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Entrepreneurial university ecosystems and graduates' career patterns: do entrepreneurship education programmes and university business incubators matter?

Graduates'
career patterns

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Maribel Guerrero

*School of Business and Economics, Universidad del Desarrollo,
Las Condes, Chile and*

Newcastle Business School, Northumbria University, Newcastle, UK

David Urbano

*Department of Business and Centre for Entrepreneurship and Social Innovation
Research (CREIS), Universitat Autònoma de Barcelona, Barcelona, Spain, and*

Eduardo Gajón

Director de Emprendimiento, Tecnológico de Monterrey, La Laguna, Mexico

Abstract

Purpose – This paper provides insights about how graduates' career patterns (i.e. academic entrepreneur, self-employed or paid employed) are influenced by entrepreneurial university ecosystems (i.e. incubators and entrepreneurship education programs).

Design/methodology/approach – By adopting Douglas and Shepherd's utility-maximising function, the influence of one entrepreneurial university ecosystem on graduates' career choices was tested using a sample of 11,512 graduates from the Monterrey Institute of Technology and Higher Education (ITESM) in Mexico.

Findings – Our results show the critical role of entrepreneurial universities ecosystems in facilitating employability options as academic entrepreneurship for ITESM's graduates. The study shows some insights about how graduates' risk aversion and work effort are positively influenced by the university business incubator and entrepreneurship education programs, respectively.

Practical implications – Diverse implications for stakeholders have emerged from our results. These implications are associated with potential benefits of implementing programmes oriented to engage academic entrepreneurship within Latin American universities.

Originality/value – Entrepreneurial universities provide a range of employability alternatives for their students, such as to be self-employed, academic entrepreneurs or paid employees. In this scenario, entrepreneurial universities have configured entrepreneurial ecosystems (educational programmes, business incubators and other infrastructures) to support potential entrepreneurs (students, academics, staff and alumni). Despite the relevance of the environmental conditions on individuals' occupational choices, few studies have explored the role of the entrepreneurial university ecosystems on graduates' employability. In this vein, our study contributes to some academic discussions: (1) the role of context on career choice models (Ilouga *et al.*, 2014; Sieger and Monsen, 2015), (2) the role of incubators and entrepreneurship education on fostering academic entrepreneurship on the

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graduates' community (Nabi *et al.*, 2017; Good *et al.*, 2019; Guerrero and Urbano, 2019a) and (3) the effectiveness of the entrepreneurial university ecosystems on graduates' employability (Herrera *et al.*, 2018; Wright *et al.*, 2017).

Keywords Graduates' career choice, University business incubation, Academic entrepreneurship, Entrepreneurial university, Entrepreneurial and innovation ecosystems, Emerging economies

Paper type Research paper

1. Introduction

Prior empirical research into individuals' career choices has investigated primarily macro-economic and demographic conditions, with a minor emphasis on individual motivations (Douglas and Shepherd, 2000; Feldman and Bolino, 2000). Entrepreneurship literature has attributed occupational choices to heterogeneous individuals' characteristics (Carter *et al.*, 2003; Feldman and Bolino, 2000) and individuals' expectations (Douglas and Shepherd, 2000 and 2002; Martiarena, 2013). However, even though the environmental conditions constrain individuals' occupational decisions (Baumol, 1990), the occupational choice literature has underexplored the role of context on individuals' occupational choices (Ilouga *et al.*, 2014; Sieger and Monsen, 2015; Kuechle *et al.*, 2018). This academic discussion has taken relevance given the most recent worldwide economic downturn and current socio-economic events (e.g. Brexit, US elections, migration/refugees, digitalisation) that have represented a strategic game-changer for any organisation (Guerrero *et al.*, 2016b; Klofsten *et al.*, 2019). In this vein, universities have faced several changes like higher rates of unemployment among university graduates, the reduction of public budgets and reduction in the demand of higher education studies (Guerrero and Urbano, 2019a). Traditionally, universities have provided a range of employability opportunities for students, including the enlargement of skills, knowledge and the willingness/awareness of the need to continue learning via teaching (Harvey, 2001). Over the past few decades, universities have transformed their core activities (teaching, research and knowledge transfer/commercialisation) to configure entrepreneurial ecosystems for providing multiple employability alternatives such as self-employment, academic entrepreneurship or entrepreneurial employees (intrapreneurs) (Audretsch, 2014; Guerrero *et al.*, 2015; Guerrero and Urbano, 2019a).

By exploring this academic discussion, the literature has recognised that entrepreneurial universities invest resources and capabilities to generate adequate infrastructures, mechanisms and educational programmes to support the university community's (students, academics, graduates) exploration and exploitation of entrepreneurial ideas (Grimaldi and Grandi, 2005; Guerrero and Urbano, 2012; Shane, 2004; Wright, 2007, 2017). In this vein, previous studies have explored why some universities create more start-ups than others located in developed countries (Di Gregorio and Shane, 2003; O'Shea *et al.*, 2008; Shane, 2004; Wright *et al.*, 2004; Guerrero *et al.*, 2014, 2017, 2018; Guerrero and Urbano, 2017). In particular, previous studies provide insights about the enabling factors for creating university business incubators (McAdam and McAdam, 2008; Sternberg, 2014), the evolution of university business incubators (Miller *et al.*, 2014), the influence of university business incubators on students' entrepreneurial intentions (Saeed *et al.*, 2014; Guerrero *et al.*, 2017) and the influence of university business incubators on knowledge transfer and commercialisation (Scillitoe and Chakrabarti, 2010; Ebberts, 2014; Lundqvist, 2014). However, a few studies have explored the influence of university business incubators and entrepreneurship education on the graduates' career choice decisions of becoming an academic entrepreneur (Al-Dajani *et al.*, 2014; Guerrero and Urbano, 2017; Guerrero *et al.*, 2017; Good *et al.*, 2019). In this vein, the influence of incubators and entrepreneurship education on graduates' occupational choices have not been explored in detail (Peters *et al.*, 2004; Nabi and Holden, 2008; Nabi; Liñán, 2011; Guerrero and Urbano, 2015; Guerrero *et al.*, 2016; Nabi *et al.*, 2017). This phenomenon is attracting the attention of academics and policymakers given the significant socio-economic

changes that have negatively been influencing job market conditions (González-Pernía *et al.*, 2018) and the current higher education challenges (Guerrero and Urbano, 2019a).

This paper analyses how the graduates' career patterns (i.e. academic entrepreneur, self-employed or paid employed) are influenced by entrepreneurial university ecosystems (i.e. incubators and entrepreneurship education programmes). By adopting the Douglas and Shepherd's utility-maximising function [1], a proposed conceptual model was tested with a sample of 11,512 graduates from a private multi-campus entrepreneurial university (Monterrey Institute of Technology and Higher Education, ITESM) located in an emerging economy (Guerrero *et al.*, 2017 and 2018). Regarding the research setting, we selected Mexico as an emerging country characterised by investment in its productive/innovative/entrepreneurial capacity in order to achieve a better economy and level of well-being for its population (Wright *et al.*, 2005; Guerrero and Urbano, 2017). Mexico's economy, politics and society have rapidly transformed from an efficiency-driven economy towards an innovation-driven economy (Guerrero and Urbano, 2017). As any emerging economies, universities play an important role in entrepreneurial innovation ecosystems, reinforcing a political strategy of stimulating economic development via innovation and entrepreneurship initiatives (Hoskisson *et al.*, 2000; Herrera *et al.*, 2018). Our results show the role of entrepreneurial universities ecosystems in facilitating employability options as academic entrepreneurship for ITESM's graduates. The study highlights some insights about the effectiveness of university business incubator by reducing graduates' risk aversion, as well as the positive effect of entrepreneurship education programmes by reinforcing graduates' work effort. In this vein, our study contributes to some academic discussions: (1) the role of context on career choice models (Ilouga *e t al.*, 2014; Sieger and Monsen, 2015), (2) the role of incubators and entrepreneurship education on fostering academic entrepreneurship on the graduates' community (Nabi *et al.*, 2017; Good *et al.*, 2019; Guerrero and Urbano, 2019a) and (3) the effectiveness of the entrepreneurial university ecosystems on graduates' employability (Grimaldi *et al.*, 2011; Autio *et al.*, 2014; Herrera *et al.*, 2018; Wright *et al.*, 2017).

The remainder of the paper is organised as follows. Section 2 develops the conceptual framework, particularly the factors involved in the graduate students' occupational choice to become an entrepreneur or self-employed or paid employee. Section 3 describes the methodology applied in this study. Section 4 addresses the results obtained. Finally, Section 5 presents the main conclusions of the study, the implications for decision-makers and future research lines.

2. Theoretical foundations

2.1 Entrepreneurial universities ecosystems

Since the publication of the Clarks' book (1998), the research about the phenomena of "entrepreneurial universities" and their core activities – teaching, research, technology transfer and entrepreneurship – has increased significantly (Guerrero and Urbano, 2019). An entrepreneurial university is understood as a university which simultaneously fulfils three core activities – teaching, research and entrepreneurship – while providing an adequate atmosphere in which the university community can explore/exploit ideas (Guerrero, 2008; Guerrero and Urbano, 2012) for contributing into the socio-economic transformation of cities/regions/countries (Grimaldi *et al.*, 2011; Urbano and Guerrero, 2013; Guerrero *et al.*, 2015; Klofsten *et al.*, 2019; Audretsch *et al.*, 2019). The entrepreneurial university core activities (teaching, research and knowledge transfer/commercialisation) are oriented to transform the mindsets, intentions and actions of the community (students and academics). The revised literature highlighted the main characteristics of students' start-ups and graduates/academics entrepreneurship across multiple higher education systems (Guerrero and Urbano, 2019a). Regarding students' start-ups, the design of entrepreneurship programmes

influence on entrepreneurial mindsets/intentions/actions of university students (Pittaway and Cope, 2007; Nabi *et al.*, 2017). In this vein, previous studies have explored the influence of entrepreneurship education on entrepreneurial intentions and few studies on career choices (Ilouga *et al.*, 2014; Sieger and Monsen, 2015) as well as the effect of specific university support mechanisms like business incubators (Guerrero *et al.*, 2017, 2018). Regarding graduates/academics entrepreneurship, the literature provides insights about the relevance of entrepreneurial university supporting knowledge generation/commercialisation via technology-based firms or spin-offs (Grimaldi *et al.*, 2011; Autio *et al.*, 2014; Guerrero and Urbano, 2014; Herrera *et al.*, 2018). As a result, a dichotomous role of entrepreneurial universities emerged in the literature to legitimise their contribution to economic growth and competitiveness via entrepreneurial and innovative initiatives (Wright, 2007; Urbano and Guerrero, 2013; Guerrero *et al.*, 2015, 2016a, 2016b; Klofsten *et al.*, 2019). The intersection of entrepreneurial universities also legitimised their critical role in entrepreneurship and innovation ecosystems (Autio *et al.*, 2014; Herrera *et al.*, 2018), as well as their critical contribution into the predominant production factors that contribute to social and economic development, which are human capital, knowledge capital and entrepreneurship capital (Urbano and Guerrero, 2013; Guerrero *et al.*, 2015, 2016b).

However, in practice, there is an inexistent line between entrepreneurship and innovation; the existent literature confirms that entrepreneurial and innovative ecosystems continue to be analysed as independent phenomena and with a few emphases on the higher education context (Guerrero and Urbano, 2019a). Conceptually, ecosystems involve a set of individuals, organisations, industries and environmental elements such as leadership, dynamic capabilities, culture, capital markets, networks and open-minded customers that combine in complex ways (Acs *et al.*, 2018; Audretsch *et al.*, 2019). In the university context, entrepreneurial innovation university ecosystems are integrated by educational programmes, infrastructures (incubators, research parks, technology transfer offices, business creation offices, employment offices), university regulations (business creation normative, property rights), university culture (role models, attitudes towards entrepreneurship) as well as relationships with government, investors, industry and other socio-economic agents (Guerrero and Urbano, 2012, 2019a; Herrera *et al.*, 2018, 2019b; Nicholls-Nixon *et al.*, 2020; van Rijnsouwer, 2020). This ecosystem supports the university community (students, alumni, academics, staff) in the identification, development and commercialisation of innovative and entrepreneurial initiatives (Grimaldi *et al.*, 2011; Guerrero *et al.*, 2017, 2018). The analysis of these inter-connections is relevant because both ecosystems regulate the nature and the quality of entrepreneurial activity by shaping rewards linked to opportunity identification/generation and pursuit of organisational forms/strategies (Wright *et al.*, 2017). In this assumption, the following section explores the influence of the element of entrepreneurial universities ecosystems on graduates' career choices.

2.2 The influence of entrepreneurial universities ecosystem on graduates' career choices

2.2.1 Influence on tolerance for work effort via entrepreneurial university's educational programs. Entrepreneurial universities play an essential role in the graduates' decision process to enter an occupation as a wage or salaried individual or as entrepreneur/self-employment status. Entrepreneurial university managers are interested in providing skills/abilities that reinforced the academic entrepreneurial lifestyle of their students (Guerrero *et al.*, 2015). In this sense, these universities have introduced transversal entrepreneurship programmes oriented to generate certain students/graduates' benefits in terms of learning, inspiration and incubation that have changed their attitudes/motivations towards academic entrepreneurship (Souitaris *et al.*, 2007; Nabi *et al.*, 2017). In this line, Blanchflower and Meyer (1994) identified a relationship between young self-employed and specific university qualifications. Linked to the concept of *work effort* introduced in Douglas and Shepherd's

utility-maximising function, if a graduate acquired skills/capabilities that facilitate her/his professional activities, he/she will have a higher tolerance for work effort by the relatively little marginal disutility from additional hours and intensity of their job activities. In this sense, this tolerance for work effort will reflect the different utilities of graduates that have been derived from their remuneration (Douglas and Shepherd, 2002). In this assumption, graduates that possess skills/abilities such as the identification of opportunities and work under uncertainty will be more tolerant to the intensive work effort that demands an academic entrepreneurship career in comparison to others occupational choices (Arenius and Minnitti, 2005; Martiarena, 2013; Parker, 2004; Guerrero and Urbano, 2014; Guerrero *et al.*, 2018). The utility gained by graduates' oriented towards academic entrepreneurial will be higher when the marginal rates of substitution between income and work hours are lower in absolute terms (Douglas and Shepherd, 2000). Therefore, we tested the following hypothesis:

- H1. Graduates that tolerate intensive work effort (e.g. recognise opportunities and work under stress, skills achieved during entrepreneurship education programmes) are more likely to be self-employed, lower than academic entrepreneurs but higher than paid employees.

2.2.2 Influence on risk tolerance via entrepreneurial university's incubators. Career options vary according to their level of risk. Kihlstrom and Laffont (1979) suggested that more *risk-averse* individuals become employees and more risk tolerance individuals become academic entrepreneurs. In this assumption, while an employee typically receives a salary/wage, self-employment typically represents a riskier endeavour (Knight, 1921). Positive tolerance for risk may expand the effort and variance of earnings (Douglas and Shepherd, 2000). In the context of the entrepreneurial university, an increased number of studies have identified that incubators are adequate university supports across the entrepreneurial and innovation process (Barbero *et al.*, 2014; McAdam and McAdam, 2008). A university incubator provides access to invaluable resources/networks (Aaboen, 2009; Ebbers, 2014) and knowledge/technology from university (Rothaermel and Thursby, 2005a, 2005b; Good *et al.*, 2019). Therefore, students/graduates can benefit from a pool of resources that help them explore business ideas and exploit these ideas into ventures (Souitaris *et al.*, 2007). The impact of incubation services (e.g. infrastructures, coaching and networking) has been explored in the graduation rates of tenants in the incubation centres (Peters *et al.*, 2004; Wright *et al.*, 2017). In this level of analysis, these empirical studies have evidenced the significant impact on academic entrepreneurship rates based on the quality of services offered by the incubators (Nicholls-Nixon *et al.*, 2020; van Rijnsouwer, 2020). Therefore, under the incubators' umbrella, the perception of students/graduates about risk considerably varies in comparison with the perception of those graduates that have not received this support (Di Gregorio and Shane, 2003; O'Shea *et al.*, 2008; Grimaldi *et al.*, 2011). Based on graduates' experience, the relationship between academic entrepreneurship graduates and incubators will be across the progression of the start-up's life cycle and will face the challenges in management, innovation and survival (McAdam and McAdam, 2008; Good *et al.*, 2019). Graduates who have received support from the university incubator will be more tolerant of risks than other graduates (Douglas and Shepherd, 2000; Levesque *et al.*, 2002). In our assumption, graduates who decide to become paid employees in an aligned occupation where they apply knowledge acquired in their bachelor's degree will be less tolerant of risk (Al-Dajani *et al.*, 2014; Blume-Kohout, 2014; Guerrero *et al.*, 2018). Therefore, we tested the following hypothesis:

- H2. Graduates that tolerate risk (e.g. supported by an entrepreneurial university incubator) are more likely to be self-employed, lower than academic entrepreneurs but higher than paid employees.

2.3 *The influence of graduates' motivations on their career choices*

2.3.1 *Influence on independence via graduates' motivations.* Carter *et al.* (2003) explored several reasons that individuals give for starting a business-like innovation, independence, recognition, roles, financial success and self-realisation. They evidenced that, in comparison with no entrepreneurs, nascent entrepreneurs have a similar impact on the majority of those reasons, but a few differences associated with roles, recognition, and gender perspectives. However, these differences/similitudes will be noted when the utility-maximising function is introduced. According to Douglas and Shepherd (2000 and 2002), the preference for decision-making control will determinate individuals' occupational choice. This fact is linked with the degree of independence/autonomy desired by the individual. Although academic entrepreneurs or self-employed individuals are answerable to stakeholders such as financiers, and their level of independence varies, independence is typically higher in the self-employment career option. In the case of graduates, prior experiences will evidence their decision-making control based on their occupational patterns (Shane *et al.*, 2003; Segal *et al.*, 2005). Typically, individuals who have lived an engaging entrepreneurial experience and had also experimented with higher levels of independence and income will be interested in continuing this pattern (Levesque *et al.*, 2002). In our assumption, by nature, individuals with prior experience as employees in public/private sectors are highly averse to independence. Therefore, we tested the following hypothesis:

- H3. Graduates oriented to have levels of independence (e.g. who experimented prior entrepreneurial experience) are more likely to be self-employed and academic entrepreneurs than paid employees.

2.3.2 *Influence on economic expectancy via graduates' motivations.* According to Gatewood *et al.* (2002), the central premise of the expectancy theory is that behaviours are a function of individuals' expectations based on the perceived value of their achievements (e.g. if their set of skills/abilities are adequate or not), the particular level of performance (e.g. if their outcomes are motivated to their performance) and the attractiveness of the reward (e.g. valence and personal goals relationship). Under this perspective, individuals seek to maximise their utility from their job choices (Douglas and Shepherd, 2002), and it will be influenced by their perceived desirability (Krueger *et al.*, 2000). It follows that the utility incentive to become self-employed is higher for the person who is more tolerant of decision-making autonomy (Douglas and Shepherd, 2000). Therefore, we tested the following hypothesis:

- H4. Graduates' academic entrepreneurs are more likely to demand higher income, lower than self-employed but higher than paid employees.

2.4 *Proposed conceptual model*

By adopting the utility-maximising function (Douglas and Shepherd, 2000 and 2002), we proposed a conceptual model to explore the role of the entrepreneurial university ecosystem on graduates' occupational choice, particularly the influence of entrepreneurship education programmes and university business incubators. Figure 1 shows the proposed dimensions of this function linked to the influence of entrepreneurial university (H1 and H2) and individual motivations (H3 and H4).

3. Methodology

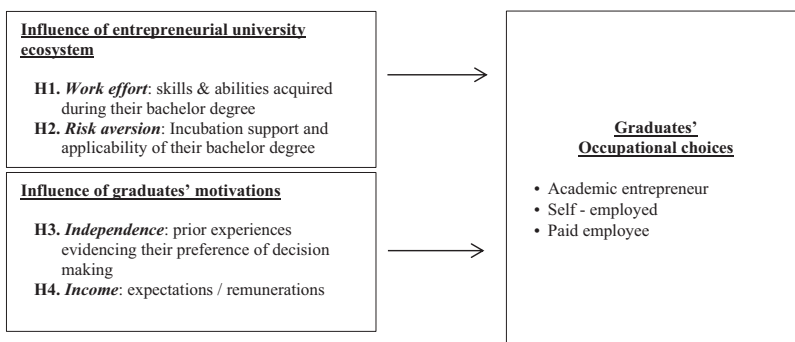
3.1 *A multi-campus entrepreneurial university*

Based on the objective of this study and adopting the theoretical criteria to identify entrepreneurial universities, [2] the Monterrey Institute of Technology and Higher Education

(Instituto Tecnológico y de Estudios Superiores de Monterrey, ITESM) was identified as one of the most entrepreneurial university in Latin America (Guerrero *et al.*, 2014, 2017, 2018). Since its foundation by a group of businessmen, the ITESM has responded to the educational demands that emerge from social, economic, scientific, labour and technological changes, and to the challenges that the country's development faces (Guerrero *et al.*, 2018). The ITESM's aim is "to offer an education that transforms lives through educative experience. We develop persons who become change-makers, willing to be even more competitive on everybody's benefit". As a result, the ITESM's vision is oriented to develop entrepreneurial leaders, who are sensible and internationally competitive. The ITESM's Directive Board is integrated by 20 members that represent civil society and business sector with the CEOs of well-recognised Mexican enterprises. The ITESM has adopted an organisational structure of a multi-campus university distributed by 31 campuses located in different cities [3] across Mexico. In this sense, the ITESM also faces the influence of regional characteristics at the economic, social, political and geographical level. Also, the ITESM has an international presence in 15 other countries through 22 international liaison offices.

Based on this multi-campus system, the ITESM promotes teaching, research and entrepreneurial activities. Concerning the *teaching activities*, the ITESM has implemented a novel educational system with transversal entrepreneurship training. Nowadays, the ITESM has a strong mandatory curricular of entrepreneurship courses/programmes across disciplines/campuses. Regarding *research activities*, ITESM's researchers are organised in over 41 research groups that conduct basic/applied research in strategical public areas [4]. Concerning the *entrepreneurial activities*, the ITESM has created the Eugenio Garza Lagüera Entrepreneurship Institute that enhances students' entrepreneurial spirit in order to propose/implement solutions for social, economic and environmental development. With this aim, the ITESM has celebrated strategic alliances with other universities such as the Babson College, Stanford, UC Berkeley, among others.

Based on these experiences, the ITESM has implemented a business incubator model integrated by a platform comprising three subnetworks: (1) a technology-based incubator network that drives the transformation of ideas and innovative projects in advance 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 elements of innovation and (3) a social incubator network that promotes the creation and strengthening of micro-enterprises. All the entrepreneurship initiatives contribute to the generation of jobs and to strengthening the national economy using knowledge transfer to develop and grow companies.



Source(s): Adapted from Douglas and Shepherd (2000 and 2002) and Guerrero and Urbano (2019a)

Figure 1. Understanding the role of entrepreneurial universities ecosystem on graduates' career choices

3.2 Data collection and description of variables

Based on previous studies [5], this research uses the database from the ITESM's 2011–2013 Professional Trajectory of ITESM Graduates Survey [6]. The population size of graduates associated with a generational cohort between five to fifteen years was 50,301 ITESM's graduates. Our database includes 11,512 graduates from different campuses/knowledge areas. This sample represents a response rate of 23% with a margin of error of 0.80% at 95% confidence level. Nevertheless, after missing values, our final sample was integrated by 8948 ITESM's graduates with a margin of error of 0.94% at 95% confidence level.

The *dependent variable* was measured with a categorical that captures the current career choices of ITESM's graduates: (1) *academic entrepreneur* who has created, organised, and operated an entrepreneurial initiative like a spin-off or technological-based venture taking higher risks in order to do so, (2) *self-employed* who has worked for oneself as a freelancer and (3) *paid employee* who has been employed by an employer to develop specific tasks in an established organisation. We were interested in distinguishing entrepreneurs and self-employed individuals in order to explore similitudes or differences in an emerging economy (Parker, 2004; Sieger and Monsen, 2015; Guerrero *et al.*, 2018). Also, this paper does not explore the possibility that graduates can choose to be unemployed or unemployable; however, the database provides the information (Kolvereid and Isaksen, 2006).

We included a set of *independent variables* associated with the university influence on work effort and risk aversion, as well as individuals' motivations of independence and income expectations. Regarding the *entrepreneurial university influence*, we introduced *work effort* associated with the skills and capabilities acquired by the graduates during their studies at the university. Based on extant studies (Arenius and Minnitti, 2005; Davidsson; Honig, 2003; Martiarena, 2013; Parker, 2004; Nabi *et al.*, 2017), we selected the skills/abilities associated to the generation of ideas, work under uncertainty, auto-learning and ethics. Based on the ITESM's survey, these perceptual variables were measured on a 1–4 Likert scale. Linked to *risk aversion*, we use the variable that captures whether graduates have or have not used the *assistancel/support of university incubator* (Di Gregorio and Shane, 2003; Clarysse *et al.*, 2005; O'Shea *et al.*, 2008; Powers and McDougall, 2005); concretely, it is a dichotomous variable that takes value 1 when the graduates mentioned that they received support from the university incubators, and 0 otherwise; *the applicability of their bachelor degree* in their occupation is measured on a 1–4 Likert scale (Al-Dajani *et al.*, 2014).

Concerning the *individuals' motivation*, linked to *independence*, we introduced *prior experience* measured by three dummy variables that capture whether the graduate has experience such as an entrepreneur or employee in public and private sectors (Davidsson and Honig, 2003; Feldman and Bolino, 2000; Tkachev and Kolvereid, 1999), and (2) *graduates' aspirations* measured by their level of income (Autio and Acs, 2010; Gatewood *et al.*, 2002; Hessels *et al.*, 2008). As the survey asked the income using a categorical variable, we include a set of eight dummy variables taking such a reference to the lower category (less than 10,000 Mexican pesos).

Regarding *control variables*, we controlled by specific individual/university characteristics: (1) *gender* that is a binary variable that takes value 1 when it is a male, and 0 if female. Extant studies have evidenced the significant gender differences in the career choices (Carter *et al.*, 2003; Wilson *et al.*, 2007), (2) years after *graduation* that is a continuing variable that captures the number of years after the graduation (Davidsson and Honig, 2003), (3) *knowledge area* measured with a categorical variable that allows control of knowledge area where the graduates earned their bachelor degree and taking as reference business studies (Douglas and Shepherd, 2002; Levesque *et al.*, 2002), (4) the *generational cohorts* (Pekala, 2001) and (5) dummy variables to control by the effect of *each university campus* where the graduates studied their bachelor (Heriot and Simpson, 2007).

3.3 Data analysis

Given the nature of our dependent variable, a multinomial logistic regression was used with a categorical dependent variable that has three collaboration categories to predict the likelihood of an individual choosing a career (academic entrepreneurs or self-employed or employed) followed by a set of control variables denoted by Z . Adopting the utility-maximising function (Douglas and Shepherd, 2000 and 2002), we estimate that the occupational choices are as follows:

$$U_i = \mu + \beta_0 \text{work tolerance} + \beta_1 \text{risk tolerance} + \beta_2 \text{independence} + \beta_3 \text{expectatives} + \beta_4 Z_{ij} + \varepsilon_i$$

$$U_i = \alpha + \beta_0 \text{skills\&abilities} + \beta_1 \text{incubation support} + \beta_2 \text{prior experience} + \beta_3 \text{income} + \beta_4 Z_{ij} + \varepsilon_i$$

Using STATA 13.0, we estimate the multinomial logistic model as follows (Greene, 2003):

$$\Pr(y = k) = \frac{\exp(\alpha + \beta X'_{ij})}{\sum_{j=1}^3 \exp(\alpha + \beta X'_{ij})} \quad k = 1, 2, 3.$$

The categorical dependent variable is defined so that it takes on three levels (1 for academic entrepreneurs, 2 for self-employed and 3 for employed). Multinomial logistic regression does necessitate careful consideration of the sample size and examination for outlying cases.

4. Results and discussion

4.1 Descriptive statistics

Table 1 reports the descriptive analysis of all the variables and the correlation matrix. In all, 2127 graduates' academic entrepreneurs, 698 graduates' self-employed and 7750 graduates' paid-employee integrated our sample. On average, the ITESM's graduates profile is male (60%), graduated eight years ago and who have been working in the public sector (22%). Almost all graduates evidenced a positive perception of the contribution of university entrepreneurship education programmes on their skills/capabilities for opportunity generation, work under uncertainty, working by themselves and ethics. The correlation matrix reveals that most of the explanatory variables are not highly correlated (Table 1). The mean-variance inflation factor also indicates that the entire model is moderately correlated.

Table 2 shows the results of our multinomial logistic regression. The model achieves the statistical specifications for this type of models [$\text{Chi}^2 = 1954.74$; $\text{Prob} > \text{Chi}^2 = 0.001$; Pseudo $R^2 = 0.2519$].

4.2 Influence of the ITESM' ecosystem on their graduates' career choices

Concerning the influence of entrepreneurial university ecosystem, results show the influence of entrepreneurship education and business incubators on graduates' job alternatives.

Our first assumption was that graduates who choose paid employment are less tolerant of intensive work effort than those who choose to become self-employed and academic entrepreneurs. On the one hand, taking as the reference academic entrepreneurs, Model 1 and Model 2 show that the probability of becoming a paid employee (-0.392 ; $p < 0.001$) and self-

Table 1.
Descriptive statistics
and correlation matrix

| No. | Variables | Entire sample | | | | | Academic entrepreneurs | | | | | ITESM's graduates | | | | | Paid employee | | | | |
|-----|--|---------------|----------|----------|---------|----------|------------------------|----------|----------|-----|-----|-------------------|-------|-------|-----|-----|---------------|-------|-------|-----|-----|
| | | N | Mean | S.D. | Min | Max | N | Mean | S.D. | Min | Max | N | Mean | S.D. | Min | Max | N | Mean | S.D. | Min | Max |
| 1 | Career choice | 11,469 | 2.03 | 0.75 | 1 | 4[1] | 2,127 | 0.73 | 0.44 | 0 | 1 | 698 | 0.52 | 0.50 | 0 | 1 | 7,750 | 0.60 | 0.49 | 0 | 1 |
| 2 | Gender [male] | 11,512 | 0.60 | 0.49 | 0 | 1 | 2,127 | 0.04 | 0.20 | 0 | 1 | 698 | 0.13 | 0.33 | 0 | 1 | 7,750 | 0.02 | 0.15 | 0 | 1 |
| 3 | Entrepreneurial | 11,512 | 0.04 | 0.19 | 0 | 1 | 2,127 | 0.04 | 0.20 | 0 | 1 | 698 | 0.53 | 0.50 | 0 | 1 | 7,750 | 0.23 | 0.42 | 0 | 1 |
| 4 | Public sector | 11,512 | 0.22 | 0.41 | 0 | 1 | 2,127 | 0.08 | 0.26 | 0 | 1 | 698 | 0.16 | 0.37 | 0 | 1 | 7,750 | 0.06 | 0.24 | 0 | 1 |
| 5 | Private sector | 11,512 | 0.08 | 0.27 | 0 | 1 | 2,127 | 0.08 | 0.26 | 0 | 1 | 698 | 0.16 | 0.37 | 0 | 1 | 7,750 | 0.06 | 0.24 | 0 | 1 |
| 6 | Income | 9,588 | 4.04 | 1.85 | 1 | 9 | 1,827 | 4.32 | 2.03 | 1 | 9 | 626 | 3.13 | 1.70 | 1 | 9 | 7,135 | 4.04 | 1.79 | 1 | 9 |
| 7 | Applicability of their bachelor degree | 10,614 | 1.80 | 0.82 | 1 | 4 | 2,119 | 1.84 | 0.82 | 1 | 4 | 693 | 1.74 | 0.86 | 1 | 4 | 7,728 | 1.80 | 0.82 | 1 | 4 |
| 8 | Knowledge area | 11,512 | 1.66 | 0.63 | 1 | 4 | 2,127 | 1.58 | 0.60 | 1 | 4 | 698 | 1.78 | 0.71 | 1 | 4 | 7,750 | 1.69 | 0.62 | 1 | 4 |
| 9 | Idea/opportunity generations | 10,782 | 3.28 | 0.83 | 1 | 4 | 2,007 | 3.40 | 0.81 | 1 | 4 | 655 | 3.32 | 0.83 | 1 | 4 | 7,236 | 3.25 | 0.82 | 1 | 4 |
| 10 | Work under uncertainty | 10,783 | 3.63 | 0.73 | 1 | 4 | 2,011 | 3.63 | 0.72 | 1 | 4 | 655 | 3.66 | 0.70 | 1 | 4 | 7,234 | 3.62 | 0.73 | 1 | 4 |
| 11 | Learning by themselves | 10,778 | 3.42 | 0.81 | 1 | 4 | 2,003 | 3.38 | 0.83 | 1 | 4 | 651 | 3.38 | 0.85 | 1 | 4 | 7,240 | 3.44 | 0.80 | 1 | 4 |
| 12 | Ethics | 10,784 | 3.42 | 0.83 | 1 | 4 | 2,010 | 3.39 | 0.83 | 1 | 4 | 654 | 3.37 | 0.85 | 1 | 4 | 7,237 | 3.43 | 0.82 | 1 | 4 |
| 13 | Incubator support received | 11,512 | 0.02 | 0.14 | 0 | 1 | 2,127 | 0.03 | 0.18 | 0 | 1 | 698 | 0.02 | 0.12 | 0 | 1 | 7,750 | 0.02 | 0.13 | 0 | 1 |
| 14 | Years after graduation | 11,512 | 8.29 | 4.04 | 5 | 15 | 894 | 8.52 | 4.17 | 5 | 15 | 698 | 8.85 | 4.18 | 5 | 15 | 7,750 | 8.14 | 3.98 | 5 | 15 |
| 15 | Years after graduation square | 11,512 | 85.07 | 78.96 | 25 | 225 | 894 | 89.90 | 82.04 | 25 | 225 | 698 | 95.85 | 82.60 | 25 | 225 | 7,750 | 82.01 | 77.53 | 25 | 225 |
| No. | Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | | | | |
| 1 | Career choice | 1 | | | | | | | | | | | | | | | | | | | |
| 2 | Gender [male] | -0.1866* | 1 | | | | | | | | | | | | | | | | | | |
| 3 | Entrepreneurial | 0.0427* | 0.0066 | 1 | | | | | | | | | | | | | | | | | |
| 4 | Public sector | 0.1837* | 0.0584* | 0.3267* | 1 | | | | | | | | | | | | | | | | |
| 5 | Private sector | 0.0740* | -0.0426* | 0.6090* | 0.1503* | 1 | | | | | | | | | | | | | | | |
| 6 | Income | -0.1248* | 0.2907* | -0.0246 | -0.0001 | -0.0402* | 1 | | | | | | | | | | | | | | |
| 7 | Applicability of their bachelor degree | -0.0189 | 0.0086 | -0.0349* | -0.0254 | -0.0269 | 0.0134 | 1 | | | | | | | | | | | | | |
| 8 | Knowledge area | 0.0305 | 0.0883* | 0.0011 | -0.0040 | 0.0023 | -0.0270 | 0.0409* | 1 | | | | | | | | | | | | |
| 9 | Idea/opportunity generations | -0.0675* | -0.0740* | 0.0251 | 0.0423* | 0.0138 | -0.0578* | -0.1099* | -0.0719* | 1 | | | | | | | | | | | |

(continued)

| No. | Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-----|-------------------------------|----------|----------|---------|---------|---------|----------|----------|----------|---------|---------|---------|---------|---------|---------|----|
| 10 | Work under uncertainty | 0.0027 | -0.1075* | 0.0061 | 0.0081 | 0.0038 | -0.0804* | -0.0964* | 0.0117 | 0.3926* | 1 | | | | | |
| 11 | Learning by themselves | -0.0135 | -0.0663* | -0.0047 | 0.0139 | -0.0134 | -0.1002* | -0.1209* | 0.0124 | 0.3897* | 0.5342* | 1 | | | | |
| 12 | Ethics | -0.0062 | -0.0903* | -0.0086 | 0.0126 | -0.0120 | -0.0747* | -0.1137* | -0.0748* | 0.3946* | 0.3972* | 0.4090* | 1 | | | |
| 13 | Incubator support received | -0.0345* | 0.0416* | 0.0361* | 0.1577* | 0.0063 | -0.0154 | -0.0143 | 0.0070 | 0.0254 | -0.0038 | 0.0028 | -0.0218 | 1 | | |
| 14 | Years after graduation | 0.0023 | 0.0374* | 0.0813* | 0.1234* | 0.0688* | 0.3351* | -0.0219 | -0.0508 | 0.0131 | -0.0027 | -0.0255 | 0.0348* | -0.0043 | 1 | |
| 15 | Years after graduation square | 0.0040 | 0.0392* | 0.0804* | 0.1215* | 0.0676* | 0.3283* | -0.0230 | -0.0515 | 0.0112 | -0.0046 | -0.0303 | 0.0312 | -0.0035 | 0.9915* | 1 |

Note(s): [1] Includes one category associated with 937 unemployed graduates that were not included in the analysis
Significance level * $p < 0.001$; VIF = 1.8

Table 1.

Table 2.
Multinomial regression
analysis

| Relationships | Model 1 Academic entrepreneur (base) vs paid employees | | Model 2 Academic entrepreneur (base) vs self-employed | | Model 3 Self-employed (base) vs paid employees | |
|---|--|-------|---|-------|--|-------|
| | Coef. | Std. | Coef. | Std. | Coef. | Std. |
| <i>Influence of entrepreneurial University ecosystem</i> | | | | | | |
| Work effort [skills/abilities acquired via entrepreneurship educational programmes] | -0.392 | 0.043 | -0.290 | 0.076 | -0.102 | 0.067 |
| Idea/opportunity generations | -0.094 | 0.051 | 0.066 | 0.092 | -0.161 | 0.082 |
| Work under uncertainty | 0.147 | 0.044 | -0.080 | 0.078 | 0.227 | 0.069 |
| Learning by themselves | 0.156 | 0.041 | 0.037 | 0.075 | 0.119 | 0.067 |
| Ethics | | | | | | |
| Risk aversion [support via university business incubator] | -0.113 | 0.036 | -0.228 | 0.065 | 0.115 | 0.057 |
| Applicability of their bachelor degree | -1.966 | 0.237 | -2.880 | 0.414 | 0.914 | 0.362 |
| Support received from university incubator | | | | | | |
| <i>Influence of graduates' motivations</i> | | | | | | |
| Independence [prior experiences] | -3.399 | 0.284 | -2.750 | 0.375 | -0.649 | 0.285 |
| Entrepreneurial | 3.659 | 0.225 | 4.916 | 0.244 | -1.257 | 0.102 |
| Public sector | 0.061 | 0.137 | 0.297 | 0.259 | -0.235 | 0.239 |
| Private sector | | | | | | |
| Expectations [income less than 10,000 Mexican pesos] | 0.894 | 0.163 | -0.184 | 0.211 | 1.078 | 0.175 |
| 10,000-19,999 Mx | 1.040 | 0.162 | -0.688 | 0.219 | 1.728 | 0.185 |
| 20,000-29,999 Mx | 1.021 | 0.165 | -1.069 | 0.233 | 2.089 | 0.200 |
| 30,000-39,999 Mx | 0.914 | 0.167 | -1.302 | 0.242 | 2.216 | 0.210 |
| 40,000-59,999 Mx | 0.863 | 0.181 | -1.784 | 0.307 | 2.647 | 0.276 |
| 60,000-79,999 Mx | 0.723 | 0.187 | -2.014 | 0.340 | 2.737 | 0.310 |
| 80,000-100,999 Mx | 0.797 | 0.207 | -2.229 | 0.418 | 3.026 | 0.389 |
| 110,000-139,999 Mx | | | | | | |

(continued)

| Relationships | Model 1 Academic entrepreneur (base) vs paid employees | | Model 2 Academic entrepreneur (base) vs self-employed | | Model 3 Self-employed (base) vs paid employees | |
|----------------------------------|--|----------------|---|----------------|--|----------------|
| | Coef. | Std. $p > z $ | Coef. | Std. $p > z $ | Coef. | Std. $p > z $ |
| More than 140,000 Mx | 0.143 | 0.246 | -2.626 | 0.537 | 2.769 | 0.505 |
| <i>Control variables</i> | | | | | | |
| Gender [male] | -0.794 | 0.069 | -0.910 | 0.117 | 0.116 | 0.101 |
| Years after graduation | -0.142 | 0.147 | 0.133 | 0.243 | -0.275 | 0.214 |
| Years after graduation square | 0.006 | 0.007 | -0.004 | 0.012 | 0.010 | 0.011 |
| <i>Knowledge area [Business]</i> | | | | | | |
| Enlivening | 0.449 | 0.064 | 0.570 | 0.117 | -0.121 | 0.104 |
| Social science | 0.473 | 0.134 | 0.792 | 0.196 | -0.318 | 0.158 |
| Health | 1.986 | 0.662 | 3.111 | 0.766 | -1.175 | 0.440 |
| <i>Campuses [dummies]</i> | | | | | | |
| Generational cohorts [dummies] | | | | controlled | | controlled |
| -cons | 2.740 | 0.726 | 0.141 | controlled | 2.598 | controlled |
| N | 8,948 | | | 1.210 | | 1.053 |
| chi2(68) | 1954.74 | | | | | |
| Prob > chi2 | *** | | | | | |
| Pseudo R ² | 0.2519 | | | | | |
| Log-likelihood | -54573.6 | | | | | |

Note(s): Mx means Mexican pesos; Level of statistical significance: *** $p \leq 0.001$, ** $p \leq 0.05$, * $p \leq 0.10$

Table 2.

employed (-0.290 ; $p < 0.001$) decreases for ITESM's graduates who identify ideas/opportunities. Given the nature of the graduates' occupational choice, the intensive/exploitation of skills such as the identification of ideas/opportunities will be different. A general assumption is that paid employee does not necessarily exploit the skills of identification/generation of business opportunities as part of their paid employment, except for intrapreneurs who were not considered in this study (Guerrero *et al.*, 2019a). Self-employees tend to use these skills but with lower intensity than graduates who decided to become academic entrepreneurs (Wright *et al.*, 2017). A plausible explanation is that academic entrepreneurs should exploit these skills during the identification/generation of unique technologies/knowledge that will be commercialised within a very competitive market (Guerrero and Urbano, 2014). In this vein, the acquired skill of identification of ideas/opportunities will reduce the initial graduates' filters/barriers for choosing an academic entrepreneur as an occupational alternative. Model 1 and Model 3 show that ITESM graduates who work under uncertainty are more likely to become academic entrepreneurs (0.094 ; $p < 0.100$) and self-employed (0.161 ; $p < 0.050$) than paid employees (who showed a negative signal). A paid employee is looking for economic stability and reducing uncertainty in the long-term following a routine and knowing the required effort (Arenius and Minnitti, 2005; Martiarena, 2013). Given the quality/nature of the professional activity, an academic entrepreneur should operate under uncertainty as well as investing time for achieving business/market expectations (Guerrero and Urbano, 2014). Therefore, the work effort of an academic entrepreneur should be higher than the work effort of self-employee and paid-employee (Sieger and Monsen, 2015). Besides, ITESM's graduates who possess other skills/abilities acquired during their university studies such as learning by themselves or ethics are more likely to be paid employees than academic entrepreneurs. These findings about the role of entrepreneurial university educational programmes are consistent with previous studies that recognised how skills/abilities acquired in entrepreneurship educational such as the identification of opportunities as well as working under stress will be very useful for being more tolerant to intensive work effort that is crucial for the persistence and the achievement of the expectations/demands of an academic entrepreneurship career in comparison to other occupational choices (Arenius and Minnitti, 2005; Douglas and Shepherd, 2000; Martiarena, 2013; Parker, 2004; Sieger; Monsen, 2015; Guerrero and Urbano, 2014; Guerrero *et al.*, 2018). In this vein, the results support H1 that states that graduates that tolerate intensive work effort (e.g. recognise opportunities and work under stress) are more likely to be self-employed, lower than academic entrepreneurs but higher than paid employees.

Our second assumption was that graduates who choose paid employment are less tolerant of risk than those who choose to become self-employed and academic entrepreneurs. On the one hand, all models support that graduates who received support from the ITESM's incubators are more likely to become academic entrepreneurs (1.966 ; $p < 0.001$) than self-employed (0.914 ; $p < 0.001$) and paid employees. A plausible explanation is that the complexity of academic entrepreneurship initiatives demands multiple resources, specialised knowledge and diverse contacts with agents involved in the regional entrepreneurial and innovation ecosystem (Autio *et al.*, 2014; Guerrero and Urbano, 2019a). In this vein, the support provided by entrepreneurial universities infrastructures (incubators) reduces market filters/barriers (i.e. entry barriers, innovation/technology protections) as well as financial risks across the initial stages of the entrepreneurial process (Guerrero and Urbano, 2014; Good *et al.*, 2019). Similarly, graduates who are applying their knowledge gained in their bachelor's programme to their occupation are more likely to become academic entrepreneurs (0.113 ; $p < 0.001$) but not self-employed (-0.115 ; $p < 0.050$). It mainly happens when the graduates are from science, technology, engineering and mathematics (STEM) fields, facilitating the generation of entrepreneurial innovations (Blume-Kohout, 2014; Guerrero and Urbano, 2017). Similar to the phenomenon of corporate entrepreneurship, the entrepreneurial

university incubator acts like an umbrella where graduates have access to unique resources, university capabilities and networks that transform their academic entrepreneurs' behaviours, risks, perceptions and expectations (Aaboen, 2009; Barbero *et al.*, 2014; Ebbbers, 2014; McAdam and McAdam, 2008; Rothaermel and Thursby, 2005a, b). In this vein, the results support our H2 that states that graduates that tolerate risk (e.g. supported by university incubator) are more likely to be self-employed, lower than academic entrepreneurs but higher than paid employees.

4.3 Influence of the ITESM' graduates motivations on their career choices

Concerning the influence of graduates' motivations, we explored how the motivation for being independent, as well as the income expectations, influenced their occupational decision. First, based on prior experience, we explored the *level of independence* associated with their prior occupational choices. The results show that graduates who have prior entrepreneurial experience are less likely to become paid employees (-3.399 ; $p < 0.001$) and self-employed (-2.750 ; $p < 0.001$). By analysing academic entrepreneurs and self-employed profiles, it is essential to understand that self-employed individuals try to do everything themselves for security, while academic entrepreneurs know that they cannot do or control everything, and therefore they delegate responsibilities. However, those profiles could have a similar level of independence because both are their bosses (Ilouga *et al.*, 2014; Sieger; Monsen, 2015; Guerrero *et al.*, 2019a). Our findings are aligned to extant studies that showed the preferences of occupational decision-making based on the degree of independence/autonomy (Douglas and Shepherd, 2000, 2002; Shane *et al.*, 2003; Segal *et al.*, 2005; Ilouga *et al.*, 2014; Sieger; Monsen, 2015). These insights are also linked to higher tolerance to risk, work effort and higher-income expectations (Levesque *et al.*, 2002). ITESM's graduates with prior experience such as paid employees in public or private organisations are more likely to continue being paid employees than academic entrepreneurs (3.659 ; $p < 0.001$) but they are open to become self-employed (-1.257 ; $p < 0.050$). In this vein, results support our H3 that states that graduates oriented to have levels of independence (e.g. who experimented prior entrepreneurial experience) are more likely to be self-employed and academic entrepreneurs than paid employees. Second, considering the *graduates' income expectations*, that as reference the lower category of income that is lower than 10,000 Mexican pesos, our results show that paid employees prefer to receive a salary than become an academic entrepreneur or self-employed. These results confirm the premise of the expectancy theory where individuals' expectations are based on the perceived value of their achievements, of the particular level of performance and the attractiveness of the reward (Gatewood *et al.*, 2002; Guerrero *et al.*, 2018). Consequently, ITESM's graduates are seeking to maximise their utility from their work choices. In this vein, the results support our H4 that states that graduate' academic entrepreneurs are more likely to demand higher income, lower than self-employed but higher than paid employees. Finally, our models evidence the vital role of gender, knowledge areas and campuses (Carter *et al.*, 2003; Davidsson; Honig, 2003; Douglas and Shepherd, 2002; Heriot and Simpson, 2007; Levesque *et al.*, 2002; Guerrero *et al.*, 2018).

5. Conclusions

5.1 General conclusions and contributions

The objective of this paper was to provide insights into how the graduates' career choices (i.e. academic entrepreneur, self-employed or paid employed) are influenced by the entrepreneurial university ecosystem (i.e. incubators and entrepreneurship education programs). Conducting an exploratory study, we developed hypotheses about the effects

of entrepreneurial university educational programmes (H1), the entrepreneurial university business incubators (H2) and the individual motivations (H3 and H4) on the graduates' career choice (i.e. academic entrepreneur, self-employed or paid employed) determinants. By adopting Douglas and Shepherd's utility-maximising function in a sample of 11,512 graduates from a Mexican and private entrepreneurial university (ITESM), Table 3 summarises the tested hypotheses. In this regard, this paper contributes to at least three contributions to the ongoing academic debate.

The first contribution relates to the effects of entrepreneurial university ecosystem on the graduates' career choices. Our results showed the role of educational programmes on the acquisition of specific skills/abilities (i.e. the identification of business opportunities and work under uncertainties) that are essential for achieving the highest level of work effort tolerance required to becoming an academic entrepreneur. In this regard, these results provide particular insights about the effectiveness of educational programmes on entrepreneurial action of graduates from an entrepreneurial university. A research gap highlighted in the academic discussion on entrepreneurial education literature has been the concentration of investigations about the effect of entrepreneurial education on students' intentions instead of graduates' entrepreneurial actions (Nabi *et al.*, 2017; Guerrero *et al.*, 2018; Guerrero and Urbano, 2019a). Our results showed insights on how the entrepreneurial university infrastructure (business incubators) reinforced the risk tolerance during the graduates' career decisions. In this vein, the result contributes to the academic discussion on the emergence of university technology transfer ecosystem which fosters students'/graduates' academic entrepreneurship (Herrera *et al.*, 2018; Wright *et al.*, 2017; Good *et al.*, 2019). Therefore, these entrepreneurial university conditions are needed to establish an academic entrepreneurship spirit across graduates communities, as well as reducing failure at micro-level of academic entrepreneurship.

The second contribution relates to the role of micro-environmental conditions (entrepreneurial university ecosystem) on individuals' occupational choices models. Although our findings have been obtained from a sample of alumni from one entrepreneurial university, our insights contribute to the academic discussion on how micro-environmental conditions are constraints of individuals' occupational decisions. These insights are crucial, following two reflections. On the one hand, the extant studies have primarily explored the macro-economic and demographic conditions with an unrepresentative discussion on individual motivations (Douglas and Shepherd, 2000 and 2002; Martiarena, 2013) and micro-environmental conditions (Ilougaet *et al.*, 2014; Sieger; Monsen, 2015). On the other hand, the current worldwide socio-economic events demand evidence about the contribution of entrepreneurial universities into the societal problems (Al-Dajani *et al.*, 2014; Guerrero *et al.*, 2015, 2016b; Klofsten *et al.*, 2019; Guerrero and Urbano, 2019a, 2019b).

The third contribution relates to academic entrepreneurship literature. Our findings show how a supportive entrepreneurial university ecosystem and individuals' motivations

| Main focus | Utility-maximising determinant | Measure | H | Empirically (tested) |
|--------------------------------------|--------------------------------|--|----|----------------------|
| Entrepreneurial University Ecosystem | Work effort | Skills/Capabilities via entrepreneurial educational programs | H1 | Supported |
| | Risk aversion | Incubation support via university business incubator | H2 | Supported |
| Individual motivations | Independence | Prior experience | H3 | Supported |
| | Expectative | Income | H4 | Supported |

Table 3.
Testing hypotheses

(independence and income aspirations) determine the involvement of graduates on academic entrepreneurship. In the light of knowledge spillover of entrepreneurship approaches, these levels of analysis have been part of the ongoing academic discussion about the elements that reduce academic entrepreneurs' filters/barriers (Guerrero and Urbano, 2014). However, there are still gaps regarding the direct/moderation/mediation effect of multiple contexts on academic entrepreneurship (Autio *et al.*, 2014; Herrera *et al.*, 2018; Good *et al.*, 2019). Besides, there is the academic debate about the strategic management of entrepreneurial universities (Guerrero *et al.*, 2019b; Secundo *et al.*, 2019).

5.2 Limitations and research agenda

5.2.1 *We acknowledge that this study has several limitations:* First, similar to previous studies, the critical challenge is the access to longitudinal information (i.e. Douglas and Shepherd, 2002 used a sample of 300 graduates of one university between two to ten years after graduation from the business degree). In this study, we explored the occupational patterns of different graduates (from diverse bachelor's degrees) of a multi-campus entrepreneurial university located in diverse regions of Mexico. Although our insights are only applicable within our research setting, this paper should explore in detail the influence on graduates' occupational decisions of diversity in terms of multiple generational cohorts (Guerrero *et al.*, 2019a) and multiple regional contexts (Guerrero and Urbano, 2019a). Each generation has particularities in terms of their backgrounds, skills and attitudes that should be revised, as well as each university's campus has particularities in terms of leadership, resources/capabilities, regional regulations and cultural backgrounds towards academic entrepreneurship.

Second, although our proxies have been used in extant studies, it is essential to explore new dimensions to measure the graduates' determinants of academic entrepreneurship. Given the nature of the data set, we applied multinomial regression analysis. The complexity behind the determinants of graduates' occupational choices demands the use of robust variables and longitudinal data sets to understand this phenomenon (Guerrero *et al.*, 2018) as well as the dynamism of the ecosystems' life cycle (Cantner *et al.*, 2020). It also implies the improvement of the statistical analysis by implementing other techniques (i.e. panel data, structural equation modelling, experiments) as well as complementing the utility-maximising model with other theoretical frameworks (e.g. institutional economic theory, stakeholder theory, generational cohorts approach, spillover theory).

Third, we intuitively captured the effectiveness of micro-level conditions at an entrepreneurial university. We are assuming the same value-added of the entrepreneurial university ecosystem for all graduates across all campuses (Peters *et al.*, 2004; Guerrero *et al.*, 2018). However, given the limitations of our data set, we did not test the effectiveness and the success of entrepreneurship education programmes and business incubators. A natural extension of this study should measure the effectiveness and success/failure at micro-level of academic entrepreneurship. It implies a mixed longitudinal approach that allows capturing objective as well as subjective measures for a better understanding of this phenomenon. It is also aligned with the academic debate about the lack of studies concerning strategic knowledge management models for entrepreneurial universities (Guerrero *et al.*, 2019b and Secundo *et al.*, 2019), as well as understanding the technological, economic and societal contribution of entrepreneurial ecosystems (Audretsch *et al.*, 2019).

Fourth, our findings explored how the university has configured its entrepreneurship ecosystem for supporting academic entrepreneurship. However, this study does not explore the influence/impacts generated by regional entrepreneurial ecosystems on the university ecosystem (Audretsch *et al.*, 2019; Cantner *et al.*, 2020). A future research avenue will be focused on exploring the contribution of regional entrepreneurship ecosystems to university's infrastructures like incubators (Nicholls-Nixon *et al.*, 2020; van Rijnsoever, 2020). It requires a multilevel analysis using both university and regional data.

5.3 Implications

5.3.1 *This study also provides some implications.* For the ITESM's students and graduates, this study shows how multiple generations have been benefitted by an adequate environment for entrepreneurship and innovation. The educational programmes and the university ecosystem have contributed to the highest levels of employment after graduation. Also, the recognition of the positive influence of the university culture and infrastructures may attract more students across the globe.

For the ITESM's managers, this study exhibits good practices and legitimises the role of the university in fostering academic entrepreneurship. At the same time, the study also shows the necessity to exploit further the unique resources and capabilities of the university (e.g. the dynamic capabilities distributed across the 31 campuses across Mexico and Latin America). Therefore, a strategic management reflection is needed to reinforce local/regional networks in order to extend the impact of the university entrepreneurial and innovation ecosystem across the trajectory of academic entrepreneurship initiatives. Therefore, the implementation of strategic knowledge management models and tools for measuring the impact of entrepreneurial universities ecosystem is also required by the ITESM.

For multiple agents enrolled in the local/regional entrepreneurial and innovation ecosystem, this study shows how a multi-campus university could have an impact at the regional/country level. On the one hand, the multiple agents could increase their collaboration with the ITESM supporting diverse types of entrepreneurial initiatives. On the other hand, the co-creation of strategies and actions among them allow the reinforcement of local entrepreneurial and innovation ecosystems. Both implications are relevant considering the institutional voids produced by the lack of quality institutions as in any emerging economies.

For Latin American decision-makers, despite the generalisable restrictions, the ITESM's model may be a strategic management example of how multi-campus entrepreneurial universities are configuring a supportive entrepreneurial and innovative ecosystem. This study may apply to the benchmarking analysis by universities interested in exploring similar strategies in emerging economies with comparable characteristics. Consequently, our findings also legitimise the contribution of Latin American universities and graduate students as part of regional entrepreneurship ecosystems. This legitimisation is linked to positioning Latin American universities in the international scope.

Notes

1. Douglas and Shepherd (2000 and 2002) model the individual's choice of career path out to the individual's time horizon by defining a career path as one or more jobs over that same planning period. Thus, they state: $U_{ij} = F(Y_{ij}, W_{ij}, R_{ij}, I_{ij}, O_{ij})$ where U_{ij} represents the utility anticipated in the i th period from the j th job; Y_{ij} represents the income anticipated in the i th period from the j th job; W_{ij} represents the work effort anticipated in the i th period from the j th job; R_{ij} represents the risk anticipated in the i th period from the j th job; I_{ij} represents the independence anticipated in the i th period from the j th job; O_{ij} represents the net perquisites anticipated in the i th period from the j th job; $i = 1, 2, 3, \dots, n$ represents the different periods out to the time horizon (n), and $j = 1, 2, 3, \dots, m$ represents the different jobs available in any period.
2. The criteria used in extant studies (Audretsch and Lehmann, 2005; Clark, 1998; Di Gregorio and Shane, 2003; Guerrero and Urbano 2012, 2019; Guerrero *et al.*, 2015; O'Shea *et al.*, 2008; Shane, 2004; Wright *et al.*, 2007) to identify entrepreneurial universities consider: (i) the promotion of an entrepreneurial culture across the university community, (ii) making self-instituting efforts to develop an entrepreneurial ecosystem and fostering innovative/entrepreneurial initiatives, (iii) socio-economic impact on the regions/countries, (iv) continued and sustained transformation process and (v) involvement of several socioeconomic actors in the decisions, activities and objectives.
3. Aguascalientes, Central de Veracruz, Chiapas, Chihuahua, Ciudad de México, Ciudad Juárez, Ciudad Obregón, Cuernavaca, Estado de México, Guadalajara, Hidalgo, Irapuato, Laguna, León, Mazatlán,

4. Biotechnology and food, social sciences, regional development, social development, sustainable development, education, entrepreneurship, government, humanities, manufacturing and design, mechatronics, nanotechnology, business, health and information and communications technologies.
5. Douglas and Shepherd (2002) used a sample of 300 graduates from one university between two to ten years after graduation from business degree. They conducted a survey, and the response rate was around 31%. In addition, Guerrero *et al.* (2018) used an alumni survey from diverse generational cohorts.
6. For confidential agreement reason, we are not able to include a copy of the questionnaire.

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About the authors

Maribel Guerrero is Professor of Entrepreneurship at the School of Business and Economics (Universidad del Desarrollo, Chile) and the Newcastle Business School (Northumbria University, UK). Her research interests are related to entrepreneurial activities inside public (entrepreneurial universities) and private organisations (corporate entrepreneurship), their socio-economic impacts, as well as the configuration of entrepreneurship/innovation ecosystems. She participates in international research projects (e.g. the Global Entrepreneurship Monitor, Panel Studies of Entrepreneurial Dynamics, HEInnovate initiative, and Global University Entrepreneurial Spirit Students' Survey). Maribel Guerrero is the corresponding author and can be contacted at: maribel.guerrero@northumbria.ac.uk

David Urbano is Professor of Entrepreneurship at the Department of Business, Deputy Director at the Centre for Entrepreneurship and Social Innovation Research (Universitat Autònoma de Barcelona) and ICREA-Academia Research Fellow. His research focuses on the analysis of factors affecting entrepreneurship in different contexts, using institutional economics as a theoretical framework, and combining quantitative and qualitative methodologies. He participates in several international research projects (e.g. GEM, PSED, GUESS) and also regularly visits Haas School of Business (University of California, Berkeley).

Eduardo Gajón is the Academic Director of the Business School of the Tecnológico de Monterrey (ITESM- Campus La Laguna, Mexico). He holds a PhD degree from the Department of Business in the Universitat Autònoma de Barcelona (UAB-Spain). His research interest is focused on entrepreneurial universities.

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