, we posit that incubation mechanisms increases the probability of a student becoming an entrepreneur because those mechanisms help to reinforce entrepreneurial motivation, to identify business opportunities, and to exploit opportunities in the short term; particularly in transitional economies characterized by embryonic nature of the external entrepreneurship facilities (government, nonprofit agents, community, etc.). Based on these arguments, we hypothesize that:

H2a: Prior access to the incubation support provided by the university increases the number of start-ups created by graduates.

Second, many universities have established their own science parks to foster the creation of start-ups based on university technologies that are considered such as innovation-related infrastructures through which knowledge is exchanged, and a university is often the catalyst for that symbiosis (Hobbs et al. 2017). A university science park operates depending on the capabilities that sustain the creation of competitive advantages in certain technological sectors with strong linkages in the regional economies (Koh, Koh, and Tschang 2005). In this university environment, a graduate can get advice from researchers and have access to resources from science parks to test and improve their ideas (Phan, Siegel, and Wrigh 2005). According to the academic entrepreneurship literature, the effectiveness in the incumbent of innovative ideas and their transformation into economic value depends on certain individual, organizational, and environmental conditions (Guerrero and Urbano 2014). In this sense, the identification and the assessment of entrepreneurial opportunities represent a strong challenge to offer new value to society by introducing innovative and novel products/services (Lee and Venkataraman 2006). Nevertheless, extant studies also recognized that a lower percentage of graduates and students are involved in the creation of science-based ventures but that founders of such start-ups are drawn from faculty or graduates (Smilor, Gibson, and Dietrich 1990). A plausible explanation is associated to the university's nature (public/private) and scope (broad/technologic) that delimitate the identification and generation of innovative opportunities (Guerrero and Urbano 2012). Even those tendencies, authors such as Koh, Koh, and Tschang (2005) and McAdam and McAdam (2008) have identified several patterns of universities science parks located in very well-developed entrepreneurship/innovation ecosystems and that collaborate with external agents to fostering graduates'

science based or technological initiatives (e.g., Cambridge, Hungry, Silicon Valley, Singapore, Sweden, Taiwan, Western Australia, etc.). Moreover, Hobbs et al. (2017) in their review of science park literature highlight that the empirical studies focus has been on the United Kingdom and the United States and they did not identify any studies of science parks in Mexico. Based on these arguments, we argue that the existence of research parks increases the probability that graduates will be involved in new start-up creation. Therefore, we hypothesize that:

H2b: The existence of research parks provided by the university increases the number of start-ups created by graduates.

Third, even though not all universities have implemented these mechanisms and empirical research is limited, another phenomenon which has received much attention has been the university accelerators. According to Cohen (2013), the accelerators help cohorts of ventures involved in their initial stages providing seed capital, networking, and mentorship (by successful entrepreneurs, program graduates, venture capitalists, angel investors, or even corporate executives) with the objective of accelerating their establishment in competitive market segments as well as training them for venture pitches to a large audience of qualified investors. The focus on accelerators models is primarily on education and training and is at a pre-seed stage, oriented toward small investors, focused on business development and usually delivered over a short period of time (Pauwels et al. 2016). In comparison to incubators, accelerators are distinguished in the limited duration of their programs and focused on certain cohorts of start-ups in their initial stages (Radojevich-Kelley and Hoffman 2012). Moreover, accelerators do support venture development and compliment the prior experience of participants (Hallen, Bingham, and Cohen 2016). Following these ideas, we argue that the existence of university accelerators increases the probability that graduates be involved in new start-up creation. Therefore, we hypothesize that:

H2c: The existence of accelerators provided by the university increases the number of start-ups created by graduates.

Proposed Conceptual Model

Figure 1 shows the proposed conceptual model and the hypotheses that attempt to provide a better understanding of the individual and university conditions that determine the number of start-ups created by graduates from a multi-campus entrepreneurial university.

Methodology

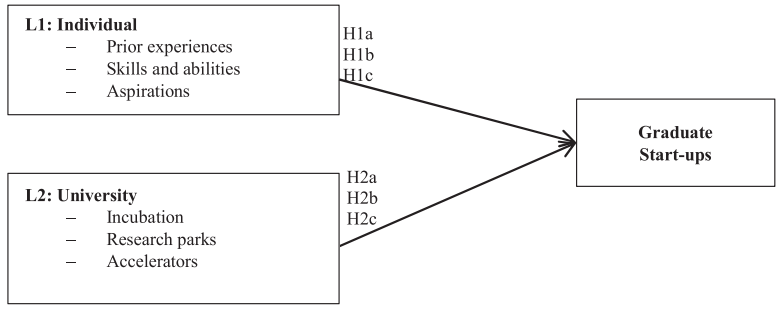
Context

For our research, we explored the Monterrey Institute of Technology and Higher Education (ITESM) as a multi-campus entrepreneurial university in Mexico. According to the theoretical criteria established to identify entrepreneurial universities,[3] since its foundation ITESM has been considered one of the best entrepreneurial universities in Latin America (Guerrero, Urbano, and Gajón 2014). Founded by a group of business owners, it has undergone a continuous innovation process in order to respond to the educational demands issuing from social, economic, scientific, labor market, and technological changes, and to the challenges posed by the country's development. The mission of ITESM is: "to offer education that transforms lives through educational experiences, developing individuals who will become change makers, willing to be increasingly competitive for everybody's benefited." Interestingly, ITESM has adopted the organizational structure of a multi-campus university distributed throughout 31 campuses located in different cities[4] across Mexico (Figure 2), and it is also present in 15 other countries

[3]The criteria used in extant studies (Audretsch and Lehmann 2005; Clark 1998; Di Gregorio and Shane 2003; Guerrero and Urbano 2012; Guerrero et al. 2015; O'Shea et al. 2008; Shane 2004; Wright et al. 2007) to identify entrepreneurial universities include: (1) the promotion of an entrepreneurial culture across the university community; (2) institutional efforts aimed at developing an entrepreneurial ecosystem and fostering innovative/entrepreneurial initiatives; (3) their socioeconomic impact on their regions/countries; (4) a continuous and sustained transformation process, and (5) involvement of various socioeconomic actors in their decisions, activities, and objectives.

[4]Aguascalientes, Chiapas, Chihuahua, Ciudad Juárez, Ciudad Obregón, Cuernavaca, Guadalajara, Hidalgo, Irapuato, Laguna, León, Mazatlán, Mexico City, Monterrey, Morelia, North Sonora, Puebla, Querétaro, Saltillo, San Luis Potosí, Santa Fe, Sinaloa, State of Mexico, Tampico, Toluca, Veracruz Central, and Zacatecas.

Figure 1
Determinants of Graduates' Start-Ups Decisions



Source: The authors.

Figure 2
ITESM's Multi-Campus System

Source: ITESM Website.

through 22 international liaison offices. Its campuses are thus influenced by regional characteristics, in economic, social, political, and geographical terms. ITESM promotes teaching, research, and entrepreneurial activities throughout its multi-campus system. In regard *to teaching activities*, ITESM has implemented a novel educational system with cross-disciplinary entrepreneurship training. In regard to *entrepreneurial activities*, ITESM implemented a business incubator model[5] that allows that at least each campus has an incubator with a research park or/and accelerator to provide those services for university community (students, graduates, staff, professors, etc.) and local community (entrepreneurs). With this kind of initiative, ITESM tries to contribute to the generation of jobs and the strengthening of the Mexican economy.

Sample and Measures

In this regard, we used the 2011, 2012, and 2013 Professional Trajectory of ITESM Graduates Surveys. The sample includes information about 11,546 graduates from the 30 campuses located in 21 different Mexican regions. We also used secondary data about the ITEMS campuses and about the regional characteristics of each campus, as provided by the Mexican Institute for Statistics and Geography. As for the variables, the main *dependent variable* used in this study was the *number of start-ups* created by ITESM graduates. This proxy allows us to understand the levels of entrepreneurial activity across all the ITESM campuses (Audretsch et al. 2002; Audretsch, Lehmann and Warning 2005; Baker, Gedajlovic, and Lubatkin 2005; Klapper, Amit, and Guillén 2010; Klapper, Lewin, and Delgado

[5]Formed by a platform that comprises three subnetworks: (1) a technology-based incubator network that drives the transformation of innovative ideas and projects in advanced sectors into high-value-added businesses; (2) an intermediate technology-based incubator network that supports the creation, development, and consolidation of new businesses that incorporate some innovative elements; and (3) a social incubator network that promotes the creation and strengthening of micro-enterprises.

2011; Philpott et al. 2011). On the basis of the information available, our main *independent variables* addressed: (1) the individual level (Arenius and Minniti 2005; Bates 1990; Becker 1964; Douglas and Shepherd 2002; Reynolds et al. 2005; Wong, Ho, and Autio 2005), and (2) the university level (McMullen and Shepherd 2006; Pittaway and Hannon 2008; Shane 2004; Wright, Birley, and Mosey 2004).

In regard to the *individual level*, human capital was measured by: (1) *prior experience*, including seven dummy variables that capture whether the graduates have had experience as entrepreneurs, in the public sector, and/or as private-sector employees, as well as the interaction among these three types of experiences, and one for a three-way interaction for each of the types of experience (Arenius and Minniti 2005; Autio and Acs 2007; Maula, Autio, and Arenius 2005); and (2) the skills *and abilities* acquired during their studies at the university in relation to teamwork, professional knowledge, leadership, idea generation, ability to work under stress, self-directed learning, and ethics (Arenius and De Clercq 2005; Autio and Acs 2010; Davidsson and Honig 2003; Koellinger 2008; Pittaway and Hannon 2008). These variables were measured using a 1–4 Likert scale. Conversely, the *graduates' aspirations* were measured on the basis of their income level (Autio and Acs 2010; Douglas and Shepherd 2002; Hessels, Van Gelderen, and Thurik 2008; Terjesen and Szerb 2008; Wiklund, Davidsson, and Delmar 2003; Wiklund and Shepherd 2003). As the survey measured the income with a categorical variable, we included a set of eight dummy variables, taking the lower category (less than 10,000 Mexican pesos) as a reference. Finally, we included several control variables (gender, knowledge areas, whether the graduates were applying the knowledge acquired during their studies in their current activity, and the generational cohort[6]).

In regard to the *university level*, we included three dummy measurements to capture the university support at each campus: (1) the on-campus *incubator assistance* used by graduates in their start-ups (Clarysse et al. 2005; Di Gregorio and Shane 2003; O'Shea, Chugh, and Allen 2008; Powers and McDougall 2005); (2) the presence of *research parks* on campus (Koh, Koh, and Tschang 2005; McAdam and McAdam 2008; Phan, Siegel, and Wrigh 2005); and (3) the presence of *accelerators* on campus (Radojevich-Kelley and Hoffman 2012; Cohen 2013). As control variables, we included the size and age (age^2) of each campus as well as three lagged nominal variables that capture: (1) the *business density* in the region where each university campus is located (Klapper, Amit, and Guillén 2010; Klapper, Lewin, and Delgado 2011), (2) the *number of universities* in the region where each university campus is located (Armington and Acs 2002; Audretsch, Lehmann, and Warning 2005; Mueller 2006), and (3) the GDP per capita in the region where each university campus is located (Audretsch et al. 2002; Baker, Gedajlovic, and Lubatkin 2005; Fritsch and Mueller 2004; Reynolds et al. 2005).

Method

Our database was composed of cross-sectional data. As used in previous studies (Autio and Acs 2010), this specification allows for regressions and intercepts to vary across campuses/regions and makes it possible to test cross-level moderating effects. We conducted a two-level Hierarchical Linear Model (HLM) analysis considering individual level (level 1) and the university-level (level 2). HLM is a complex form of Ordinary Least Square (OLS) regression used to analyze variance in the outcome variables when the predictor variables are at varying hierarchical level. We began by specifying the unconditional or null model (Anderson 2012; Woltman et al. 2012) as follows: $Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$; where the number of enterprises created (Y) for one graduate (i) is nested in level two (ITESM campuses, j). It is equal to the average of entrepreneurial activity of each campus (the level two intercept, γ_{00}) plus the random parameter related to the campus associated to each graduate (the level two random parameter, u_{0j}), plus the residual

[6]The Professional Trajectory Survey is distributed to ITESM graduates who have completed their studies 5, 10, 15, 20, and 25 years ago. In this regard, we controlled by two generational cohorts using a binary variable that takes value: (0) for Gen X when the individual born during 1966–1976 and completed their university studies during 1987–1997; and (1) for Gen Y when the individual born during 1977–1994, and completed their university studies during 1997–2008 (Pekala 2001; Schroer 2008).

Table 1
Descriptive Statistics

Variables	*N*	Mean	S.D.	Min	Max
Individual level					
Start-ups	15,274	0.5082493	0.1717978	0	130
Gen_Y	15,274	0.7536991	0.43087	0	1
Gender (male)	15,274	0.6205316	0.4852706	0	1
Exp_entrepreneur	15,274	0.2834228	0.4506746	0	1
Exp_private sector	15,274	0.0998429	0.2998002	0	1
Exp_public sector	15,274	0.8990441	0.3012801	0	1
Exp_entrepreneur*public	15,274	0.0466152	0.2108201	0	1
Exp_public*private	15,274	0.2505565	0.4333477	0	1
Exp_entrepreneur*private	15,274	0.0853738	0.2794463	0	1
Exp_entrepreneur*public*private	15,274	0.0422941	0.2012659	0	1
Income	12,467	4.360953	0.202661	1	9
Applicability	14,083	1.786125	0.8210849	1	4
Area	15,274	1.69268	0.619181	1	4
Skills_Teamwork	14,465	3.503353	0.7312407	1	4
Skills_Knowledge	14,370	3.37968	0.728245	1	4
Skills_Leadership	14,374	3.275915	0.8220049	1	4
Skills_Idea generation	14,385	3.221481	0.852447	1	4
Skills_Working under pressure	14,395	3.631539	0.7143734	1	4
Skills_Self-directed learning	14,390	3.409312	0.8104516	1	4
Skills_Ethics	14,388	3.407979	0.8429611	1	4
University level					
Campus_incubator support	30	0.0191175	0.1369423	0	1
Campus_research parks	30	1.175331	0.6827017	0	2
Campus_accelerators	30	0.9328925	0.2502163	0	1
Campus_size	30	1129.396	985.1168	0	3,009
Campus_year	30	45.49142	17.35872	9	70
Campus_year*year	30	2370.775	1713.22	81	4,900
Business density	30	0.0575003	0.043002	0.01	0.13
HEIs	30	296.3122	139.8673	38	574
GDP per capita	30	0.1509703	0.0597878	0.05	0.25

variance to the graduates and not captured by the model (the level one residual, r_{ij}). In this sense, the level two random parameter (u_{0j}) is what allows the model to vary by the higher-level unit (ITESM campuses).

Adding a predictor to each level, we obtained the mixed model represented such as $Y_{ij} = \gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01} \quad W_j + \gamma_{11}W_jX_{ij} + u_{0j} + u_{1j}X_{ij} + r_{ij}$. Where X_{ij} represents a predictor variable for one graduate i nested in j each campus and W_j represents a predictor variable for campus. Note that for each new predictor added to individual level we get a new beta at campus level that is set as an outcome. The random effects at campus level in the model u_{0j} can also be fixed at 0, which forces the effect to stay constant across all level two units, as with single level regression. Based on this mixed model structure, we build/test our hypotheses at individual level (level-1) and at campus level (level-2). Stata package was used to test the models. Each HLM analyses need to be accompanied by the overall model fit, the interclass correlation coefficient (ICC), and the pseudo R^2 statistic (Anderson 2012; Streenberg 2012; Woltman et al. 2012). Concerting the ICC, it was defined as, $p = \frac{\tau_{00}}{(\sigma^{2+} \tau_{00})}$ where, p is the ICC, $\tau_{00=} u_{0j}$ variance at level 2 and $\sigma^2 = r_{0j}$ variance at level 1. The ICC range from 0 to 1 describes the proportion of the

Table 2
Correlation Matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Start-ups	1														
2	Gen_Y	−0.0765*	1													
3	Gender (male)	0.0917*	−0.0703*	1												
4	Exp_entrepreneur	0.1041*	−0.1560*	0.0733*	1											
5	Exp_private sector	0.0227	−0.0570*	−0.0226	0.1356*	1										
6	Exp_public sector	−0.3034*	0.0213	−0.0843*	−0.0313*	−0.0486*	1									
7	Exp_entrepreneur* public	0.0407*	−0.0870*	0.0129	0.3516*	0.6639*	0.0061	1								
8	Exp_public*private	−0.0104	−0.1383*	0.0577*	0.9194*	0.1330*	0.1938*	0.3351*	1							
9	Exp_entrepreneur* private	−0.0065	−0.0570*	−0.0320*	0.1437*	0.9174*	0.1024*	0.6504*	0.1726*	1						
10	Exp_entrepreneur* public*private	0.0236	−0.0815*	0.0101	0.3341*	0.6310*	0.0704*	0.9504*	0.3634*	0.6878*	1					
11	Income	0.1141*	−0.2919*	0.3232*	0.0486*	−0.0404*	−0.0749*	−0.0174	0.0206	−0.0458*	−0.0198	1				
12	Applicability	−0.0092	0.0375*	0.0029	−0.0356*	−0.0441*	−0.0080	−0.0443*	−0.0339*	−0.0382*	−0.0439*	0.0066	1			
13	Area	−0.0444*	−0.0791*	0.0856*	0.0036	0.0189	0.0292*	0.0170	0.0098	0.0158	0.0134	−0.0069	0.0458*	1		
14	Skills_Teamwork	−0.0219	0.1531*	−0.1249*	−0.0305*	−0.0151	0.0248	−0.0229	−0.0177	−0.0166	−0.0251	−0.1219*	−0.0928*	−0.0411*	1	
15	Skills_Knowledge	−0.0083	−0.0620*	−0.0274	0.0019	−0.0042	0.0136	0.0001	0.0070	−0.0130	−0.0052	−0.0190	−0.1493*	−0.0086	0.3498*	1
16	Skills_Leadership	−0.0002	0.1171*	−0.1024*	0.0038	0.0106	0.0092	0.0100	0.0089	0.0102	0.0075	−0.0957*	−0.1306*	−0.0623*	0.4927*	0.3443*
17	Skills_Idea generation	0.0330*	0.1105*	−0.0701*	0.0331*	0.0120	−0.0239	0.0181	0.0299*	0.0077	0.0123	−0.0866*	−0.1127*	−0.0779*	0.4024*	0.3242*
18	Skills_Working under pressure	0.0047	−0.0139	−0.0986*	0.0025	0.0039	0.0041	0.0074	0.0043	0.0034	0.0025	−0.0692*	−0.0904*	0.0258	0.4417*	0.3808*
19	Skills_Self-directed learning	−0.0306*	0.0153	−0.0500*	−0.0027	0.0035	0.0229	0.0041	0.0081	−0.0034	0.0008	−0.0932*	−0.1177*	0.0236	0.3822*	0.3786*
20	Skills_Ethics	−0.0050	0.0210	−0.0863*	−0.0043	−0.0050	0.0098	−0.0052	0.0023	−0.0063	−0.0061	−0.0835*	−0.1134*	−0.0603*	0.4012*	0.3400*
21	Campus_incubator support	0.0208	0.0077	0.0313*	0.1403*	0.0061	−0.0183	0.0304*	0.1355*	0.0053	0.0253	−0.0240	−0.0192	0.0060	0.0048	−0.0041
22	Campus_research parks	0.0188	−0.1568*	0.0526*	−0.0057	−0.0449*	−0.0301*	−0.0281*	−0.0113	−0.0462*	−0.0273*	0.1617*	0.0358*	0.1309*	−0.0341*	0.0185
23	Campus_accelerators	−0.0183	0.0028	0.0157	−0.0073	−0.0189	−0.0022	−0.0201	−0.0080	−0.0211	−0.0216	0.0975*	0.0143	0.0625*	−0.0039	−0.0096
24	Campus_size	−0.0021	0.0460*	0.0272*	−0.0579*	−0.0612*	−0.0206	−0.0504*	−0.0574*	−0.0611*	−0.0489*	0.0819*	0.0633*	0.1146*	−0.0059	0.0066
25	Campus_year	0.0237	−0.2139*	0.0401*	−0.0027	−0.0352*	−0.0361*	−0.0162	−0.0085	−0.0374*	−0.0162	0.1563*	0.0368*	0.1207*	−0.0391*	0.0355*
26	Campus_year*year	0.0241	−0.2071*	0.0430*	−0.0047	−0.0358*	−0.0382*	−0.0179	−0.0115	−0.0384*	−0.0180	0.1499*	0.0407*	0.1131*	−0.0373*	0.0352*
27	Business density	−0.0252	0.0725*	−0.0010	−0.0117	−0.0229	0.0311*	−0.0175	−0.0059	−0.0232	−0.0209	0.0339*	−0.0002	0.0185	−0.0058	−0.0252
28	HEIs	−0.0175	0.1189*	0.0048	−0.0242	−0.0307*	0.0224	−0.0298*	−0.0194	−0.0286*	−0.0305*	0.0552*	0.0147	0.0263	0.0018	−0.0227
29	GDP per capita	0.0088	0.0006	0.0387*	−0.0209	−0.0335*	−0.0190	−0.0260	−0.0223	−0.0296*	−0.0226	0.0969*	0.0349*	0.0830*	−0.0045	0.0075

Table 2
Continued

	Variables	16	17	18	19	20	21	22	23	24	25	26	27	28	29
16	Skills_Leadership	1													
17	Skills_Idea generation	0.5578*	1												
18	Skills_Working under pressure	0.4105*	0.3634*	1											
19	Skills_Self-directed learning	0.4134*	0.3710*	0.5193*	1										
20	Skills_Ethics	0.4527*	0.3877*	0.3831*	0.4063*	1									
21	Campus_incubator support	0.0055	0.0305*	0.0017	0.0073	−0.0154	1								
22	Campus_research parks	−0.0665*	−0.0840*	0.0271	−0.0167	−0.0279*	−0.0275*	1							
23	Campus_accelerators	−0.0155	−0.0265	−0.0051	−0.0305*	−0.0110	−0.0046	0.4618*	1						
24	Campus_size	−0.0499*	−0.0742*	0.0211	−0.0183	−0.0375*	−0.0318*	0.8565*	0.2818*	1					
25	Campus_year	−0.0714*	−0.0911*	0.0416*	−0.0050	−0.0250	−0.0381*	0.8623*	0.2190*	0.8928*	1				
26	Campus_year*year	−0.0721*	−0.0928*	0.0387*	−0.0039	−0.0252	−0.0377*	0.8716*	0.2018*	0.9005*	0.9909*	1			
27	Business density	0.0192	0.0117	−0.0359*	−0.0341*	−0.0049	0.0212	−0.2664*	0.1806*	−0.1951*	−0.3924*	−0.4215*	1		
28	HEIs	0.0088	0.0006	−0.0327*	−0.0442*	−0.0191	0.0030	−0.0322*	0.2979*	0.0207	−0.1821*	−0.1999*	0.8380*	1	
29	GDP per capita	−0.0395*	−0.0486*	0.0039	−0.0285*	−0.0276*	−0.0411*	0.5651*	0.1414*	0.5833*	0.6022*	0.6083*	−0.2762*	0.1840*	1

*Note: Significance level *$p < .001$.

total variance that depends upon group membership. As there is no direct measure of variance accounted for the HLM model, we estimate a "pseudo R^2" for the overall residual in the model as follows: $R^2 = \frac{(\sigma^2\ \text{unconditional} - \sigma^2\ \text{conditional}\ )}{\sigma^2\ \text{conditional}}$ (Hayes 2006). Finally, we also test the robustness of our model using an HLM as well as OLS regression by entering the variables in different steps.

Results

Tables 1 and 2 show the sample's descriptive statistics and the correlation matrix, respectively. A precondition for HLM is that significant between-group variance exists for the dependent variable. Therefore, we corroborated the relationship between the number of graduate start-ups at the individual level and the university/regional level predictors.

Table 3 presents the results obtained by the entire sample (11,569 graduates) using the two level HLM. On average, model I shows that the number of ITESM's enterprises created by those graduates was just 0.583 ($p < .001$) with a residual variance of 2.915. The interclass correlation in this null model confirm that 11 percent of the total variance in the number of enterprises created by ITESM graduates is accounted for by differences among campuses (Hayes 2006). This indicator tends to increase with the predictors variables. Then, when the set of individual's control variables are added (Model Ia), we observe that the number of enterprises created decreased when the graduates are associated to Gen Y (–0.334; $p < .001$) and increased when are male (0.363; $p < .001$). Moreover, taking such as reference business degree, graduates from health, engineering, and social science tends to create fewer enterprises. In general, these effects are observed in the majority of tested models. Nevertheless, the intensity of the effect is reduced by the presence of the predictors from Model Ib to Model Ie. Model Ib shows that there is a positive relationship between prior entrepreneurial *experience* and the number of graduate start-ups (1.761; $p < .001$). However, prior experience in public organizations (–1.357; $p < .001$) and private organizations (–0.271; $p < .100$) decreases the number of graduate start-ups. Similarly, prior experience in both public and private organizations and as entrepreneurs has a negative

Table 3
Model I. Hierarchical Linear Model

Number of Graduate Start-Ups	All Generational Cohorts															
	Model I (null)			Model Ia			Model Ib			Model Ic			Model Id			Model Ie		
	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$
Fixed effects																		
Level-1: individual																		
Experiences																		
Exp_entrepreneur							1.761	0.101	***	1.501	0.107	***	1.376	0.114	***	1.378	0.113	***
Exp_private sector							−0.271	0.151	*	−0.463	0.158	**	−0.489	0.164	**	−0.484	0.164	**
Exp_public sector							−1.357	0.062	***	−1.547	0.069	***	−1.573	0.073	***	−1.571	0.073	***
Exp_entrepreneur*public							−0.998	0.276	***	−0.766	0.281	**	−0.570	0.291	*	−0.566	0.291	*
Exp_public*private							−1.679	0.107	***	−1.441	0.113	***	−1.300	0.110	***	−1.306	0.119	***
Exp_entrepreneur*private							0.231	0.167		0.402	0.175	*	0.433	0.183	**	0.428	0.181	**
Exp_entrepreneur* public*private							1.300	0.295	***	1.084	0.300	***	0.883	0.311	**	0.885	0.311	**
Skills and Competences																		
Teamwork										−0.006	0.025		−0.016	0.026		−0.016	0.026	
Knowledge										−0.032	0.023		−0.032	0.024		−0.032	0.024	
Leadership										0.003	0.024		0.016	0.026		0.016	0.025	
Idea generation										0.087	0.022	***	0.098	0.023	***	0.098	0.023	***
Working under pressure										0.047	0.026	*	0.035	0.027		0.035	0.027	
Self-directed learning										−0.078	0.023	***	−0.066	0.024	***	−0.066	0.024	**
Ethics										−0.010	0.021		−0.012	0.022		−0.011	0.022	
Income (less than 10 thousand Mx)																		
10–19 Mx													−0.087	0.091		−0.088	0.091	
20–29 Mx													−0.064	0.090		−0.062	0.090	
30–39 Mx													0.012	0.091		0.013	0.091	
40–59 Mx													−0.022	0.092		−0.018	0.092	
60–79 Mx													0.018	0.098		0.023	0.098	
80–99 Mx													0.146	0.100		0.151	0.100	
100–139 Mx													0.194	0.016	*	0.200	0.017	*
More than 140 Mx													0.432	0.117	***	0.436	0.107	***

Table 3
Continued

Number of Graduate Start-Ups	All Generational Cohorts															
	Model I (null)			Model Ia			Model Ib			Model Ic			Model Id			Model Ie		
	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$
Control variables—individual level																		
Gender (male)				0.363	0.026	***	0.238	0.031	***	0.230	0.032	***	0.169	0.034	***	0.168	0.035	***
Applicability				−0.002	0.018		−0.004	0.017		−0.006	0.018		−0.006	0.019		−0.005	0.018	
Area (Business)																		
Engineering				−0.278	0.033	***	−0.189	0.031	***	−0.161	0.033	***	−0.145	0.034	***	−0.145	0.039	***
Social Science				−0.215	0.063	***	−0.163	0.058	**	−0.158	0.061	**	−0.129	0.063	**	−0.129	0.062	*
Health				−0.345	0.227		−0.606	0.214	**	−0.486	0.119	**	−0.390	0.122	*	−0.393	0.222	*
Gen_y				−0.334	0.036	***	−0.264	0.035	***	−0.282	0.037	***	−0.260	0.040	***	−0.279	0.051	***
Level-2: University																		
Campus_incubator support																0.087	0.108	
Campus_research parks																−0.307	0.334	
Campus_accelerators																−0.315	0.374	
Control variables—campus level																		
Campus_size																0.000	0.000	
Campus_year																−0.000	0.000	
Campus_year*year																−0.000	0.000	
Business density in region																−13.39	6.697	*
HEIs in the region																0.004	0.001	*
GDP per capita in the region																−4.579	2.421	*
Constant (γ_{00})	0.583	0.014	***	0.805	0.127	***	1.931	0.140	***	2.108	0.182	***	2.100	0.210	***	2.301	0.356	***
Random effects: Campus																		
Var (Constant, u_{0j})	0.365	0.116		0.387	0.124		0.388	0.121		0.450	0.139		0.529	0.160		0.506	0.127	
Var (Residual, r_{ij})	2.915	0.033		2.877	0.367		2.713	0.032		2.704	0.04		2.581	0.034		2.580	0.034	
LR test versus linear regression																		
Chi^2	87.04			76.15			79.83			89.73			112.33			104		
$Prob > Chi^2$	***			***			***			***			***			***		
Interclass correlation (ICC)	11 percent			12 percent			13 percent			14 percent			17 percent			16 percent		

Table 3
Continued

Number of Graduate Start-Ups	All Generational Cohorts															
	Model I (null)			Model Ia			Model Ib			Model Ic			Model Id			Model Ie		
	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$
Overall model																		
N	11569			11569			11569			11569			11569			11569		
Groups	30			30			30			30			30			30		
Min	13			12			12			11			9			9		
Avg	509			469			469			432			386			385		
Max	5133			4706			4706			4327			3749			3749		
Wald chi^2	–			253.38			2174.37			2114.11			1937.67			1963.64		
Prob > chi^2	–			***			***			***			***			***		
Log likelihood	−29894			−27946			−27061			−24921			−21955			−21950		
Pseudo R^2	–			1.3 percent			6.9 percent			7.2 percent			11.5 percent			11.5 percent		

Note: Mx means Mexican pesos. Level of statistical significance: ***$p \leq .001$, **$p \leq .05$, *$p \leq .10$.

Table 4
Hypotheses Tested

Level	Determinant	H	Theoretical (Expected)	Empirical (Demonstrated)
Individual	Prior experience	H1a	Positive effect	Supported
	Skills and abilities	H1b	Positive effect but lower than for prior experience	Supported
	Aspirations	H1c	Positive effect	Supported
University campus	Incubators	H2a	Positive effect	Not demonstrated
	Research parks	H2b	Positive effect	Not demonstrated
	Accelerators	H2c	Positive effect	Not demonstrated

effect on graduates' entrepreneurial activity (–1.679; $p < .001$; and −0.998; $p < .001$, respectively). Moreover, graduates who have had these three experiences simultaneously create a greater number of start-ups (1.300; $p < .001$). Compared to model Ia, adding the graduates' experiences as a level-1 predictor has reduced the residual variance to 2.713. The interclass correlation was 12 percent and the pseudo R^2 was 6.9 percent. Analyzing the entire sample with the two levels HLM, the majority of the models show that a combination of various prior individual experiences (entrepreneurial, managerial, and job experiences) has a positive effect on the number of start-ups created by graduates in a transition economy (supporting our H1a).

In regard to *graduates' skills/knowledge*, model Ic also shows the contribution of certain skills/knowledge acquired at the university. More concretely, we found that skills associated with idea generation (0.087; $p < .001$) and work under pressure (0.47; $p < .100$) increase the number of start-ups. However, the effect produced by the idea generation is intensified in Model Id linked to the individuals' aspirations. Nevertheless, other skills, such as self-directed learning, decrease the number of start-ups (–0.078; $p < .001$), whereas others do not have a significant effect. Concerning the HLM parameters, the interclass correlation was 14 percent and the pseudo R^2 was 7.2 percent. Adding the graduates' skills at level-1 predictors has reduced the residual variance to 2.704. Even than skills/knowledge has less effect on start-up creation than the effect of prior experiences, the evidence supports our H1b. As for *aspirations*, we found that incomes greater than 10,000 Mexican pesos are positively related to the number of start-ups created (model Id). It also contributes to reduce the residual variance to 2.581. Our results show that a higher individual economic aspiration increase the number of start-ups created by graduates (supporting our H1c). Concerning the *university environment*, model Ie shows the effect of the university variables on the number of graduate start-ups. Even then about 2 percent of graduates have been supported by ITESM incubators in their business creation; surprisingly, when analyzing the entire sample, we found that the support offered by university (incubators, research parks, and accelerators) has a nonsignificant effect on the number of graduate start-ups. The interclass correlation in this model was 16 percent and the pseudo R^2 was 12 percent. Therefore, adding university variables has reduced the residual variance to 2.580.

According to our results and robustness analysis (Appendices 1 and 2), Table 4 summarizes the hypotheses tested.

Discussion and Conclusions

The purpose of this exploratory research was to provide a better understanding of the individual and university determinants of the number of start-ups created by graduates in a transition economy. On the basis of the results obtained using data from a multi-campus university

located in Mexico, we can draw two relevant contributions.

First, we identified and confirmed the significant role of a combination of human capital (prior experiences, skills/knowledge) and aspirations on the number of start-ups created by graduates. Concerning prior experiences, Maula, Autio, and Arenius (2005) and Parker (2011) found similar effects on individual experiences on start-up creation; therefore, our study extends this evidence in a transitional economy context. Our study found that graduates who have job stability in the public or private sector are less likely to create start-ups than those who have had prior entrepreneurial experience, suggesting an opportunity cost associated with job conditions versus entrepreneurship (Douglas and Shepherd 2002). This confirms that if there is attractive job stability with alternative, more secure jobs, then graduates, even though they have higher levels of human capital, particularly education that is positively related to entrepreneurial decision, are more attracted to organizational employment than becoming an entrepreneur. However, even when the graduates' experiences effects are confirmed, a slight reduction in their influence is observed with the presence of other individual predictors such as skills/knowledge and aspirations; a slight improvement in experiences' effects is also observed when the university variables are introduced. In this regard, a plausible explanation of the positive influence of skills/knowledge could be that ITESM have traditionally implemented entrepreneurial education and training across all careers. Previous studies within entrepreneurship education literature found such provision of entrepreneurship education has positive benefits for graduate with respect to skills/knowledge and entrepreneurial aspirations (Davidsson and Honig 2003; Galloway and Brown 2002). Hence, educational programs play a role in the development of certain individual skills/knowledge required for any entrepreneurial initiative (e.g., teamwork, leadership, innovation/creativity, the ability to work under pressure, and ethics) as well as reinforced individuals' feasibility (Kirby 2004; Pittaway and Hannon 2008). Therefore, in the case of this multi-campus entrepreneurial university adequate combination of individuals' skills and experiences reduces the personal barriers and fostering entrepreneurship (Guerrero and Urbano 2012, 2014), but the decision to become graduates entrepreneurs is also influenced by job stability. Regarding aspirations, in line with extant studies, the availability of personal resources is a determinant for the development of entrepreneurial initiatives (Audretsch et al. 2002; Baker, Gedajlovic, and Lubatkin 2005; Klapper, Amit, and Guillén 2010; Philpott et al. 2011), particularly in a transitional economy where graduates' aspirations have a positive influence on the number of start-ups created (Hessels, Van Gelderen, and Thurik 2008; Wiklund, Davidsson, and Delmar 2003; Wiklund and Shepherd 2003). This further reinforces one of the benefits of introducing graduates to entrepreneurship during their studies as it has a positive effective in a transitional economy as well as in rapidly growing economies, as Phan et al. (2005) found in their Singapore study of university students. This highlights that education provision across all disciplines matters in contributing to individual determinants in a transition economy and further confirms the benefits of participation to non-business graduates (Vij and Ball 2009). As a result, we believe that our exploratory study contributes to the academic debate on the individual determinants of graduates' start-up activity (Busenitz et al. 2014; Hessels, Van Gelderen, and Thurik 2008; McMullen and Shepherd 2006) in transitional economies.

Second, our study found that the university support mechanisms (incubators and research parks) have a modest effect on graduate start-ups. In transitional economies, universities are a necessary and important actor in providing access the knowledge, technology, and resources required to create and develop start-ups (Cohen, Nelson, and Walsh 2002; Guerrero and Urbano 2017). However, their impact is lower than the effect of individual and regional characteristics. This is a surprising finding given a significant number of previous studies in relation to incubators have found that they have positive effects. Our findings in this regard runs counter to Powers and McDougall (2005) who found statistically significant relationship between support mechanisms and the level of universities' entrepreneurial activities. One possible explanation about the nonevidenced effect of incubators on the entire sample may be linked to feasibility; in other words, to what graduates perceive that they can achieve in the way they envision it (McMullen and Shepherd 2006). With respect to research parks results,

any exploration of entrepreneurial opportunities involves the refinement/extension of existing knowledge and requires the learning/acquisition of new external knowledge. On the basis of those elements, enterprises develop collaborative agreements to access external resources (Becker and Dietz 2004), particularly in transitional economies, where universities are key pillars in the governments' attempts to reinforce the innovation ecosystem via subsidies aimed at making science more relevant to industry needs (Cohen, Nelson, and Walsh 2002; Guerrero and Urbano 2017). One possible explanation for this result of not finding a significant effect is that transitional economies science base is not of a sufficient scale and capacity to engage effectively with graduate or industry and there may be some institutional or individual-level barriers that limits the postive benefits and impacts (Cunningham and Link 2015; Cunningham et al. 2014). Empirical studies on accelerators to date have been limited and the delivery of programs and support is over a short period of time (Pauwels et al. 2016). With respect to our results about accelerators, these may be explained by the maturity of ideas, as university accelerators tend to be more geared toward offering support during the high-growth stage of start-ups (Guerrero, Urbano, and Gajón 2014). Therefore, a major structural challenge behind the effectiveness of such mechanisms is their inclusion within functionally structured universities—across departments/campuses—(Ochs, Watkins, and Boothe 2001). The keys to success are shared responsibility by the different participating campuses and the incorporation of various infrastructures to support graduate projects. This requires resources that often at times are in high demand but in short supply at the campuses (Heriot and Simpson 2007). If graduates perceive a university environment that responds to their aspirations and reinforces their self-efficacy, they will become involved in entrepreneurial activities more frequently (Bandura 1997). In any case, entrepreneurial actions are not only dependent on the university environment, but also involve individual judgmental decisions about new venture creation, which always entails the possibility of economic gain or loss (Hastie 2001). In this sense, the multilevel analysis has shown those environmental conditions related to each university campus which explain the variability of graduates' start-up activity (Haynes and Janosik 2012). Based on these arguments, we believe that our exploratory study contributes to the extant literature on entrepreneurial universities, with special emphasis on the support measures that reinforce graduates' start-up activity across multi-campus universities (Guerrero and Urbano 2012; Guerrero, Urbano, and Gajón 2014).

The findings of this study also have practical implications. For students and graduates, becoming entrepreneurs is a viable career path in the uncertainty and complexity context of a transitional economy. Even though a lower percentage of university students are becoming entrepreneurs, particularly in transitional economies, universities are natural environments where students are effused by entrepreneurial mindsets, values, behaviors, and skills. Therefore, the acquisition of knowledge with respect to entrepreneurship combined with individual determinants has transferability to other career paths and activities. Early exposure to entrepreneurship irrespective of field can be beneficial, and graduates should also be encouraged and supported to use the university mechanisms such as accelerators, research parks, and incubators to set up their new venture. For entrepreneurship educators, our study highlights the positive effect at the individual level when graduates from all disciplines are exposed to entrepreneurship education. Furthermore, we would suggest based on our study that early exposure to entrepreneurship education in all university schools and departments is an absolute necessity in transitional economies, as it has a direct positive impact on individual students, but also strengthens the organizations they work in if they do not follow the entrepreneurial route by starting up their own venture. In practical terms, this also means increasing the entrepreneurship faculty in business schools and or embedding entrepreneurship faculty in different department in universities. This is also dependent on the organization structure the university leader prefers and adopts in terms of entrepreneurship provision and the wider organizational supports in place such as accelerators, incubators, and research parks. The university strategy to encourage graduate entrepreneurship should encompass entrepreneurship education provision and university mechanism supports such as accelerators, incubators, and research parks. For university managers, in transitional economies, the higher levels of entrepreneurship rates by necessity evidenced the relevant socioeconomic contribution of new start-ups and self-employment. In this regard, it is generally

accepted that to be competitive each entrepreneurial organizations needs to allocate strategically its unique set of valuable, rare, and imperfectly imitable resources and capabilities (Amit and Schoemaker 1993) in activities such as promoting the creation of firms. As a result, several externalities will be observed such as the generation of sustained competitive advantages (Clarysse et al. 2005), the attraction of talented people and funds, the social recognition (Gately and Cunningham 2014b; Guerrero, Cunningham, and Urbano 2015) as well as the contribution to the regional well-being (Audretsch 2014). For example, after analyzing various criteria,[7] Pittaway and Hannon (2008) found that the most valuable university organizational model for the development of enterprises by graduates is associated with a variety of contexts (different campuses) and long-term sustainability. However, multi-campus universities face a major challenge in attempting to transmit the same ideology and resources in a homogeneous manner, because their complex organization generates variations in the implementation of their academic and entrepreneurship programs. ITESM offers an interesting multi-campus entrepreneurial university model and a great opportunity for university managers to measure the outcomes. Policy makers and governments around the world have created subsidies or programs to promote knowledge exchange (Bozeman 2000), especially in transitional economies, where university-enterprise partnership is compulsory as a strategy to stimulate regional economic development (Dimos and Pugh 2016; van de Vrande et al. 2009). In this context, our evidence provides insights to design public policies or programs oriented to combine the developing innovations with the reinforcement of the entrepreneurial orientation of existent organizations (enterprises, universities, government agencies, etc.), taking into account how different agents operate, collaborate, make decisions, identify benefits, and transform their roles or behaviors. This means that total policy replication from more developed economies may not be appropriate and have the desired immediate positive impacts in transitional economies. While some of the policy instruments are designed to influence the broad socioeconomic conditions, there is also a need for working with other ecosystem actors to reinforce and legitimize entrepreneurship as a viable career pathway for students irrespective of field of study. This awareness and legitimization can be taken for granted in established economies, but as our study highlights, it is important in transitional economies where graduates' value job stability more than entrepreneurial start-ups.

This study has several limitations, which, however, provide good opportunities for future research. The *first limitation* is the database used for the analysis. Due to confidentiality restrictions, we did not have access to the graduates' family backgrounds. It is important based on the ITESM nature and origin. Future studies may use reinforcing variables associated with the individuals' close environment (Liñan et al. 2011). The *second limitation* is the lack of information about certain regional variables in transitional economies (e.g., indicators related to the entrepreneurial and innovation ecosystems). Therefore, future research need to explore the effect of regional conditions with a three-level HLM. The *third limitation* is the interaction effect among individual and university conditions. The statistical models require a more in-depth analysis, which would facilitate understanding the variances in the university campus and regional impacts. A natural extension of this work may include other theoretical approaches for an in-depth understanding of these relationships as well as an exploration of the aforementioned conditions in transition economies via case studies. The *fourth limitation* is associated with bias in the measure of graduates' skills and competences obtained from their instruction at the university that could also impact their careers. It brings us to another potential extension associated with the potential influence of generational cohorts on individual entrepreneurial decisions. For example, the introduction of a moderation effect of generational cohorts in the differing levels of HLM (Ding, Au, and Chiang 2015; Evanschitzky, Caemmerer, and Backhaus 2016; Shepherd and Patzelt 2015). In this regard, our exploratory study leads us to raise new research avenues. Future studies may use reinforcing variables associated with the

[7]The main criteria were: educational impact, financial sustainability, academic credibility, human capital, structural embeddedness, context and infrastructures, alignment with institutional strategies and policies, community engagement, alignment with the policy context, and available funding.

individuals' close environment (Liñán, Urbano, and Guerrero 2011) in other transitional economy studies. Studies also need to explore the effect of regional conditions with a three-level HLM. While this may prove challenging given data limitations, it would further our understanding of the relationship between regional conditions and university and individual determinates in transitional economies. There is a need for research to focus on the specific organizational strategies, programs, structures, and investments that transitional economy entrepreneurial universities have adopted to support their third mission aspirations, particularly with respect to graduate entrepreneurship. Moreover, the impact of graduate entrepreneurship venture failure is also another fruitful research avenue. Finally, another potential extension of this research is associated with the potential influence of generational cohorts on individual entrepreneurial decisions. For example, the introduction of a moderation effect of generational cohorts in the differing levels of HLM (Ding, Au, and Chiang 2015; Evanschitzky, Caemmerer, and Backhaus 2016; Shepherd and Patzelt 2015). This is important to understand with respect to individual and university determinants as in transitional economies it make take a number of generations of graduate entrepreneurs to reach or exceed the rate and intensity of graduate entrepreneurship experienced in established economies.

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Appendix 1: Robustness. Hierarchical Linear Model (Individual, Disaggregated Data)

Number of Graduate Start-Ups	All Generational Cohorts															
	Model III (null)			Model IIIa			Model IIIb			Model IIIc			Model IIId			Model IIIe		
	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$
Fixed effects																		
Level-1: Individual																		
Experiences																		
Exp_entrepreneur							1.759	0.102	***	1.510	0.107	***	1.385	0.114	***	1.385	0.114	***
Exp_private sector							−0.264	0.151	*	−0.451	0.159	**	−0.463	0.165	**	−0.458	0.165	**
Exp_public sector							−1.369	0.062	***	−1.557	0.069	***	−1.580	0.073	***	−1.574	0.073	***
Exp_entrepreneur*public							−1.020	0.278	***	−0.795	0.283	**	−0.604	0.293	*	−0.586	0.293	**
Exp_public*private							−1.669	0.107		−1.432	0.114	***	−1.294	0.120	***	−1.298	0.121	***
Exp_entrepreneur*private							0.254	0.168	***	0.425	0.176	*	0.458	0.183	**	0.447	0.183	**
Exp_entrepreneur*public* private							1.318	0.296	***	1.110	0.302	***	0.900	0.314	**	0.888	0.314	**
Skills and Competences																		
Teamwork										−0.008	0.026		−0.019	0.026		−0.018	0.026	
Knowledge										−0.028	0.023		−0.094	0.024		−0.029	0.024	
Leadership										0.002	0.024		0.015	0.025		0.015	0.025	
Idea generation										0.088	0.022	***	0.100	0.023	***	0.100	0.023	***
Working under pressure										0.051	0.026	*	0.039	0.027		0.037	0.027	
Self-directed learning										−0.077	0.023	***	−0.065	0.024	***	−0.067	0.024	**
Ethics										−0.012	0.021		−0.013	0.022		−0.010	0.022	
Income (less than 10 thousand Mx)																		
10–19 Mx													−0.088	0.091		−0.089	0.091	
20–29 Mx													−0.062	0.090		−0.053	0.090	
30–39 Mx													0.014	0.091		0.023	0.091	
40–59 Mx													−0.018	0.092		−0.004	0.092	
60–79 Mx													0.025	0.098		0.041	0.098	
80–99 Mx													0.142	0.100		0.160	0.100	
100–139 Mx													0.195	0.017	*	0.210	0.017	*
More than 140 Mx													0.441	0.107	***	0.455	0.107	***

(Continued)

Appendix 1: (Continued)

Number of Graduate Start-Ups	All Generational Cohorts															
	Model III (null)			Model IIIa			Model IIIb			Model IIIc			Model IIId			Model IIIe		
	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$	Coef.	S.E.	$p>z$
Control variables—individual level																		
Gender (male)				0.361	0.027	***	0.233	0.030	***	0.224	0.032	***	0.162	0.035	***	0.160	0.035	***
Applicability				−0.002	0.018		−0.006	0.017		−0.007	0.018		−0.003	0.018		−0.003	0.018	
Area (Business)																		
Engineering				−0.281	0.034	***	−0.190	0.031	***	−0.163	0.033	***	−0.152	0.033	***	−0.144	0.034	***
Social Science				−0.211	0.062	***	−0.150	0.058	*	−0.143	0.060	*	−0.117	0.062	*	−0.099	0.063	
Health				−0.320	0.227		−0.595	0.213	*	−0.478	0.219	*	−0.402	0.223	*	−0.401	0.224	*
Gen_y				−0.331	0.034	***	−0.257	0.033	***	−0.274	0.035	***	−0.240	0.039	***	−0.255	0.049	***
Level-2: University																		
Campus_incubator support																0.075	0.108	
Campus_research parks																0.082	0.059	
Campus_accelerators																−0.193	0.070	*
Control variables—campus level																		
Campus_size																0.000	0.000	
Campus_year																−0.000	0.000	
Campus_year*year																−0.000	0.000	
Business density in region																−3.966	1.111	***
HEIs in the region																0.001	0.000	***
GDP per capita in the region																−1.412	0.183	***
Constant (γ_{00})	0.508	0.014	***	0.731	0.051	***	1.862	0.077	***	2.015	0.132	***	1.971	0.162	*	2.195	0.183	***
Random effects: Graduates																		
Var (Residual, r_{ij})	2.951	0.034		2.915	0.37		2.748	0.033		2.744	0.034		2.631	0.035		2.623	0.035	
Overall model																		
N	11569			11569			11569			11569			11569			11569		
Wald chi^2	–			256.16			2172.97			2104.07			1937.67			1959.63		
Prob > chi^2	–			***			***			***			***			***		
Log likelihood	−29937			−27984			−27100			−24966			−22011			−22002		
Pseudo $R^{2,8}$	–			1.2 percent			6.8 percent			7.0 percent			10.8 percent			11.1 percent		

[1]Note: Mx means Mexican pesos. Level of statistical significance: ***$p \leq .001$, **$p \leq .05$, *$p \leq .10$.

[8]If we estimated these models using OLS, the R^2 obtained is pretty similar 1.8, 13.3, 14.0, 14.4 and 14.5 percent, respectively.

Appendix 2: Robustness. OLS Regression

	All Generational Cohorts											
	Model IV			Model Iva			Model IVb			Model Ivc		
Number of Graduate Start-Ups	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***
Individual predictors												
Experiences												
Exp_entrepreneur				1.385	0.114	***	1.385	0.115	***	1.387	0.114	***
Exp_private sector				−0.464	0.166	**	−0.459	0.166	**	−0.455	0.166	**
Exp_public sector				−1.581	0.073	***	−1.576	0.073	***	−1.574	0.073	***
Exp_entrepreneur*public				−0.604	0.294	**	−0.596	0.294	**	−0.585	0.294	*
Exp_public*private				−1.294	0.121	***	−1.298	0.121	***	−1.301	0.121	***
Exp_entrepreneur*private				0.458	0.183	**	0.453	0.183	**	0.444	0.183	**
Exp_entrepreneur*public*private				0.900	0.314	**	0.894	0.314	**	0.887	0.314	**
Skills and Competences												
Teamwork				−0.019	0.026		−0.018	0.026		−0.018	0.026	
Knowledge				−0.029	0.024		−0.029	0.024		−0.029	0.024	
Leadership				0.015	0.025		0.016	0.025		0.016	0.025	
Idea generation				0.100	0.023	***	0.100	0.023	***	0.099	0.023	***
Working under pressure				0.039	0.027		0.038	0.027		0.037	0.027	
Self-directed learning				−0.065	0.024	**	−0.066	0.024	**	−0.067	0.024	**
Ethics				−0.013	0.022		−0.013	0.022		−0.010	0.022	
Income (less than 10 thousand Mx)												
10–19 Mx				−0.088	0.091		−0.090	0.091		−0.091	0.091	
20–29 Mx				−0.063	0.090		−0.059	0.091		−0.055	0.091	
30–39 Mx				0.014	0.091		0.016	0.092		0.020	0.092	
40–59 Mx				−0.018	0.092		−0.014	0.092		−0.005	0.092	
60–79 Mx				0.025	0.098		0.030	0.098		0.038	0.098	
80–99 Mx				0.142	0.100		0.146	0.101		0.157	0.101	
100–139 Mx				0.195	0.107	*	0.198	0.108	*	0.206	0.108	*
More than 140 Mx				0.440	0.117	***	0.445	0.118	***	0.452	0.118	***
Control variables—individual level												
Gender (male)				0.162	0.035	***	0.161	0.035	***	0.162	0.035	***
Applicability				0.003	0.019		0.005	0.019		0.005	0.019	

(Continued)

Appendix 2: (Continued)

	All Generational Cohorts											
	Model IV			Model Iva			Model IVb			Model Ivc		
Number of Graduate Start-Ups	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***	**Coef.**	**S.E.**	***p>z***
Area (Business)												
Engineering				−0.152	0.034	***	−0.156	0.034	***	−0.145	0.034	***
Social Science				−0.117	0.062	*	−0.113	0.063	*	−0.103	0.063	
Health				−0.402	0.223	*	−0.404	0.224	*	−0.400	0.224	*
Gen_y				−0.241	0.039	***	−0.226	0.047	***	−0.255	0.050	***
University predictors												
Campus_incubator support							0.073	0.109		0.078	0.109	
Campus_research parks							0.109	0.059	*	0.092	0.060	
Campus_accelerators							−0.177	0.078	**	−0.215	0.081	**
Control variables—campus level												
Campus_size							−0.000	0.000		0.000	0.000	
Campus_year							0.003	0.007		0.009	0.007	
Campus_year*year							−0.000	0.000		−0.000	0.000	
Business density										−4.374	1.155	***
HEIs										0.001	0.000	***
GDP per capita										−1.543	0.523	**
Constant	0.508	0.014	***	1.971	0.162	***	2.003	0.221	***	2.022	0.223	***
N	11569			11569			11569			11569		
F	–			69.03			57.03			52.85		
Prob > *F*	–			***			***			***		
R-squared	–			0.1435			0.1439			0.1450		
Adj. *R*-squared	–			0.1414			0.1414			0.1422		
Root MSE	–			1.624			1.624			16.232		

[1]Note: Mx means Mexican pesos. Level of statistical significance: ***$p \leq .001$, **$p \leq .05$, *$p \leq .10$.