TESIS DOCTORAL

IMPACTOS DE UN ECOSISTEMA EMPRENDEDOR UNIVERSITARIO EN EL COMPORTAMIENTO DE SUS EGRESADOS EN UNA ECONOMÍA EMERGENTE

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DOCTORAL DISSERTATION

IMPACTS OF UNIVERSITY ENTREPRENEURSHIP ECOSYSTEM ON GRADUATES' BEHAVIOR IN EMERGING ECONOMIES

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ABSTRACT

Universities have become one of the main actors that train and develop future entrepreneurs. This phenomenon has caused entrepreneurship education to grow exponentially, as has been expressed in new methodologies, courses, academic programs, and the development of inner entrepreneurial ecosystems comprised of activities, infrastructure, and collaboration networks. Although the literature on entrepreneurship ecosystems continues to expand, scholars still need to hold conceptual and empirical discussions about re-thinking the configuration of university entrepreneurship ecosystems in emerging economies to impact the university community.

Inspired by this re-thinking opportunity, this doctoral dissertation's general objective was to explore the configuration and the impacts of university entrepreneurship ecosystems in the context of emerging economies. The three specific objectives of this doctoral dissertation were as follows: (a) to propose a theoretical model for understanding the configuration of university entrepreneurship ecosystems in the context of emerging economies (SO1), (b) to explore the influence of university entrepreneurship ecosystems on graduates' behaviors in emerging economies (SO2), and (c) to explore the impacts generated by entrepreneurial graduates due to the university entrepreneurship ecosystem in emerging economies (SO3).

This doctoral dissertation contributed to the entrepreneurship field by analyzing the extant literature, proposing a conceptual model to understand this phenomenon, and testing that model in an emerging economy setting. By analyzing a follow-up survey, it provided insights into a university entrepreneurial ecosystem's influence on graduates' behavior and its direct/indirect impacts on several social dimensions. Based on our findings, we made a

significant implication to university managers and policymakers by providing relevant information for future strategies to increase entrepreneurial ecosystems' performance and impact.

RESUMEN

Las universidades se han convertido en uno de los principales actores en la formación y desarrollo de los futuros emprendedores. Este fenómeno ha gatillado el crecimiento exponencial de la educación pata el emprendimiento lo que se expresa en nuevas metodologías, cursos, programas académicos y el desarrollo de ecosistemas emprendedores compuestos por actividades, infraestructuras y redes de colaboración. Si bien la literatura sobre ecosistemas de emprendimiento continúa ampliándose, repensar cómo los ecosistemas de emprendimiento universitario en economías emergentes se configuran para generar múltiples impactos en la comunidad universitaria aún demanda una mayor discusión conceptual y empírica.

Motivado por esta oportunidad, el objetivo general de esta tesis doctoral es explorar la configuración y los impactos de los ecosistemas de emprendimiento universitario en el contexto de las economías emergentes. Los tres objetivos específicos de esta tesis doctoral son: (a) proponer un modelo teórico que permita comprender la configuración de los ecosistemas de emprendimiento universitario en el contexto de una economía emergente (OE1); (b) explorar la influencia que generan los ecosistemas de emprendimiento universitario en el comportamiento de los egresados en economías emergentes (SO2), y (c) explorar los impactos generados por los egresados emprendedores que surgieron de un ecosistema de emprendimiento universitario en una economía emergente (SO3).

Esta tesis doctoral contribuirá al campo del emprendimiento a través de un análisis de la literatura existente y la propuesta de un modelo conceptual que ayude a comprender este fenómeno y probarlo en un entorno de economía emergente. Al analizar una encuesta de

seguimiento, proporcionaremos información sobre la influencia en el comportamiento de los graduados de un ecosistema emprendedor universitario y sus impactos directos/indirectos en varias dimensiones sociales. Con base en nuestros hallazgos, buscamos tener una implicación significativa para los administradores universitarios y los formuladores de políticas al proporcionar información relevante para futuras estrategias que aumenten el desempeño e impacto de los ecosistemas emprendedores.

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CHAPTER 1: INTRODUCTION

1.1 Problem statement

Entrepreneurship is a driver for development, growth, and competitiveness (Audretsch, Keilbach & Lehmann, 2006). In emergent economies, public and private actors' aspiration to build an entrepreneurial society has motivated them to design and implement policies that promote entrepreneurship and innovation (Audretsch, 2014; Stam, 2015). Among the most relevant actors are universities, which have become entrepreneurial themselves (Budyldina, 2018). Indeed, they have become active drivers for socio-economic growth via commercialized knowledge (e.g., patents, licenses, and agreements), human capital (e.g., qualified research scientists, talent), entrepreneurial initiatives (e.g., start-ups, spinoffs), and collaborative initiatives with local, regional, and international agents (Guerrero, Cunningham, & Urbano, 2015).

Several scholars have expressed this new strategic focus by generating appropriate environments for entrepreneurship through different programs and infrastructures (e.g., technology transfer offices, incubators, educational programs) for the academic community (e.g., students, graduates, alumni, academics, staff; Wright, Siegel & Mustar, 2017; Fini, Rasmussen, Siegel, & Wiklund, 2018). It also explains why entrepreneurship ecosystems have become a popular topic of discussion and a promising research area for scholars and policymakers (Autio, Kenney, Mustar, Siegel & Wright, 2014; Graham, 2014; Siegel & Wright, 2015; Guerrero & Urbano, 2017). However, universities' contribution to socio-economic development is not the only reasons they have embraced entrepreneurship.

A growing social valuation toward entrepreneurship has also increased individuals' and organizations' demand for entrepreneurial skills (Urbano, Aparicio, Guerrero, Noguera, & Torrent-Sellens, 2017; Bolton & Lane, 2012).

Universities have been encouraged to develop new learning models by aligning new generations' desires and employers' requirements, focusing not only on the traditional *classroom-centered process* but also beyond what some scholars define as *experiential learning* (Dhliwayo, 2008; Welsh & Dragusin, 2013). This process has generated two effects in the university context. The first is an exponential growth of entrepreneurship education (EE), expressed in a higher offer of entrepreneurship courses and new teaching methodologies (Rideout & Gray, 2013). The second is the generation and expansion of university entrepreneurship ecosystems, with EE as its central pillar (Belitski & Heron, 2017). A university's entrepreneurial ecosystem (UEE) could represent an advantage compared to isolated models based solely on courses (Daniel, Medlin, Connor, Statsenko, Vnuk & Hancock, 2018) due to the more solid and rich networks generated between different participating actors.

A traditional EE model (i.e., course centric) has overshadowed the potential of a systemic approach where not only courses but other university infrastructures (e.g., incubators, clubs, role models, mentors) could impact students' entrepreneurial intentions and behavior (Costa, Santos, Wach, & Caetano, 2018; Wright et al., 2017; Xiao & North, 2017). However, despite the growing interest in EE and UEE, related literature in both topics remains underdeveloped. A stronger conceptual and empirical discussion is therefore necessary (Belitski & Heron, 2017; Wright et al., 2017), especially in the context of emergent economies. For instance, several studies have, on the one hand, adopted a narrow view by focusing on describing UEE's elements while ignoring its impacts on graduates (Wright et al., 2017; Guerrero, Urbano, Cunningham & Gajon, 2018), academics (Hayter, Lubynsky & Maroulis, 2017; Fini

et al., 2018), and regional development (Guerrero et al., 2016). On the other hand, several concerns have been raised about the link between EE and UEE's outcomes. Such concerns stem from the unbalanced focus on short-term results; subjective measures (i.e., intentions and attitudes) rather than objective ones like venture´s creation, growth, and student ventures performance (i.e., quality of venture´s creation); and the methodological eclecticism present in entrepreneurship programs. This has resulted in contradictory conclusions about the effects of EE (Meyer, 2011; Nabi, Liñán, Fayolle, Krueger, & Walmsley, 2016).

Although the literature on entrepreneurship ecosystems continues to expand (Acs, Stam, Audretsch, & O'Connor, 2017), re-thinking the configuration of university entrepreneurship ecosystems in emerging economies to generate multiple impacts on the university community still demands conceptual and empirical discussion (Guerrero & Urbano, 2019a).

1.2 Research objectives

Inspired by this re-thinking opportunity, this doctoral dissertation's general objective is to explore the configuration and impacts of university entrepreneurship ecosystems in the context of emerging economies. Thus, the specific objectives of this doctoral dissertation are as follows:

SO1: To propose a theoretical model that allows understanding of the configuration of university entrepreneurship ecosystems in the context of emerging economies.

SO2: To explore the influence generated by university entrepreneurship ecosystems on graduates' entrepreneurial behaviors in emerging economies.

SO3: To explore the sustainable impacts generated in emerging economies by entrepreneurial individuals participating in a university entrepreneurship ecosystem.

1.3 Contributions and implications

This study contributes empirically to three academic debates:

First, regarding the entrepreneurship ecosystem literature, the SO1 contributes to the discussion of how environmental conditions determine the university entrepreneurship ecosystem's configuration (Acs et al., 2017; Wright et al., 2017; Guerrero & Urbano, 2019a) in emerging economies. We provide insights into how entrepreneurial universities are reducing institutional voids through core activities and by configuring favorable conditions toward entrepreneurship (Guerrero & Urbano, 2017). After analyzing the literature review, we proposed a conceptual model for understanding this phenomenon before testing it in an emerging economy setting.

Second, regarding the university entrepreneurship literature, the SO2 contributes to the discussion of the types of impacts generated by university entrepreneurship ecosystems in emerging economies, especially considering that few studies have explored the outcomes/impacts generated by university entrepreneurship ecosystems (Guerrero et al., 2015; Fini et al., 2018; Guerrero & Urbano, 2019a). We assumed that the most effective pillar in the ecosystem was entrepreneurship education (Guerrero & Urbano, 2017). Therefore, our general assumption was a significant relationship between entrepreneurship education (within a university ecosystem) on students' entrepreneurial behaviors after graduating (Nabi et al., 2016). Analyzing a longitudinal dataset enabled us to provide insights about the

influence on graduates' entrepreneurship education behaviors and other elements of the university entrepreneurial ecosystem.

The third academic debate this study contributes to regards the effectiveness of entrepreneurship support. Specifically, the SO3 contributes to discussions of the efficacy of university entrepreneurship ecosystems in emerging economies. There is little evidence of the effectiveness of entrepreneurship support mechanisms/programs in new venture creation (quality and performance), especially on the effects and impacts those new endeavors have on sustainable development and economic growth (Guerrero & Urbano, 2019a, 2019b). Using a follow-up survey, we provided insights into the effects of a university entrepreneurial ecosystem on the number and quality of new ventures created by alumni over time as well as the direct/indirect impacts of those ventures.

Finally, our findings contributed to university managers and policymakers, providing information relevant to future strategies for increasing the performance and impact of entrepreneurial ecosystems.

1.4 Structure of the doctoral dissertation

In line with the specific objectives, Figure 1 shows the proposed structure of this doctoral dissertation.

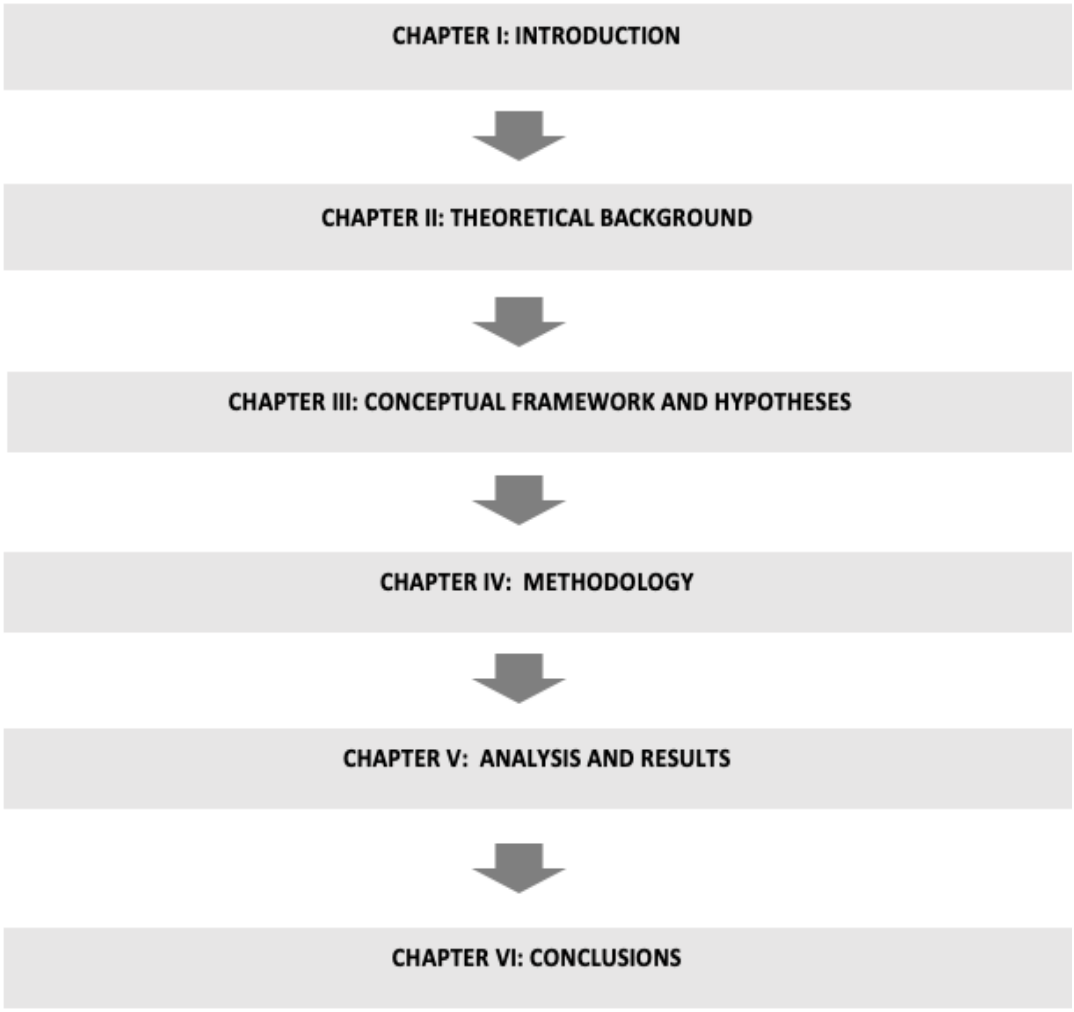


Figure 1: Doctoral Dissertation structure

Source: Author

CAPÍTULO 1: INTRODUCCIÓN

1.1 Problema de Investigación

El espíritu emprendedor es un motor para el desarrollo, el crecimiento y la competitividad (Audretsch, Keilbach & Lehmann, 2006). En las economías emergentes, la aspiración de construir una sociedad emprendedora ha motivado a los actores públicos y privados a diseñar e implementar políticas para promover el emprendimiento y la innovación (Audretsch, 2014; Stam, 2015). Entre los actores más relevantes se encuentran las universidades, que también se han vuelto emprendedoras (Budyldina, 2018), convirtiéndose en un motor activo del crecimiento socioeconómico a través de la comercialización del conocimiento (p. ej., patentes, licencias y acuerdos), capital humano (p. ej., investigación cualificada). científicos, talento), iniciativas emprendedoras (eg, start-ups, spin-offs) e iniciativas colaborativas con agentes locales, regionales e internacionales (Guerrero, Cunningham, & Urbano, 2015).

Este nuevo enfoque estratégico se ha expresado en la generación de ambientes apropiados para el emprendimiento a través de diferentes programas e infraestructuras (por ejemplo, oficinas de transferencia de tecnología, incubadoras, programas educativos) para la comunidad académica (es decir, estudiantes, egresados, egresados, académicos, personal) (Wright, Siegel & Mustar, 2017; Fini, Rasmussen, Siegel, & Wiklund, 2018), y explica por qué los ecosistemas de emprendimiento se han convertido en un tema popular de discusión y un área de investigación prometedora para académicos y formuladores de políticas (Autio, Kenney, Mustar, Siegel & Wright, 2014; Graham, 2014; Siegel & Wright, 2015; Guerrero & Urbano, 2017). Sin embargo, la contribución de las universidades al desarrollo socioeconómico no es el único factor que explica por qué han adoptado el espíritu empresarial.

Una creciente valoración social hacia el emprendimiento también ha aumentado la demanda de habilidades emprendedoras por parte de individuos y organizaciones (Urbano, Aparicio, Guerrero, Noguera, & Torrent-Sellens, 2017) (Bolton & Lane, 2012). Al alinear los deseos de las nuevas generaciones y los requisitos de los empleadores, se ha alentado a las universidades a desarrollar nuevos modelos de aprendizaje, centrándose no solo en el proceso tradicional centrado en el aula, sino también más allá de lo que algunos académicos definen como aprendizaje experiencial (Dhliwayo, 2008; Welsh & Dragusin, 2013). Este proceso ha generado dos efectos en el contexto universitario: primero, el crecimiento exponencial de la educación para el emprendimiento (EE), expresado en una mayor oferta de cursos de emprendimiento y nuevas metodologías de enseñanza (Rideout & Gray, 2013), y segundo, la generación y expansión de los ecosistemas de emprendimiento universitario, siendo la EE su pilar central (Belitski & Heron, 2017). El ecosistema emprendedor de una universidad (UEE) representa una ventaja frente a modelos aislados basados únicamente en cursos (Daniel, Medlin, Connor, Statsenko, Vnuk & Hancock, 2018) debido a las redes más sólidas y ricas que se generan entre los diferentes actores que participan en este. Un modelo de EE tradicional (es decir, centrado en el curso) ha eclipsado el potencial detrás de un enfoque sistémico en el que no solo los cursos, sino también otras infraestructuras universitarias (por ejemplo, incubadoras, clubes, modelos a seguir, mentores) podrían tener un impacto en las intenciones y el comportamiento empresarial de los estudiantes (Costa, Santos, Wach y Caetano, 2018; Wright et al., 2017; Xiao y North, 2017). Sin embargo, a pesar del creciente interés en EE y UEE, la literatura relacionada con ambos temas aún es muy temprana y necesita una discusión conceptual y empírica más sólida (Belitski & Heron, 2017; Wright et al., 2017), especialmente en el contexto de las economías emergentes. . Por ejemplo, varios estudios han adoptado una visión estrecha al describir principalmente los elementos de la

UEE pero ignorando sus impactos en los graduados (Wright et al., 2017; Guerrero, Urbano, Cunningham & Gajon, 2018), académicos (Hayter, Lubynsky & Maroulis, 2017; Fini et al., 2018), y desarrollo regional (Guerrero et al., 2016). Por otro lado, se han planteado varias preocupaciones sobre el vínculo entre EE y los resultados de UEE dado el enfoque desequilibrado en los resultados a corto plazo, las medidas subjetivas (es decir, las intenciones y actitudes) en lugar de las objetivas (es decir, la creación y el crecimiento de empresas), y el eclecticismo metodológico presente en los programas de emprendimiento, resultando en conclusiones contradictorias sobre los efectos de la EE (Meyer, 2011; Nabi, Liñán, Fayolle, Krueger, & Walmsley, 2016).

Si bien la literatura sobre ecosistemas de emprendimiento continúa ampliándose (Acs, Stam, Audretsch, & O'Connor, 2017), repensar cómo los ecosistemas de emprendimiento universitario en economías emergentes se configuran para generar múltiples impactos en la comunidad universitaria aún requiere una discusión conceptual y empírica. (Guerrero y Urbano, 2019a).

1.2 Objetivos de la Investigación

Inspirado en esta oportunidad de repensar, el objetivo general de esta tesis doctoral es explorar la configuración y los impactos de los ecosistemas de emprendimiento universitario en el contexto de las economías emergentes. Así, los objetivos específicos de esta tesis doctoral son los siguientes:

OE1: Proponer un modelo teórico que permita comprender la configuración de los ecosistemas de emprendimiento universitario en el contexto de las economías emergentes.

OE2: Explorar la influencia que generan los ecosistemas de emprendimiento universitario en los comportamientos emprendedores de los egresados en economías emergentes.

OE3: Explorar los impactos sostenibles generados en economías emergentes por individuos emprendedores que participan en un ecosistema de emprendimiento universitario.

1.3 Contribuciones e Implicaciones

Este estudio contribuirá empíricamente a tres debates académicos:

Primero, con respecto a la literatura del ecosistema de emprendimiento, el SO1 contribuye a la discusión sobre cómo las condiciones ambientales determinan la configuración del ecosistema de emprendimiento universitario (ACS et al., 2017; Wright et al., 2017; Guerrero & Urbano, 2019a) en economías emergentes. Brindamos información sobre cómo las universidades emprendedoras están reduciendo los vacíos institucionales a través de sus actividades centrales y la configuración de condiciones favorables para el emprendimiento (Guerrero & Urbano, 2017). Al analizar la revisión de la literatura, propondremos un modelo conceptual para comprender este fenómeno, que luego se analizará en un entorno de economía emergente.

En segundo lugar, en cuanto a la literatura sobre emprendimiento universitario, el SO2 contribuye a la discusión sobre qué tipo de impactos generan los ecosistemas de emprendimiento universitario en economías emergentes, especialmente considerando que muy pocos estudios han explorado los resultados/impactos generados por los ecosistemas de emprendimiento universitario (Guerrero et al. ., 2015; Fini et al., 2018; Guerrero & Urbano, 2019a). Suponemos que el pilar más efectivo en el ecosistema será la educación empresarial (Guerrero y Urbano, 2017). Por lo tanto, nuestro supuesto general es la relación significativa entre la educación emprendedora (dentro de un ecosistema universitario) y los comportamientos emprendedores de los estudiantes después de graduarse (Nabi et al., 2016). Al analizar un conjunto de datos longitudinales, proporcionaremos información sobre la influencia de la educación empresarial y otros elementos del ecosistema empresarial universitario en los comportamientos de los graduados.

En tercer lugar, en cuanto a la eficacia del apoyo al emprendimiento, el SO3 contribuye a la discusión sobre la eficacia de los ecosistemas universitarios de emprendimiento en economías emergentes. Hay poca evidencia sobre la efectividad de los mecanismos / programas de apoyo empresarial en la creación de nuevas empresas (calidad y rendimiento), especialmente en los efectos y el impacto de aquellos nuevos esfuerzos sobre desarrollo sostenible y crecimiento económico (Guerrero y Urbano, 2019A, 2019b). Mediante una encuesta de seguimiento, proporcionaremos información sobre los efectos de un ecosistema empresarial universitario sobre el número y la calidad de las nuevas empresas creadas por los exalumnos en el tiempo y también los impactos directos / indirectos de esas empresas.

Finalmente, con base en nuestros hallazgos, pretendemos contribuir a los administradores universitarios y hacedores de políticas, brindando información relevante para futuras estrategias para aumentar el desempeño y el impacto de los ecosistemas emprendedores.

1.4 Estructura de la Investigación

En línea con los objetivos específicos, la figura 1 muestra la estructura propuesta para esta tesis doctoral.

Figure 2: Estructura de la tesis Doctoral

Source: Autor

CHAPTER 2: THEORETICAL BACKGROUND

2.1 Entrepreneurial universities

During the last 20 years and especially since Clark published his 1998 book *Creating Entrepreneurial Universitie*s, research on the phenomena of entrepreneurial universities has increased significantly (Etzkowitz, 2003; Woollard, Zhang, & Jones, 2007; Cunningham & Link, 2015; Guerrero & Urbano, 2019a, p.14). Entrepreneurial universities foster a university community's capacity to become entrepreneurs, as well as identify the factors that make it possible to "act" in a more entrepreneurial way. In so doing, they develop the institutional abilities to innovate, recognize, create opportunities, work in teams, take risks, and respond to challenges (Guerrero, Liñán, Toledano, Urbano, 2010, p.591).

From this perspective, an entrepreneurial university contributes not only by providing marketable knowledge and qualified research scientists but also by generating new ventures, creating jobs, and collaborating with relevant local and international stakeholders (Guerrero et al., 2015, p.749). Though the concept of the entrepreneurial university is not the focus of this research, it helps to contextualize the strong relation between institutions and the generation of entrepreneurial ecosystems within them (Hayter, 2016; Acs et al., 2017; Miller & Acs, 2017; Guerrero et al., 2018).

2.2 University entrepreneurship ecosystem

An ecosystem (ecological system) comprises a biotic community, its physical environment, and all the interactions possible in the complex of living and non-living components (Tansley, 1935). Moore (1993) adopted this concept in social science to legitimize the contribution of relationships/interaction among suppliers, investors, and customers during the development of business activities. Later, Isenberg (2010) introduced this terminology to

non-academic entrepreneurship audiences. Though there is no unique definition of an entrepreneurship ecosystem, prior studies have shown conceptual agreements on elements such as the interdependent relationships between different entrepreneurial actors and their focus on using collaboration to support entrepreneurial activities (Acs et al., 2017; Brown & Mason, 2017). According to Mason and Brown (2014, p.5), an entrepreneurial ecosystem is understood as

> a set of interconnected entrepreneurial actors (potential and existing), entrepreneurial organizations (firms, venture capitalists, business angels, banks), institutions (universities, public sector agencies, financial bodies) and entrepreneurial processes (the business birth rate, numbers of high growth firms, levels of 'blockbuster entrepreneurship', number of serial entrepreneurs, degree of sell-out mentality within firms and levels of entrepreneurial ambition) which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment.

In an educational context, the university entrepreneurship ecosystem (UEE; Graham, 2014; Hayter, 2016) has become a promising research area in the entrepreneurship field (Fuster, Padilla-Meléndez, Lockett & del-Águila-Obra, 2019). This has mainly been triggered by university managers and scholars' growing interest in understanding the most favorable conditions for promoting entrepreneurship. According to Guerrero & Urbano (2019a, p.5), a university entrepreneurial ecosystem (UEE) is understood as

> a system comprised of resources and capabilities for developing the core activities (teaching, research, and knowledge transfer) that were designed to support an all-around experience, knowledge, skills, and favorable conditions towards entrepreneurship.

Several support mechanisms are present within a university entrepreneurship ecosystem. The main and most common element of every ecosystem is entrepreneurship education, meaning mandatory or elective courses designed to develop entrepreneurial skills. The degree of development of other mechanisms relates to factors such as the level of institutional commitment to entrepreneurship, the presence or lack of resources, and institution size. Those elements can be grouped into a) ventures, incubators, or accelerators (depending on the level of maturity of the endeavor); b) seed funds; c) infrastructure (e.g., Cowork´s areas, prototyping labs, fab labs, etc.); d) mentor hours access; and e) special activities (e.g., Talks, business contests, and awards; Carvalho, Costa & Dominguinhos, 2005; Miller, 2015; Hayter, 2016; Alvedalen & Boschma, 2017; Wright et al., 2017; Daniel et al., 2018; Guerrero et al., 2018). A UEE also provides value for internal and external stakeholders (Matt & Schaeffer, 2018) and reinforces the connection and coordination between dynamic interactions among actors to develop a university entrepreneurial culture (Isenberg, 2010; Spigel, 2017; Matt & Schaeffer, 2018) and entrepreneurial identity (Donnellon, Ollila & Middleton, 2014).

Wright et al. (2017) developed an entrepreneurship ecosystem's framework to better understand the many actors involved and the different levels and contexts of interactions. Figure 2 shows the UEE framework, which highlights the importance of internal context (i.e., scale, scope, research quality, history and culture, location, and local network resources and capabilities; Clarysse, Wright, Lockett, Van de Velde & Vohora, 2005). It also highlights both the external context where the organization is immersed (Autio et al., 2014) and time—as a variable to consider—due to the evolutive nature of ecosystems (Clarysse et al., 2005).

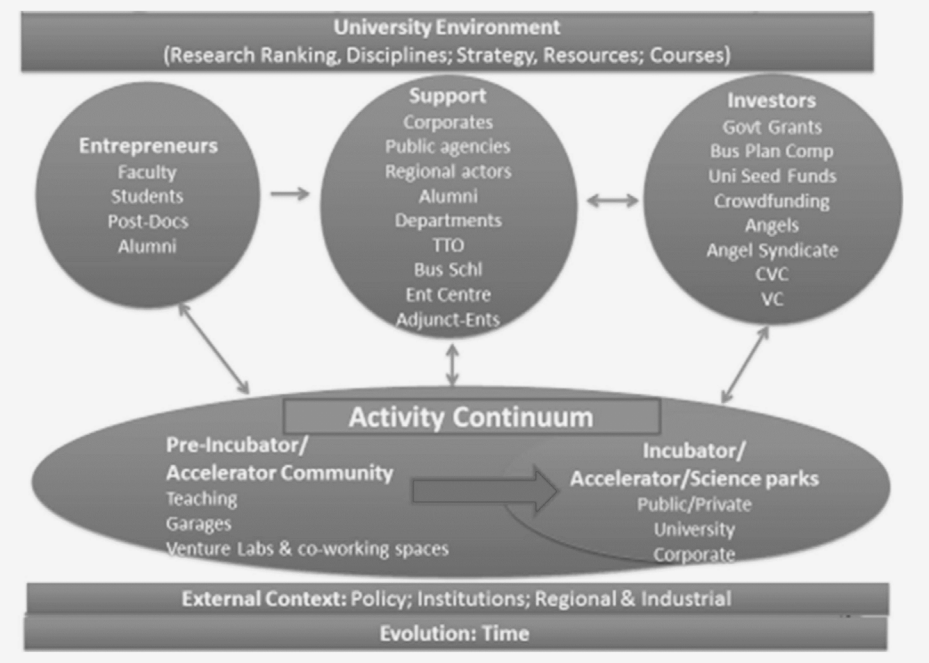


Figure 2: University Ecosystem for student start-up

Source: Wright et al. (2017, p. 911)

Although most research efforts have examined the role of faculty as academic entrepreneurs (Hayter, Nelson, Zayed & O'Connor, 2018), literature has increasingly analyzed the role students and alumni play and the potential influence of entrepreneurship education programs on their future entrepreneurial endeavors (Rasmussen & Wright, 2015; Boh, De-Haan & Strom, 2016).

2.2.1 Entrepreneurship Education: A critical pillar of the university entrepreneurship ecosystem

Interest in entrepreneurship education has increased dramatically in recent years, triggering an exponential growth in the number of specific courses and programs offered in the field

(Rideout & Gray, 2013). According to Finkle, Kuratko, and Goldsby (2006), in the United States, the number of students taking entrepreneurship courses has increased almost fifteen times in a decade and has expanded beyond the borders of business schools, gaining popularity in other corners such as engineering, design, and even law. Fayolle, Gailly, and Lassas-Clerc (2006b, p.702) defined entrepreneurship education (EE) as "any pedagogical program or process of education for entrepreneurial attitudes and skills." The first antecedents of entrepreneurship courses have been attributed to Shigeru Fiji in 1938 at Kobe University in Japan and during the 1940s at Harvard University (Alberti, Sciascia, & Poli, 2004).

However, it was not until the 1990s that EE gained universal recognition and gained in popularity (Dana, 1992). Lorz, Mueller, & Vollery (2013) posited that this phenomenon responded to three factors. First, policymakers recognized the importance of entrepreneurship as a driver for social development (Fayolle et al., 2006; Matlay, 2008; Mwasalwiba, 2010). Second, student interest in entrepreneurship grew (Katz, 2003). Finally, third, the number of chairs and centers of entrepreneurship increased, as did the number of potential instructors and research endeavors in entrepreneurship education (Klandt, 2004).

The interest in entrepreneurship has not only been expressed in the growing number of courses but in the generation of multiple methodologies attempting to develop students' entrepreneurial skills and attitudes. This methodological eclecticism is an expression of the multiple approaches scholars and instructors have taken. According to Neck & Greene (2011), three main approaches represent EE teaching: (a) *the entrepreneur world approach* focused on the entrepreneurial "traits" of individuals; (b) *the process world approach,*

focused on entrepreneurship as a roadmap; and (c) *the cognition world approach,* focused on individuals' thoughts and behavior.

The first two have received major criticism because they represent the entrepreneur as an individual with almost unattainable characteristics and project the entrepreneurial process as a linear and immersed concept in a predictable world (Neck & Greene, 2011). In contrast, the *cognition world approach* has recently gained popularity. Consensus about its advantages over others has risen due to its notion of EE as a dynamic and iterative process that considers individuals' expectations and achieves stimulation through updated examples and real experiences (Costa, Santos, Wach & Caetano, 2018; Dhliwayo, 2008). However, despite this consensus, methodological eclecticism remains an issue, mainly because of the lack of relevant data and rigorous methodological designs evidencing each approach's effectiveness (or lack thereof). This could provide information about improving the curricular decision-making process (Duval-couetil, 2013).

Over the past decade, scholars have published several meta analyses and systematic literature reviews on entrepreneurship education (Bae, Qian, Miao, & Fiet, 2014; Lorz et al., 2013; Martin, McNally, & Kay, 2013; Nabi et al., 2016; Rideout & Gray, 2013). This accumulation of knowledge has illustrated entrepreneurship education's significant contribution to entrepreneurial behavior (Bae et al., 2014) and performance (Martin et al., 2013). However, in addition to the growing interest in the field, there remains an important criticism regarding the lack of measurement robustness and the use of poor statistical methods (Lorz et al., 2013; Nabi et al., 2016; Rideout & Gray, 2013). In the case of the University's entrepreneurship ecosystems (UEE), even though it is a much more recent topic, conclusions are similar.

Consequently, there has been little progress in the empirical exploration of UEE's effectiveness.

Although an effective EE remains the central pillar of a successful UEE (Matlay, 2016, p. 56), universities should also consider other factors. Combined with an effective EE, these factors can create better conditions for developing entrepreneurial behaviors in students and faculty. Several studies have explored the efficacy of different entrepreneurship support programs and infrastructures, such as a physical co-working space, incubators or accelerators, seed funds, mentoring programs, and extracurricular activities (Ndonzuau, Pirnay & Surlemont, 2002; Powers & McDougall, 2005; Boh et al., 2015; Moraes, Iizuka & Pedro, 2018).

Beyond the relative importance of each specific program or support's infrastructure, several scholars have posited that interactions between students and teachers play a central role due to their participation in those supportive elements. This could occur through natural and spontaneous engagement as well as in a managed way (e.g., mentoring or coaching programs; Phelps, Heidl & Wadhwa, 2012; Hayter 2016b; Wright et al., 2017). For example, mentoring improves students' business and management skills and introduces them to new business networks (St-Jean & Audet, 2012). In this vein, scholars have found that generating an environment and a culture that positively affects students' entrepreneurial intentions (Guerrero & Urbano, 2014; Autio et al., 2014, p.4) is relevant because it enhances understanding of entrepreneurial performance (Bowman, Brandenberger, Lapsley, Hill & Quaranto, 2010; Moraes et al., 2018).

2.3 Entrepreneurial intentions, actions, and impact assessment

One of the most-used constructs for measuring entrepreneurial behavior (i.e., the process of venture creation) is *entrepreneurial intention*. The main reason behind this preference is its high predictive capacity for future entrepreneurial actions (Blanchflower, Oswald & Stutzer, 2001; Hisrich, Peters & Shepherd, 2005). Ajzen's (1991) theory of planned behavior (TPB) is the most used within this approach. The TPB posits that the entrepreneurial process is comprised of and shaped by three main dimensions or constructs: a) personal attitude towards entrepreneurship; b) subjective norms; and c) perceived behavioral control, also known as self-efficacy.

A significant amount of work has been based on this model, which states the positive effect of EE on EI (Fini, Grimaldi, Marzocchi & Sobrero, 2012). However, there is still high criticism of the overweight nature of lower-level attitudinal and intentionality impact measures and insufficient details about pedagogical approaches (Nabi et al., 2016; Rideout & Gray, 2013). According to Lorz et al. (2013), there are three main limitations of impact studies. The first is the lack of rigor in the design and selection of proper methodologies, often expressed in the use of elementary statistical procedures. The second is the lack of a detailed description of the entrepreneurship programs being assessed to understand better the different elements involved and how they relate to results. The third limitation is the lack of knowledge about the effects of EE over time (especially long-term).

2.3.1 Graduates' entrepreneurship: university entrepreneurship ecosystems' impact

Over time, several scholars have found a significant economic impact (e.g., job creation and income generation) of new ventures generated by university alumni (Carree & Thurik, 2005).

According to Guerrero et al. (2015, p. 750), methods to empirically investigate universities' economic impact have advanced since the 1980s to favor more robust measures and more sophisticated analytical techniques. Traditionally, the focus of university impact studies has been input-output relationships (i.e., resources and core activities) rather than economic impact (i.e., labor force, revenues obtained from patents, R&D collaborations, spillover effects).

According to Audretsch and Thurik (2004), one relevant aspect to consider before determining the more suitable impact measure is the type of economy. For example, in a managed economy, the production factors of capital and (unskilled) labor are the predominant sources of competitive advantage (Audretsch & Thurik, 2004, p.144). In an entrepreneurial economy, the dominant production factor is knowledge capital, complemented by entrepreneurship capital (i.e., the capacity to engage in and generate entrepreneurial activity; Audretsch & Thurik, 2004, p.144). Therefore, universities' economic contribution should be studied by considering the type of economy to understand how entrepreneurial universities' activities contribute to the predominant production factors (Urbano & Guerrero, 2013).

Universities play a special role as providers of human capital, knowledge (technology), and entrepreneurship capital (Audretsch, 2014; Autio et al., 2014; Guerrero et al., 2015). Since graduate entrepreneurs have been configured directly and indirectly through dynamic connections with universities' entrepreneurship elements, they represent the real impact of the university ecosystem (Alvedalen & Boschma, 2017). However, despite progress in the

field, there remains a need for better methodologies to measure and quantify graduate entrepreneurs' aggregate impact on society.

2.3.2 Entrepreneurship in emergent economies

Scholars have increasingly recognized the importance of entrepreneurial activity as a key driver of growth and sustainable development (Audretsch, Keilbach & Lehmann, 2006). Unsurprisingly, these measures have special relevance in the context of emergent economies (Bruton, Filatotchev & Wright, 2013). Despite this, though, most research has focused on mature economies, which are more efficient and stable (Bruton et al., 2013). Studying entrepreneurship must, then, consider context as an important dimension, as the accumulated knowledge about this phenomenon may not represent the challenges of emergent economies (Zahra & Wright, 2011).

The first step toward a better understanding and contextualization is to define the concepts of an emergent economy. Although different definitions exist, scholars agree that emergent economies are characterized by a low level of institutional capacity or institutional voids, meaning weaker laws and less-developed enforcement capacities in formal legal institutions (Khanna & Palepu, 2000) than those in developed economies. For example, González-Pernía, Jung, and Peña (2015) indicated that the contextual conditions (i.e., the market and institutions) for launching innovative start-ups are less creative and supportive in emerging economies than in advanced ones. This could lead to lower availability of opportunities generated by knowledge spillovers. On the other side, Eesley, Eberhart, Skousen, and Cheng (2018) posited that institutional voids are a source for opportunities generation and therefore also an adequate space for entrepreneurs. The latter is true in part because ventures tend to

adapt to unoccupied competitive niches, which is one of the characteristics of emerging markets. Following this last argument, the question of whether universities can use their entrepreneurial ecosystems to fill the institutional void present in their economic contexts is relevant and should be granted more attention from scholars.

Another important aspect that sometimes appears forgotten or overlooked is the evolutionary and volatile nature of these economies compared to their developed counterparts. One of the main mistakes made when addressing and understanding the entrepreneurial activities of emerging economies is the use of a static approach (Bruton et al., 2013). Finally, scholars should consider cultural and institutional forces involved in generating entrepreneurial activities (Welter, 2011) and how these factors can accentuate variations in the types and rates of new ventures' creation and evolution over time (Zahra & Wright, 2011).

2.2.3 Entrepreneurship ecosystems, and sustainable impact

Though entrepreneurship has been recognized as a driver for achieving a more sustainable economy (Shepherd & Patzel, 2011; Hall, Daneke & Lenox, 2010; Senge, Lichtenstein, Kaeufer, Bradbury & Carroll, 2007; Wheeleer, McKague, Thomson, Davies, Medalye & Prada, 2005), sustainable entrepreneurship is an emergent research stream within general entrepreneurship literature (Binder & Belz, 2015; Sarango-Lalangui, Santos & Hormiga, 2018; Demirel, Rentocchini & Tamvada, 2019;,). That said, what do we understand about sustainability and sustainable development? Zaman and Goschin (2010) found that sustainable development emerges from the intersection of three main dimensions: social, environmental, and economic. Accordingly, sustainable development should lead to better and stronger social ties, diversification of the biosphere, and essential ecosystems and

ecological processes (Zaman & Goschin, 2010). Finally, it should lead to a scenario where future generations' income per capita is higher (or at least not lower) than that of current generations (Gawel, 2012). Based on both sustainable development and entrepreneurship literature, Shepherd and Patzel (2011, p.142) offered the following definition, which could help create a better understanding of the complexity of entrepreneurial outcomes and expected impacts:

> "Sustainable entrepreneurship is focused on the preservation of nature, life support, and community in the pursuit of perceived opportunities to bring into existence future products, processes, and services for gain, where the gain is broadly construed to include economic and non-economic gains to individuals, the economy, and society."

Research regarding how universities face entrepreneurship education and ecosystems from a sustainable approach is scarce. However, increasingly, universities and related actors (public sector, accreditation institutions, international rankings, etc.) have been raising the importance of transcending the classical teaching and research view. Instead, they have embraced an additional societal role in regional and economic development through the support of knowledge spillovers and entrepreneurial endeavors from their academic communities (Etzkowitz & Leydesdorff, 2000; Agarwal, Audretsch & Sarkar, 2010).

Wagner, Schaltegger, and Fichter (2021) used a multiple case study with German universities and found that university-linked entrepreneurship support programs had positive effects on regional sustainable development. Nonetheless, the evidence on entrepreneurship programs and sustainable outcomes is considered niche (Fichter, Fuad-Luke, Hjelm, Klofsten, Backman, Bergset, & Kuisma, 2016) and requires further development, especially in the context of emerging economies.

CHAPTER 3: CONCEPTUAL FRAMEWORK AND HYPOTHESES

3.1 Conceptual Framework

To achieve the specific objective one of the dissertation (see SO1), Figure 3 shows the proposed conceptual model based on an exhaustive literature review. This first part of the model theorizes the positive influence of UEE configuration via entrepreneurship education (H1) and other support mechanisms (H2) on graduate entrepreneurship. Simultaneously, the second part of the model theorizes how graduate entrepreneurship directly generates sustainable development impacts on society (H3a). However, it could also mediate the relationship between the UEE configuration and its sustainable development impacts (H3b).

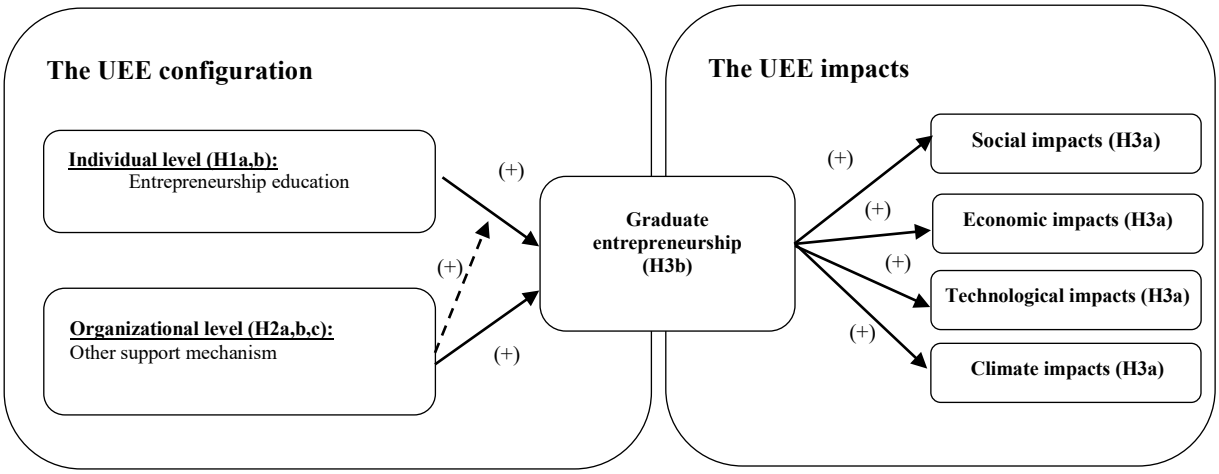


Figure 3: The proposed conceptual framework

Source: Author

The relationships observed in this proposed conceptual framework are supported in the following hypothesis section.

3.2 Hypotheses

3.2.1 The influence of university entrepreneurship ecosystem on graduates' behaviors

Different dimensions are at play when students are exposed to an entrepreneurship course. One of the most mentioned is awareness and understanding of the entrepreneur's mind-set (i.e., values, attitudes, and motivations; Gibb, 1993; Johanisson, 1991). As a first step, this could increase students' entrepreneurial intentions and, in the long run, increase their entrepreneurial behavior as well (Fayolle & Gailly, 2015). Another important dimension the literature identified as a driver in entrepreneurial behavior is entrepreneurial self-efficacy. This refers to the belief in a person's ability to successfully perform the roles and tasks of entrepreneurship (Chen, Greene & Creek, 1998).

Self-efficacy is associated with determinants such as emotional arousal, verbal persuasion, vicarious experience, and enactive mastery (Bandura, 1986). Students enrolled in entrepreneurship courses have a permanent interaction with entrepreneurs. They are exposed to examples and other pedagogical elements that help maintain motivation and interest, resulting in higher expectations of success and increased self-efficacy (Zhao, Seibert & Hills, 2005). A substantial number of studies have shown that specific entrepreneurship courses impact students' intentions. Thus, the courses in turn impact their chances of considering entrepreneurship as an entry into the labor market (Fayolle et al., 2006; Souitaris, Zerbinati, & Al-Laham, 2007; Krueger, Hansen, Michl, & Welsh, 2011). This discussion leads to the following hypotheses:

Hypothesis 1a: Entrepreneurship education has a positive effect on graduate's entrepreneurship

Hypothesis 1b: Entrepreneurship education has a positive effect on the quality of graduate´s entrepreneurship

Numerous scholars have explored the coordination and combination of not only courses but also different support mechanisms at the university level. In particular, they have examined how that experience is embedded in an entrepreneurial environment and intentionally managed by universities (Fayolle & Gailly, 2015; Boh et al., 2015; Fichter & Tiemann, 2018). Entrepreneurship courses could positively affect students' entrepreneurial intentions. That said, other complementary spaces, such as specialized support programs for entrepreneurs both at the initial (i.e., incubators) and escalation (i.e., accelerators (Di Gregorio & Shane, 2003; Hacket & Dilts, 2004; Wright et al., 2017; M'chirgui, Lamine, Mian & Fayolle, 2018) stages, the connection with other actors of the academic community (i.e., professors and researchers; Matt & Schaeffer, 2018), and the interaction with relevant actors beyond the frontiers of the university (Belitski & Heron, 2017), can enhance the specific effect of EE. In turn, such spaces can increase the impact on future entrepreneurial behavior.

The UEE demands a strong connection and coordination among actors in order to develop an entrepreneurial culture (Isenberg, 2010; Spigel, 2017; Clark, 2004; Matt & Schaeffer, 2018) and identity among individuals (Donnellon et al., 2014). The effects on students and other actors are expected to be more relevant in emerging economies, given institutional voids and a lack of resources. We assumed the influence of institutional voids in emerging economies (Mair & Marti, 2009) and the existence of a demand for university resources and capabilities behind each element of the ecosystem. In light of these assumptions, we proposed the following hypothesis:

Hypothesis 2a: The university entrepreneurship ecosystem has a positive effect on graduate's entrepreneurship

Hypothesis 2b: The university entrepreneurship ecosystem has a positive effect on the quality of graduate's entrepreneurship

Beyond acquiring the knowledge and skills to act entrepreneurially, entrepreneurial education also involves the development of an entrepreneurial identity (Donnellon et al., 2014, p.490). In this perspective, entrepreneurship education helps build or reconstruct students' identity because students experience diverse challenges that lead them to develop an entrepreneurial identity (Falck, Heblich & Luedemann, 2012). Following this argument, several scholars have posited that, to develop an entrepreneurial identity, students must be involved in self-reflection activities and social engagement (Donnellon et al., 2014). This is coherent with one of the main goals of a mature entrepreneurship university ecosystem: to generate a dynamic culture of networking and collaboration among students, teachers, and entrepreneurs and to develop strong entrepreneurial identities related to more substantial post-graduation results. Entrepreneurial identity could also be moderated by other elements involved in the university ecosystem, such as their relationships and experiences with role models, mentors, and investors (Liñán, Urbano & Guerrero 2011; Wright, Siegel, & Mustar, 2017). Kacperczyk (2013 p.14) in particular noted the importance of university peers as facilitators of entrepreneurial behaviors and attitudes by reducing the uncertainty associated with entrepreneurial entry. Behind this argument lies the claim that individuals tend to imitate socially proximate individuals when facing uncertainty regarding a course of action (Burt, 1987).

Students who reinforce their entrepreneurial skills (i.e., feasibility) and entrepreneurial motivations (i.e., desirability) during the entrepreneurship learning process impact personal

entrepreneurial initiatives through other elements from the university entrepreneurship ecosystem. In contrast, those who build or reconstruct an identity that reinforces their entrepreneurial without a strong influence on entrepreneurial motivations are more oriented toward generating impacts with their professional activities. Assuming that the university entrepreneurship ecosystem moderated the students' entrepreneurial identity and hence feasibility and desirability, we proposed the following:

Hypothesis 2c: The university entrepreneurship ecosystem positive moderate the relationship between entrepreneurship education and graduate's entrepreneurship

3.2.2 The main and moderating effect of university entrepreneurship ecosystem via graduates' entrepreneurship

Graduate entrepreneurship has produced several contributions to society in terms of employment, new technologies, and the re-activation of competitiveness (Urbano et al., 2017). According to Pickernell, Jones, Miller, and Thomas (2011), graduate entrepreneurs have significant direct and indirect benefits that are helpful for furthering entrepreneurial activity. As a result, these benefits play an important role in the future economic development of local and national economies (Fuller & Pickernell, 2018). However, the generational effect also influences this relationship. For example, young generations have shown a sensibility toward social and climate sustainably. In contrast, older generations have shown an orientation towards generating economic, social, and technological impacts (Hall, Lewis & Ellsworth 2018). This means that the youngest generations are more sensitive to social impacts, while the eldest generations are more focused on economic impacts.

Although empirical research on the economic impacts of entrepreneurial students remains

scarce, some scholars have found a positive relationship (Urbano & Guerrero, 2013). Åstebro, Bazzazian, and Braguinsky (2012) found a propensity among recent university graduates who establish companies to become lifelong entrepreneurs who create value and, in consequence, economic growth. In their critical literature review of university outcomes obtained by spinoffs, Miranda, Chamorro, and Rubio (2018) found that the strength factor is the link between their universities of origin. This supports the positive role of a dynamic entrepreneurial ecosystem in which networks among students, faculty, and alumni constitute one of the main goals. Indeed, Fischer et al. (2020) and Roncancio-Marin, Dentchev, Guerrero and Crispeels (2022) provided insights into the critical role of entrepreneurial universities' initiatives in the sustainable development of certain localities from emerging economies. Assuming that the graduate's entrepreneurship generates sustainable impacts on society and could therefore be the outcome of the university entrepreneurship ecosystem, we proposed the following:

Hypothesis 3a: The graduate's entrepreneurship has a positive impact on sustainable development.

Hypothesis 3b: The graduate's entrepreneurship positively mediates the relationship between university entrepreneurship ecosystems and impacts in sustainable development.

CHAPTER 4: METHODOLOGY

4.1 Research Setting

Our research setting was Chile for four reasons. First, Chile's economy has one of the highest percentage of entrepreneurs worldwide (Bosma & Kelley, 2019). Second, Chile has been ranked within the top ten emerging economies in Latin America during the last ten years (United Nations, 2019). Third, Chile has made substantial efforts to foster entrepreneurship and build an entrepreneurial ecosystem positioned globally in the top list of ecosystems (Herrmann, Marmer, Dogrultan & Holtschke, 2012; CORFO, 2018). Finally, selecting an emerging economic context such as Chile allowed us to test and analyze the particularities of a university entrepreneurship ecosystem—specifically, that of the Universidad del Desarrollo (UDD— in that scenario (Urbano & Guerrero, 2013)).

The UDD is a private and newly established university that has possessed an entrepreneurial orientation and commitment since its foundation. These characteristics facilitate an in-depth evolutionary analysis because they reduce the interference of routines usually observed in mature universities (Guerrero & Urbano, 2012; Heaton, Siegel & Teece, 2019). In addition, UDD has built a strong entrepreneurial reputation and academic recognition and has made significant contributions to their alumni's economic, societal, and political activities (Times Higher Education, 2018; UDD, 2018). Consequently, we believed that these elements would allow us to explore how university atmosphere and culture contributes to the local entrepreneurial ecosystem. Furthermore, they helped us understand how the atmosphere has transformed into socio-economic impacts across different students' generations (Kenney & Goe, 2004; Wright et al. 2017).

Regarding the evolution of the university ecosystem (see Appendix 1), in the 1990s, the basic configuration of the UDD's infrastructure and the consolidation of international alliances with North American universities was observed (UDD, 2018). Initially, it implemented entrepreneurship education as a compulsory and transversal course in the 2000s. The university also introduced several extracurricular activities that reinforced the entrepreneurial culture within the university community (UDD, 2021b). Prodded by the market, the university strategically invested in multiple resources (infrastructure) and capabilities (attraction/retention of talent, leadership, relationships with regional actors). This allowed the institution to create a favorable environment for entrepreneurship that is observed when UDD students enter the labor market (UDD, 2021a). Today, the UDD focuses on strengthening entrepreneurship in multiple ways: ensuring excellence in entrepreneurship education, teaching, and extracurricular activities; making scholarly impacts via research and collaboration with local/national/international actors; and engaging with the university community and society to respond to the current challenges (e.g., COVID-19 pandemic, a new constitution, social movements).

Based on these historic trends, the entrepreneurial evolution of the UDD has followed similar patterns of private entrepreneurial universities (Guerrero & Urbano 2017). First, private universities consolidate education and later legitimize the role of research as the next step in the knowledge transfer. Second, young universities have more flexibility to respond to external challenges. Third, an interesting variation observed in entrepreneurial universities located in emerging economies is the speed with which university ecosystems are configured. For example, the evolutionary stage of entrepreneurial universities in emerging economies requires more time than that of universities located in developed economies (Wright et al.,

2017). These patterns and theoretical criteria support the selection of the UDD as the case study used in this doctoral dissertation.

4.2 Methodological design

4.2.1 The qualitative view: A Pilot Study

To understand the configuration of UDD's entrepreneurship ecosystem and the initial validation of our theoretical framework (to achieve SO2 and S03), we designed a pilot study based on a retrospective multiple case study analysis. This analysis is a type of longitudinal cases design in which all data, including first-person accounts, are collected when the majority of the events and activities under study have already occurred, and the outcomes are known (Street & Ward, 2010, p.826). The data collection process adopted the triangulation suggested by Yin (2014), consisting of the combination of multiple sources to gather data through primary sources, such as interviews and focus groups, as well as secondary sources, such as official records, the institutional website, financial reports, and social media records.

Participants in this study were selected based on several criteria. They needed to be UDD alumni who had created a new venture after graduation (Guerrero et al. 2018; Eesley & Lee, 2021) or current entrepreneurial students who had created new ventures before graduation or during their university studies (Lourenço, Taylor & Taylor, 2013; Urbano et al. 2017). The control group consisted of UDD alumni and current students not involved in venture creation. Both groups were representative samples of their population (age, gender, career, generation). In total, 32 students participated in our study (see Appendix 2).

Following the proposed conceptual framework review (Figure 3), we designed a protocol to lead our focus groups and interviews. Each interview and focus group session lasted two and a half hours and was recorded and transcribed. This fieldwork was developed during the final semester of 2018, and participants were assured confidentiality. This work allowed us to capture in detail our participants' general perceptions of the university ecosystem's (Wright et al., 2017, p. 911) influence on their behaviors/decisions, the weaknesses/strengths of the university ecosystem, and the ABLE able outcomes/impacts (see Appendix 3 and 4). We complemented this work using different sources of secondary data provided by UDD's Marketing Intelligence Department as historical reports since 2015. These captured the perceptions of strategic groups (e.g., employers, students, and university managers), annual institutional reports, and websites, among others (see Appendix 5). These allowed us to reconstruct the evolution of the entrepreneurial university ecosystem and triangulate our findings (Yin, 2014). Then, the data was coded and analyzed according to the general elements identified in the literature. The primary objective at this stage was identifying common patterns between focus groups and interviews to identify and connect findings framed in previous literature and strengthening the internal validity of qualitative methodologies (Aguinis & Solarino, 2019).

4.2.2 The quantitative view: A hypotheses testing

4.2.2.1 Longitudinal Dataset

Following the Pilot Study (qualitative view), and to test the proposed hypotheses SO2 and S03 (quantitative view), we matched three relevant longitudinal sources of information from the past decade. The first was the alumni dataset with information from all UDD undergraduate programs, as well as the annual employment responses of those who graduated

from those programs during the past ten years. The second was the historical academic records of all the graduate students (e.g., their involvement in entrepreneurship courses, failure, grades). The third source was (c) the financial records of UDD's investments in entrepreneurial activities (academic and non-academic) during the past ten years. This information allowed us to build a unique 10-year longitudinal dataset of approximately 24,000 UDD graduates[1] from 2010 to 2019 that could partially help test the first two hypotheses (H1 and H2) of the proposed theoretical model (Figure 3). Therefore, based on the qualitative pilot protocol, we chose to implement a follow-up survey to capture the information to test the last set of hypotheses (H3) and confirm the available perceptual variables in the longitudinal dataset with objective responses.

4.2.2.2 Follow-up Survey

The follow-up questionnaire was designed based on three main sources. First was the Stanford Alumni Survey provided by Professor Charles Eesley[2] following a meeting with him in January 2019. Unfortunately, due to confidential agreements, it was not possible to include a copy of the survey as part of the appendix. The second was the pilot study, which provided useful information about the UDD entrepreneurship ecosystem and some preliminary insights about its influence on graduates' entrepreneurial behaviors, as well as

[1] To ensure the personal data protection, university offices (Alumni, Graduates, Marketing Intelligence) created a graduate ID that allows us to match all university datasets without access to personal sensible dataset.

[2] This Professor is an expert with an outstanding experience in the design, implementation and research exploitation of the Stanford Alumni Survey (see Eesley & Lee, 2021). For further details, please visit his university website: https://profiles.stanford.edu/charles-eesley

the related socio-economic impacts. The third source was (c) the literature review that supported the proposed model and hypotheses. The first version of the follow-up questionnaire was piloted with 10 respondents (five entrepreneurs and five non-entrepreneurs). This exercise allowed us to confirm the correct understanding of each question, response timing, and instrument validity. The administrated online version of the questionnaire is attached in Appendix 6. Then, the implementation strategy focused on the UDD graduates from 2016 to 2019. It was based on the experience during the qualitative Pilot Study, especially the difficulties related to the retrospective view of the first generations and the evolution of the UDD entrepreneurial ecosystem. Considering this period, 12,666 graduates were included in the longitudinal dataset and therefore also considered in the follow-up survey.

From July 2021 to August 2021, the survey's online version[3] was sent to a stratified sample[4] of 6,472 graduates. We implemented weekly reminders using a massive mailing approach

[3] Given the COVID-19 restrictions, the questionnaire was administrated used the *Typeform Survey Platform* that was selected by the interviewees during the Pilot Study as the easiest and the most visually attractive interphase in comparison with the others options like *Lime Suryev, Survey Monkey and Google Survey*. Indeed, taking care of the graduates' data protection, the survey was sent by the UDD Alumni responsible who has the personal contacts of the graduates using their emails. It is important to mention that the graduates were asked to give their authorization to be contacted, as well as, the email that they received with the survey link had the option for them to decide do not participate or do not receive more emails related to this survey.

[4] The stratification of the sample was estimated by considering two important issues: (a) graduates that during the Alumni survey indicated that they created a business (50%), as well as the graduates that during the Alumni survey indicated that they do not create a business (50%); and (b) the distribution per university faculty.

(e.g., 3,000 mails twice a week)[5]. The response rate was 14.19% (925), but 101 responses were removed because of our longitudinal dataset's matching (identification) problems. The final representative sample of the stratified population consisted of 824 graduates with a margin of error of 3.30% at a 95% confidence level.

4.2.2.3 Description of variables

Table 1 summarizes the variables used to test the proposed conceptual model (Figure 3).

The first part of the proposed conceptual model theorized the positive influence of the UEE configuration via entrepreneurship education (H1a,b) and infrastructure and support mechanisms (H2a,b,c) on graduate entrepreneurship magnitude and quality.

Regarding the *dependent variables,* previous empirical studies have measured graduate entrepreneurship using different metrics, including the intentions of university students (Lourenço et al., 2013), expected entrepreneurial actions after graduation (Guerrero et al., 2016), and the number of ventures created (Urbano et al., 2017; Guerrero et al., 2018; Eesley & Lee, 2021). In this study, ***graduate entrepreneurship*** was measured by the total number of ventures created by the UDD bachelor students after graduation. Concretely, this measure was an objective metric captured by the follow-up survey through the question "How many ventures have you created after graduation?" (Guerrero et al., 2018; Eesley & Lee, 2021). Additionally, ***graduate entrepreneurship quality*** was measured using four dependent variables:

[5] The mean test does not show differences in the responses across the different reminders.

a) Employment: objective metric captured by the follow-up survey through the question "name the number of average employees during 2020."
b) Sales: objective metric captured by the follow-up survey through the question "name the annual average amount of sales during 2020."
c) Employment growth: average employees during 2020 with respect to the annual average of employees from 2017–2019, captured by the follow-up survey through the question "name the average annual number of employees in the following period (2017–1019)."
d) Sales growth: average sales during 2020 with respect to the annual average of sales from 2017–2019, captured by the follow-up survey through the question "name the average annual amount of sales in the following period (2017-1019)."

Regarding the *independent variables*, we used two sets: (a) entrepreneurship education and (b) infrastructure and support mechanisms.

First, *concerning entrepreneurship education,* previous empirical studies have mainly used binary variables to capture whether students who took or did not take (compulsory or extracurricular) entrepreneurial education had the highest/lowest propensity to become an entrepreneur (Pittaway & Cope, 2007; Liñán et al., 2011; Guerrero et al., 2018). In addition, qualitative studies have associated the content, teaching methods, and other indicators with the propensity to become an entrepreneur (McKeown, Millman, Sursani, Smith & Martin, 2006; Mwasalwiba, 2010). Given the multiple critics of these metrics (Fayolle, 2018), in this study, we included a set of four metrics related to *entrepreneurship education* obtained from the UUD student academic records. The first was *entrepreneurship education credits*

(eecredits), which measures the total number of credits related to compulsory entrepreneurship education courses taken by the graduate while enrolled in the university. The second metric was *entrepreneurship education grade (eegrade).* It measured the entrepreneurship education grade captured from one (lowest grade) to seven (highest grade) that was obtained by the graduate during his/her education at the university. The third, *entrepreneurship education time (eetime),* measured the time distance in number of years between when the graduate took entrepreneurship courses during their university education and the year of the follow-up survey. The fourth and final metric was *entrepreneurship education failure (eefailure),* which measured the total failure credits respect to the total number of career's credits.

Concerning *infrastructure and support mechanisms*, previous studies have exposed the different components of the university entrepreneurship ecosystem (Wright et al., 2017; Guerrero et al., 2018). Indeed, the pilot qualitative study highlighted the components of the UDD entrepreneurship ecosystem (see Appendix 3). Based on these antecedents, in this study we included a set of four metrics related to ***infrastructure and support mechanisms*** obtained from the UUD students' academic records. The first was *investment on entrepreneurship per student (lneeinvestperstudent),* which measured the total investment the university made in entrepreneurship per student and per academic year according to the UDD financial records. The second was *ecosystem influence (euinfluence),* which assessed the graduates' perceptions of the (in)direct influence university had on their propensity to develop entrepreneurial initiatives captured from 1 (the lowest influence) to 5 (the highest influence) during the follow-up survey. The third metric was *entrepreneurship ecosystem elements (eetotal*). It measured the total number of elements of existing UDD ecosystem (courses,

incubators, extracurricular, seed capital, culture) in each promotion recognized by the graduates during the follow-up survey. The fourth metric was *entrepreneurship ecosystem used (eutotal),* which measured the total number of used elements from the UDD ecosystem (courses, incubators, extracurricular, seed capital, culture) recognized by the graduates during the follow-up survey.

Regarding the *control variables*, previous studies led us to use several control variables at the individual and university levels by combining information from university records and a follow-up survey. First, ***at the individual level*****,** we included the graduates' ages (*age*), square age (*age2*), gender (*gender*), relation to business-oriented careers (*businesscareer*), recognition of entrepreneurial parents as role models (*entrefamilysrolmodel*), private or public high school attendance status (*precollege_private*), personal income at the date of the follow-up survey (*income*), and years of labor experience between graduation and the follow-up survey (postlaboryears). Additionally, ***at the university level***, the study assessed the total number of graduate students per academic year (*graduates_population*), the time between the graduation year and the follow-up survey year (graduate_time), and whether graduates were enrolled in the Santiago campus during their university studies (campus_santiago).

Table 1: Description of variable

Step 1	Level	Type	Variable	Description
		DV	postgraduatetot	total number of ventures created by the student post-graduation
			graduateent_sales	annual average amount of sales during 2020
			graduateent_employ	total number of average employees during 2020
			graduateent_employ_growt	average employees during 2020 respect to the annual average of employees in the period 2017-2019
			graduateent_sales_growth	average sales during 2020 respect to the annual average of sales in the period 2017-2019
	Individual			
		IV	eecredits	total entrepreneurship education credits taken by the graduate student
			eegrade	entrepreneurship education grade obtained by the graduate student
			eetime	time distance from the year when taken the ee course to now
			eefailure	total failure credits respect to the total career's credits
		Controls		
			age	students' age
			age2	square of students' age
			gender_male	students' gender
			Businesscareer	yes if the students' career is related to business; no otherwise
			entrefamilysrolmodel	yes if the graduate students indicated that has parent and other family members enrolled in entrepreneurial iniatives; no otherwise
			precollege_private	yes if the graduate students indicated that came from a private high school
			income	current income of the graduate student
			postlaboryears	years of labor experience of the graduate student since his/her graduation
	University	IV		
			lneeinvestperstudent	total investment in ee by the university per student and per academic year
			euinfluence	5 Likert-Scale that indicates the (in)direct contribution of the university on their entrepreneurial initiatives where 5 represents the highest contribution
			eetotal	total number of entrepeneurial ecosystem's elements (curses, incubators, extracurricular, venturecapital, culture) that exist during their promotion
			eutotal	total number of entrepeneurial ecosystem' elements (curses, incubators, extracurricular, venturecapital, culture) that have used as graduate students
		Controls		
			graduates population	total number of graduate student per academic yer
			graduate time	time distance from the graduation year until now
			campus_santiago	campus where the graduate student was involved

Continue Table 1

Step 2	Level	Type	Variable	Description	Source
		DV	economicimpact	The graduates' perception about the sustainable economic contribution of their entrepreneurial initiatives from one (the lowest contribution) to five (the highest contribution)	Follow-up survey
			socialimpact	The graduates' perception about the sustainable social contribution degree of their entrepreneurial initiatives from one (the lowest contribution) to five (the highest contribution)	Follow-up survey
			technologicalimpact	The graduates' perception about the sustainable technological contribution degree of their entrepreneurial initiatives from one (the lowest contribution) to five (the highest contribution)	Follow-up survey
			climateimpact	The graduates' perception about the sustainable climatic contribution degree of their entrepreneurial initiatives from one (the lowest contribution) to five (the highest contribution)	Follow-up survey
		IV	Graduate entrepreneurship	Total number of ventures created by graduates after bachelor graduation from the UDD	Follow-up survey
	Venture				
		Controls			
			hgeorientation	Yes, if the graduate indicated high-growth orientation in sales or employees from 2017-19 to 2020	Follow-up survey
			region	The Chilean region where the graduates' venture is allocated	Follow-up survey

Source: Authors

The second part of the model theorized how graduate entrepreneurship directly generates sustainable development impacts on society (H3a). It could also mediate the relationship between the UEE's configuration and its sustainable development impacts (H3b).

Regarding the *dependent variable,* previous empirical studies have used proxies to measure the influence of academic entrepreneurship (spin-offs) on major societal challenges through sustainable development. These include job generation, well-being, technological advances, and the improving of climate challenges (Åstebro et al., 2012; Urbano & Guerrero, 2013; Guerrero et al., 2015; Miranda et al., 2018; Roncancio-Marin et al., 2022). Based on the qualitative pilot experience and given that impacts take time to be captured, the graduates' perceptions of the ***sustainable impacts*** generated by their entrepreneurial initiatives were measured with a Likert-Scale ranging from 1 (the lowest impact) to 5 (the highest impact). It assessed the (a) *economic impact (economicimpact),* which measured graduates' perceptions of the sustainable economic impacts (income, competitiveness, attraction of investments) generated by their entrepreneurial initiatives in the region. It also assessed (b) *social impact (socialimpact)* by measuring the perception of graduates with respect to the sustainable societal impacts (employment, well-being, attraction of talent) of their entrepreneurial initiatives in the region. It further examined (c) *technological impact (technologicalimpact),* which measured graduates' perceptions of the sustainable technological impacts (sector specialization, new sectorial configuration, knowledge transfer, spillover effects) of their entrepreneurial initiatives in the region. Finally, the Likert Scale assessed (d) *climate impact (climateimpact),* measuring graduates' perceptions of the sustainable climate impacts (reducing climate change effects) of their entrepreneurial initiatives in the region.

Regarding the *independent variable,* previous empirical studies have measured graduate entrepreneurship using different metrics, such as the intentions of university students (Lourenço et al., 2013), expected entrepreneurial actions after graduation (Guerrero et al., 2016), and number of ventures created (Urbano et al., 2017; Guerrero et al., 2018; Eesley & Lee, 2021). In this study, ***graduate entrepreneurship*** was measured by the total number of ventures created by the UDD bachelor students after graduation. This measure was an objective metric captured by the follow-up survey through the question "how many ventures have you created up after graduation to this date?" (Guerrero et al., 2018; Eesley & Lee, 2021).

Regarding the *control variables*, based on previous studies, we used two control variables at the venture level obtained from the follow-up survey. The first variable was if the venture had experienced a high-growth orientation in at least 30% of sales or employees from 2017–19 to 2020 (hgeorientation), and the second was (b) the Chilean region where the venture was allocated (region).

4.2.2.4 Data analysis

To test our hypotheses, based on previous studies (see Acs et al., 2012; Berril et al., 2020; Kozlinska et al., 2020; Bennet & Nikolaev, 2021a,b), we used three statistical methods as follows.

First, we began by estimating an ordinary least squares model (OLS) model to examine the effect of the UEE (entrepreneurship education via H1 and the infrastructure and support mechanisms via H2a) on graduate entrepreneurship (similarly to Berril et al., 2020 and

Bennet & Nikolaev, 2021a,b). Because of the moderation effect of infrastructure and support mechanisms on entrepreneurship education, we created an interaction term of these two independent variables (H2b) and several control variables. Table 2 lists the descriptive statistics for all variables related to the sample of 824 observations, as well as the pairwise correlation coefficients between the variables. The highest correlations between independent variables were less than 0.6, low enough not to cause issues of multicollinearity issues. Except for age, all variance inflation factors (VIF) were below the threshold for tolerance of 10 (or 1/VIF less than 0.1). The OLS analysis is shown in Model 1. We also used an ordinary least squares model (OLS) to examine the effect of the UEE on graduate entrepreneurship quality. This time, we ran the model using a subset of 251 individuals who self-identified as entrepreneurs and four dependent variables, all of which represented the qualities of graduate entrepreneurship: sales, employment, sales growth, and employment growth.

Moreover, to avoid any reverse causality, a two-stage least squares model estimator (2SLS) was derived from testing the effect of graduate entrepreneurship on sustainable (social, economic, technological, and climate via H3a) impacts in the region (similarly to Acs et al., 2012; Berril et al., 2020; Bennet and Nikolaev, 2021a,b). Specifically, we estimated a complete 2SLS model. It encompassed first stage equations, where the dependent variable was graduate entrepreneurship related to the different set of variables of entrepreneurship education *(eecredits, eegrade, eetime, eefailure),* infrastructure, and support mechanism *(lneeinvestperstudent, euinfluence, eetotal, eutotal),* as well as the control variables *(age, age2, gender_male, Businesscareer, entrefamilysrolmodel, precollege_private, income, postlaboryears, graduates_population, graduate_time, campus_santiago)*. At the second stage, we used the output obtained from the first model (i.e., graduate entrepreneurship) as

an instrumental-independent variable to understand the effect on the different sustainable impact metrics (*economicimpact, socialimpact, technologicalimpact, climateimpact)*, and some controls (*region and hgeorientation).* The 2SLS analysis is shown in Model 2.

Table 2: Descriptive statistics and correlation matrix

	Variable	Obs	1/VIF	Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
1	economicimpact	824	0.24	1.07	1.73	0.00	5.00	1.000											
2	socialimpact	824	0.24	1.10	1.76	0.00	5.00	0.3285*	1.000										
3	technologyimpact	824	0.27	0.90	1.57	0.00	5.00	0.3141*	0.3869*	1.000									
4	climateimpact	824	0.26	0.88	1.53	0.00	5.00	0.3777*	0.3107*	0.3928*	1.000								
5	postgraduatetot	824	0.48	0.59	1.21	0.00	12.00	0.3626*	0.3188*	0.3096*	0.3006*	1.000							
6	eecredits	824	0.85	9.98	2.02	5.00	42.00	0.033	0.051	0.066	-0.003	0.010	1.000						
7	eegrade	824	0.90	5.33	1.63	0.00	7.00	-0.038	-0.031	-0.056	-0.026	-0.070	-0.020	1.000					
8	eetime	824	0.26	8.83	2.75	2.00	17.00	-0.027	0.009	-0.033	-0.009	0.061	0.2514*	-0.031					
9	eefailure	824	0.74	0.08	0.10	0.00	0.54	0.1287*	0.1223*	0.1491*	0.1156*	0.1665*	0.067	-0.1268*	0.2831*	1.000			
10	lneeinvestperstudent	824	0.74	0.06	0.17	0.01	1.92	0.028	0.035	-0.013	-0.001	0.1089*	-0.049	-0.1006*	-0.081	0.017	1.000		
11	euinfluence	824	0.23	1.13	1.66	0.00	5.00	0.3365*	0.3447*	0.3005*	0.3878*	0.3511*	0.013	-0.044	-0.059	0.0925*	0.015	1.000	
12	eetotal	824	0.32	1.01	1.59	0.00	5.00	0.3682*	0.3444*	0.3012*	0.3768*	0.3077*	0.015	-0.051	-0.1204*	0.1048*	-0.039	0.3013*	1.000
13	eutotal	824	0.58	0.32	0.76	0.00	5.00	0.4571*	0.4918*	0.4326*	0.4053*	0.4662*	-0.014	-0.052	-0.050	0.073	-0.010	0.3007*	0.5582*
14	age	824	0.01	28.76	3.30	21.00	52.00	-0.007	0.016	0.003	0.017	0.088	0.1245*	-0.1321*	0.4856*	0.2589*	0.002	-0.036	-0.080
15	age2	824	0.01	837.92	203.61	441.00	2704.00	-0.009	0.016	0.005	0.019	0.082	0.1167*	-0.1360*	0.4454*	0.2501*	0.000	-0.037	-0.078
16	gender	824	0.77	0.48	0.50	0.00	1.00	0.2790*	0.2399*	0.2727*	0.2005*	0.2464*	0.0963*	-0.0909*	0.018	0.2400*	0.046	0.2190*	0.2169*
17	Businesscareer	824	0.24	0.38	0.49	0.00	1.00	0.2122*	0.1403*	0.1941*	0.1330*	0.1173*	0.1246*	-0.1222*	-0.2417*	0.061	-0.1874*	0.1594*	0.2268*
18	entrefamilysrolmodel	824	0.89	0.58	0.49	0.00	1.00	0.2231*	0.1950*	0.1792*	0.1831*	0.2020*	0.019	-0.030	-0.009	0.022	0.007	0.2080*	0.2244*
19	precollege_private	824	0.94	0.88	0.33	0.00	1.00	0.065	0.045	0.040	0.036	0.059	0.001	-0.082	0.041	0.076	-0.019	0.000	0.033
20	postlaboryears	824	0.61	2.32	1.81	0.00	20.00	0.1059*	0.088	0.1078*	0.088	0.1687*	0.033	-0.030	0.3750*	-0.009	-0.050	0.019	-0.029
21	income	824	0.69	2.98	1.12	1.00	6.00	0.2005*	0.1417*	0.1544*	0.1071*	0.2123*	0.1335*	-0.024	0.3134*	0.065	-0.055	0.084	0.0909*
22	graduates' population	824	0.24	819.58	517.18	10.00	1547.00	0.1842*	0.1292*	0.1813*	0.1067*	0.086	0.1390*	-0.1246*	-0.2313*	0.024	-0.2985*	0.1515*	0.2096*
23	graduate time	824	0.30	3.69	2.23	0.00	15.00	0.056	0.083	0.049	0.064	0.1296*	0.2455*	-0.063	0.325*	0.059	-0.045	-0.013	-0.079
24	campus santiago	824	0.57	0.72	0.45	0.00	1.00	0.026	0.022	0.036	0.035	0.028	-0.013	-0.1142*	-0.1284*	-0.054	0.038	-0.007	0.004
25	hgeorientation	824	0.79	0.08	0.27	0.00	1.00	0.3924*	0.3876*	0.3710*	0.3568*	0.3748*	0.034	-0.006	0.003	0.073	0.023	0.3727*	0.3322*
26	region	824	0.70	11.58	2.62	1.00	17.00	-0.067	-0.081	-0.059	-0.078	-0.002	0.033	-0.088	-0.062	-0.069	-0.050	-0.038	-0.048

Note: * p<0.001

Continue Table 2

	Variable	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13	eutotal	1.000													
14	age	-0.018	1.000												
15	age2	-0.018	0.9915*	1.000											
16	gender	0.2011*	0.050	0.049	1.000										
17	Businesscareer	0.0929*	-0.1838*	-0.1768*	0.3080*	1.000									
18	entrefamilysrolmodel	0.1496*	0.001	-0.002	0.0953*	0.1596*	1.000								
19	precollege_private	0.025	-0.044	-0.050	0.061	0.058	0.063	1.000							
20	postlaboryears	-0.017	0.4222*	0.4355*	0.084	-0.057	0.051	-0.033	1.000						
21	income	0.071	0.2825*	0.2759*	0.2256*	0.1737*	0.1197*	-0.009	0.3347*	1.000					
22	graduates' population	0.1057*	-0.1884*	-0.1813*	0.3001*	0.4051*	0.1436*	0.074	-0.057	0.1828*	1.000				
23	graduate time	-0.032	0.4418*	0.4156*	0.054	-0.081	0.1108*	0.013	0.345*	0.4184*	-0.074	1.000			
24	campus_santiago	-0.016	-0.066	-0.053	0.053	0.1070*	0.1175*	0.032	0.040	0.1536*	0.2709*	0.007	1.000		
25	hgeorientation	0.2544*	0.014	0.008	0.1546*	0.063	0.1166*	-0.029	0.066	0.1375*	0.053	0.024	0.027	1.000	
26	region	0.001	-0.022	-0.018	0.014	0.073	0.045	0.019	-0.023	0.1271*	0.1594*	0.023	0.5061*	-0.040	1.000

Note: * $p<0.001$

We used a structural equation model (SEM) to capture and show results about the causal relationships and mediation effects among the variables of our proposed model (Baron & Kenny,1986, p.1176; Aguinis et al., 2017, p.673). This statistical technique was used to test the mediation effect[6] of graduate entrepreneurship (H3b) on the relationship between the UEE and sustainable impact (similarly to Kozlinska et al., 2020), as well as all direct and/or indirect effects among the variables included in the full SEM model (see Model 3). Before running this model, we first corroborated the construct validity (entrepreneurship education, infrastructure and support mechanisms, and sustainable impacts) with KMO[7] parameters above 0.700 (see Appendix 7). Then, we ran the SEM model to corroborate the direct and the indirect relationships among variables.

[6] The analysis is focused on the achievement of the three principles recommended by Baron & Kenny (1986, p.1176). According to these authors, mediation exists if three conditions are met. First, the explanatory variable is a significant predictor of both the dependent variable and the mediator variable (see OLS analysis). Second, the mediator variable is a significant predictor of the dependent variable (see 2LS analysis). Third, the effect of the independent variable on the dependent variable decreases when the mediator is added to the regression model (see SME analysis). If the effect of the explanatory variable is no longer significant when the mediator is added, then the effect is fully mediated; if the effect of the explanatory variables is reduced but significant, then the effect is partially mediated (see Aguinis et al., 2017, p.673).

[7] Kaiser–Meyer–Olkin measures the sampling adequacy that indicates the proportion of variance in the variables that might be caused by underlying factors. High values (close to 1.0) generally indicate that a factor analysis may be useful. If the value is less than 0.50, the results of the factor analysis probably will not be very useful (Information Resources Management Association, 2020, p.464).

CHAPTER 5: RESULTS

5.1 Qualitative findings

5.1.1 The UDD Entrepreneurship Ecosystem: Evolution

The interviews confirmed the different stages identified in the evolutionary process of the UDD entrepreneurship ecosystem (Appendix 2). There was a consensus in both alumni and current students that the compulsory entrepreneurship educational programs were the most influential element of the university ecosystem during their learning process. Moreover, all collectives also confirmed the configuration of the university ecosystem.

For alumni,

> nowadays, the university has designed very good initiatives that support entrepreneurship because, in the past ten years, the university ecosystem was not so developed in terms of infrastructures (incubators, accelerators, research centers) as well as it was not so opened to capture the attention of students enrolled in none business studies. (AE01, AE04, AE05, AT04, AT07, AT09)

Current students legitimized the transversal university entrepreneurship commitment because "received lot information about weekly events, formal/informal supports, and extracurricular programs implemented by the university" (SE01, SE04, SE07, ST05, ST07, ST09).

Nevertheless, the effectiveness of the university ecosystem was not well perceived by the collective of current students classified as non-entrepreneurs. The main reason was "the lack of interest in participating or attending the university entrepreneurship initiatives/activities because they are not interested in becoming entrepreneurs" (ST04, ST05, ST06, ST07). In summary, nearly all students recognized that the UDD provides a positive environment for entrepreneurship.

5.1.2 The UDD Entrepreneurship Ecosystem: Outcomes

According to the UDD (2018), 7,399 students have participated in the UDD entrepreneurship ecosystem through its training/programs (75 programs) and entrepreneurship contests (138 projects). In addition, more than 5,000 students have attended entrepreneurship events/conferences promoted by the UDD. From 2014 to 2017, the UDD entrepreneurship ecosystem was involved in more than 60 start-ups with the support of public seed capital ($1.000 MM), and in more than 150 technological agreements in alliance with recognized research centers and private organizations, producing several patents (UDD, 2018).

An alumni survey also revealed the relevant participation of this collective in the development of entrepreneurial initiatives after graduation. Approximately 20% of 14,000 graduates have created ventures motivated by the identification of business opportunities or have enrolled as self-employed (UDD, 2020). Interestingly, an alumni collective invests in entrepreneurial projects promoted by other entrepreneurs. This was corroborated during our interviews because the eight graduates' entrepreneurs detailed their involvement in creating 27 ventures after graduation (just 12 are actively operating in the market) with over 135 employees. At least 25% had a high-tech orientation and 10% an international orientation. Similarly, the eight student entrepreneurs had created 17 ventures during their time at the university (one actively operating in the market) with at least nine employees. Based on these objective outcomes, the UDD entrepreneurship ecosystem has been "responsible" for different outcomes captured from the university community (current and graduate students).

5.1.3 The UDD Entrepreneurship Ecosystem: Sustainable impacts

The interviews captured additional detailed information about the influence of the UDD ecosystem on the entrepreneurial behaviors/actions of alumni and students (Appendix 4). All those interviews evidenced more positive than negative experiences during their enrollment at the UDD.

Among the entrepreneurs (alumni and current students), most recognized that the university had strongly influenced their entrepreneurial behaviors/actions and the impact those initiatives produced on society. The majority mentioned that the entrepreneurial recognition and reputation of the university motivated them to select it as a first option when deciding their university career. Interestingly, this perception was stronger in current than former students. A plausible reason for this is the immersion of the former in a larger university ecosystem compared to the latter's experience.

For former students turned entrepreneurs*, "*the university helps them to reinforce the tolerance, persistence, resilience (AE01) as well as provides the skills/knowledge that is crucial for creating a new venture (AE08)". Nevertheless, some were especially critical, believing that "the university did not make efforts to go with him and did not offer support to his initiative*"* (AE04) or that "the entrepreneurship training did not provide all the knowledge that she required during her entrepreneurial immersion" (AE05).

The mindset of all entrepreneurial students was continuously influenced by "the knowledge acquired during entrepreneurship training (SE01), by the experiences/advice received from mentors, guest speakers, professors, investors during their participation in informal events

(SE02, SE04, SE05), by the university values (SE03) and by the openness of students to capture all these benefits (SE06)". Contrasting the entrepreneurs with non-entrepreneurs, the perception was stronger among graduate than current students.

The non-entrepreneur collective recognized that "the influence of university on their decisions was through the configuration of entrepreneurial values (ANE03, ANE05, SNE08, and SNE09) but not enough for becoming entrepreneurs after graduation (ANE04, ANE06, ANE07, SNE03, SNE01, SNE02)". In fact, they believed "that entrepreneurship is more a personal decision that is taken independently of the exposition to a supportive university environment (ANE01, ANE02, SNE04, SNE05, and SNE06)".

These subjective outcomes illustrate that UDD´s entrepreneurship ecosystem has had different influences according to the university community's profile (as expected, the strongest impact was observed in the entrepreneurs collective and the lowest in the non-entrepreneurs collective).

5.2 Quantitative findings

5.2.1 The effect of entrepreneurship education and support mechanisms on graduate entrepreneurship magnitude and quality

Table 3 shows the results from the OLS regressions. Model 1a shows the effect of control variables on the dependent variables. These results revealed that being a male [0.363, $p<0.001$] from business studies [0.364, $p<0.10$] with entrepreneurial role models [0.314,

p<0.001] and social networks from previous schools [0.204, p<0.05] was the most significant determinant of graduate entrepreneurship in the analyzed sample.

Regarding the effect of entrepreneurship education, Model 1b added the effects of the set of independent variables related to entrepreneurship education. The results showed that the number of credits taken in entrepreneurship education courses [-0.019, p<0.10] and the time from when those credits were taken [-0.048, p<0.10] slightly but significantly negatively affected the number of ventures created by the UDD graduates. A plausible explanation could be the difficulty of launching a mandatory entrepreneurship course within different schools on a large scale and the probable asymmetry in quality and disciplinary approaches (Lourenço et al., 2013). Another possible explanation is that specific courses make students' entrepreneurship expectations more realistic and, in many cases, discourage them from following an entrepreneurial path (Oosterbeek et al., 2010; Fayolle, 2018). Interestingly, the relative credits failure in entrepreneurship education [1.544, p<0.001] positively influenced the number of ventures created by the UDD graduates. A potential interpretation is that entrepreneurial students invest considerable time in their endeavors with a tradeoff effect on their academic performance. This also could be explained by the opportunity recognition. Indeed, Farashah (2013) had similar findings linking failure entrepreneurship education and entrepreneurial intentions in Iran. According to these results we did not find strong evidence to support H1a.

Regarding the effect of infrastructure and support mechanisms, Model 1c added the effects of the set of independent variables related to the university entrepreneurship ecosystem. The results showed that the UDD investment in entrepreneurship positively affected graduate

entrepreneurship [0.741, $p<0.10$]. This is similar to the findings obtained by Urbano et al. (2017) and Guerrero et al. (2018) related to the university ecosystem's ability to enhance graduate entrepreneurship in both developed and developing economies. The results also showed a strong effect of graduates' perceptions on the influence of the UDD entrepreneurship ecosystem through their involvement in entrepreneurial initiatives [0.173, $p<0.001$] and the degree of their use and recognition of the elements present in the UDD entrepreneurship ecosystem [0.294, $p<0.05$ and 0.105, $p<0.05$, respectively]. These graduates' perceptions revealed initial insights into the (in)direct contribution of the entrepreneurial university ecosystem and their subsequent entrepreneurial behaviors and actions.

Another relevant finding was the interaction effects between entrepreneurship education metrics and UDD entrepreneurship investment per year. Specifically, Model 1d shows that the effect of entrepreneurship education credits on graduate entrepreneurship was positively moderated by the investment in entrepreneurship [0.628, $p<0.05$]. It indicates a similar effect of time-distance from entrepreneurship education [0.327, $p<0.10$]. The reinforcement of entrepreneurship education by the entrepreneurial university ecosystem was recognized conceptually but had not been tested empirically until now (Pittaway & Cope, 2007).

Another line of analysis from the previous results was the compulsory nature of entrepreneurship courses compared to the voluntary dimension of other elements of the ecosystem. The latter could imply that students motivated in entrepreneurship seek advice and support and are more sensitive to the appearance and existence of specialized programs

and infrastructure. As a result, those students made greater use of these elements. Ou results showed strong evidence to support H2a and H2c.

Regarding the relationship between UEE configuration on graduate entrepreneurship quality, Tables 4,5,6, and 7 show the outputs from the OLS regressions using the same independent variables of Model 1 and four new dependent variables: sales (Model 2a), employment (Model 2b), sales growth (Model 2c), and employment growth (Model 2c). The results revealed no significant effect of any of the independent variables (i.e., entrepreneurship education and other support mechanisms), on the quality of the ventures created by the UDD entrepreneurial graduates. One explanation could be the lower reliability of the data due to the use of a smaller dataset (251), comprised of only graduates who claimed to be entrepreneurs, and the high number of non-answered questions related to entrepreneurial quality. We did not, then, find strong evidence to support both H1b and H2b. quality. We did not, then, find strong evidence to support both H1b and H2b.

Table 3: Model 1 [OLS analysis]

Variables	Graduate entrepreneurship	Model 1a			Model 1b			Model 1c			Model 1d		
		Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t
Entrepreneurship education (H1)	eecredits				-0.019	0.002	*	-0.017	0.009	*	-0.029	0.009	***
	eegrade				-0.024	0.031		-0.006	0.023		0.018	0.022	
	eetime				-0.048	0.017	*	-0.013	0.023		-0.033	0.023	
	eefailure				1.544	0.481	***	1.164	0.415	***	1.563	0.455	***
Infrastructure and support measures (H2a)	lneeinvestperstudent							0.741	0.051	*	-5.439	2.246	**
	euinfluence							0.173	0.044	***	0.159	0.041	***
	eetotal							0.105	0.041	**	0.110	0.040	**
	eutotal							0.294	0.118	**	0.306	0.119	**
Interactions (H2b)	eecredits * lneeinvestperstudent										0.638	0.234	**
	eegrade * lneeinvestperstudent										-0.229	0.127	*
	eetime * lneeinvestperstudent										0.327	0.127	*
	eefailure * lneeinvestperstudent										-9.265	4.603	*
Controls	age	0.093	0.088		0.119	0.079		0.080	0.076		0.085	0.075	
	age2	-0.001	0.001		-0.002	0.001		-0.001	0.001		-0.001	0.001	
	gender	0.363	0.077	***	0.302	0.078	***	0.105	0.059	*	0.106	0.060	*
	Businesscareer	0.364	0.209	*	0.244	0.209		0.194	0.169		0.144	0.173	
	entrefamilysrolmodel	0.314	0.068	***	0.298	0.067	***	0.096	0.055	*	0.089	0.055	*
	precollege	0.204	0.095	**	0.178	0.096	**	0.162	0.084	*	0.158	0.085	*
	postlaboryears	0.069	0.035	**	0.074	0.034	**	0.081	0.030	**	0.077	0.030	*
	income	0.086	0.042	**	0.097	0.042	**	0.081	0.036	**	0.074	0.036	*
	graduatestotal	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
	graduatetime	-0.001	0.022		0.042	0.025	*	0.041	0.019	**	0.045	0.019	**
	campus	-0.001	0.118		-0.046	0.120		0.004	0.102		0.013	0.103	
	region	0.003	0.023		0.005	0.022		0.012	0.020		0.009	0.020	
	_cons	-1.853	1.266		-1.699	1.215		-1.684	1.132		-1.760	1.113	
N		824			824			824			824		
F		10.14			8.45			16.34			16.36		
Prob > F		***			***			***			***		
R-squared		0.227			0.2418			0.4394			0.4615		

Note: * p<0.100; ** p<0.050; *** p<0.001

Table 4: Model 2a [OLS analysis]

Variables	Graduate entrepreneurship quality (sales)	Model 2a		
		Coef.	Robust Std. Err.	P>t
Entrepreneurship education (H1)	eecredits	0.376	0.595	0.527
	eegrade	1012	1.62	0.196
	eetime	-0.781	-0.99	0.321
	eefailure	-1135	-0.12	0.908
	lneeinvestperstudent	1878	0.67	0.503
	euinfluence	-1250	-1.27	0.204
	eetotal	1619	1.50	0.136
	eutotal	3260	1.62	0.186
	age	1620	0.50	0.621
	age2	-0.0254	-0.51	0.609
	gender	1.208	0.70	0.485
	sscareer	-0.928	-0.28	0.776
	entrefamilysrolmodel	0.408	0.23	0.821
	precollege	-5.008	-0.85	0.395
	postlaboryears	0.103	0.20	0.845
	income	3.013	1.93	0.055
	graduatestotal	0.003	0.94	0.346
	graduatetime	1.307	2.05	0.042
	campus	2.980	1.26	0.208
	region	-0.509	-0.98	0.326
	_cons	-35.205	-0.64	0.521
N		251		
F		1.28		
Prob > F		***		
R-squared		0.174		

Note: * p<0.100; ** p<0.050; *** p<0.001

Table 5: Model 2b [OLS analysis]

Variables	Graduate entrepreneurship quality (employment)	Model 2b		
		Coef.	Robust Std. Err.	P>t
Entrepreneurship education (H1)	eecredits	0.153	0.118	0.193
	eegrade	0.058	0.093	0.535
	eetime	0.169	0.148	0.255
	eefailure	-3.935	2.703	0.148
	lneeinvestperstudent	-0.463	0.734	0.529
	euinfluence	-0.171	0.184	0.355
	eetotal	-0.121	0.209	0.564
	eutotal	0.439	0.466	0.109
	age	0.054	0.977	0.956
	age2	-0.003	0.016	0.832
	gender	-0.004	0.511	0.994
	sscareer	-0.429	1.080	0.692
	entrefamilysrolmodel	0.033	0.703	0.962
	precollege	0.414	0 .981	0.673
	postlaboryears	0.209	0.108	0.055
	income	1.165	0.380	0.003
	graduatestotal	0.001	0.001	0.296
	graduatetime	-0.153	0.361	0.671
	campus	-0.023	0.642	0.971
	region	-0.172	0.072	0.018
	_cons	11.881	15.406	0.442
N		251		
F		1.28		
Prob > F		***		
R-squared		0.174		

Note: * p<0.100; ** p<0.050; *** p<0.001

Table 6: Model 2c [OLS analysis]

Variables	Graduate entrepreneurship quality (employment growth)	Model 2c		
		Coef.	Robust Std. Err.	P>t
Entrepreneurship education (H1)	eecredits	0.011	0.013	0.397
	eegrade	-0.0144	0.016	0.378
	eetime	-0.025	0.025	0.192
	eefailure	-0.010	0 .235	0.967
	lneeinvestperstudent	-0.140	0.168	0.241
	euinfluence	0.006	0.020	0.750
	eetotal	0.022	0.017	0.187
	eutotal	-0.010	0.021	0.623
	age	0.111	0.061	0.073
	age2	-0.002	0.001	0.075
	gender	0.058	0.045	0.201
	sscareer	-0.075	0.093	0.423
	entrefamilysrolmodel	-0.002	0.051	0.969
	precollege	0.034	0.063	0.588
	postlaboryears	0.001	0.014	0.923
	income	0.031	0.019	0.117
	graduatestotal	7.48e-06	0.001	0.945
	graduatetime	0.019	0.016	0.231
	campus	0.067	0.061	0.276
	region	-0.008	0.009	0.327
	_cons	-1.753	0.973	0.073
N		251		
F		1.28		
Prob > F		***		
R-squared		0.174		

Note: * p<0.100; ** p<0.050; *** p<0.001

Table 7: Model 2d [OLS analysis]

Variables	Graduate entrepreneurship quality (sales growth)	Model 2d		
		Coef.	Robust Std. Err.	P>t
Entrepreneurship education (H1)	eecredits	0.020	0.015	0.185
	eegrade	0.009	0.015	0.584
	eetime	0.022	0.015	0.134
	eefailure	-0.295	0.259	0.256
	lneeinvestperstudent	-0.131	0.092	0.114
	euinfluence	0.002	0.022	0.924
	eetotal	-0.005	0.019	0.780
	eutotal	0.037	0.029	0.192
	age	0.078	0.067	0.249
	age2	-0.001	0.001	0.195
	gender	0.093	0.057	0.104
	sscareer	0.165	0.143	0.254
	entrefamilysrolmodel	0.012	0.055	0.833
	precollege	-0.185	0.109	0.091
	postlaboryears	0.012	0.016	0.426
	income	0.055	0.023	0.017
	graduatestotal	-0.000	0.000	0.195
	graduatetime	-0.041	0.019	0.035
	campus	0.060	0.096	0.533
	region	-0.013	0.012	0.282
	_cons	-1.081	1.077	0.317
N		251		
F		1.28		
Prob > F		***		
R-squared		0.174		

Note: * p<0.100; ** p<0.050; *** p<0.001

5.2.2 The effect of graduate entrepreneurship on sustainable development

Table 4 present the results obtained from the first stage (to confirm the effect of entrepreneurship education and infrastructure/support mechanisms on graduates' propensity to create new ventures). It additionally shows the results from the second stage (to test the sustainable impacts generated in the region from the new ventures created by graduate entrepreneurs) of the 2SLS analysis (Model 2).

In the first stage, all models confirmed findings similar to the OLS model (Table 3) along the negative determinants of entrepreneurship education metrics (not strong evidence to support H1). In addition, the models illustrated the positive determinants of graduate entrepreneurship in the UDD university: the investment in entrepreneurship [0.741, $p<0.10$], the favorable graduates' perceptions about the significative influence of the UDD entrepreneurship ecosystem in their involvement on entrepreneurial initiatives [0.173, $p<0.001$], and the degree of using [0.294, $p<0.05$] and knowing [0.105, $p<0.05$] the UDD entrepreneurship ecosystem's elements (supported H2a).

In the second stage, all models confirmed the positive contribution of the UDD graduate entrepreneurship on the perceived dimensions of sustainable impacts in the Chilean regions. These included economic [1.607, $p<0.001$], social [1.604, $p<0.001$], technological [1.325, $p<0.001$], and climate [1.226, $p<0.001$]. The results represented a positive advance in the entrepreneurial university literature (Åstebro et al., 2012; Urbano & Guerrero, 2013; Guerrero et al., 2015; Miranda et al., 2018; Roncancio-Marin et al., 2022) by providing empirical evidence of the sustainable contribution of graduates' entrepreneurial initiatives in their regions (supporting H3a).

Table 8: Model 2 [2SLS analysis]

Step 2	Variables	Model 2a: Economic impact			Model 2b: Social impact			Model 2c: Technologic impact			Model 2ad Climate impact		
		Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t	Coef.	Robust Std. Err.	P>t
DV	Graduate entrepreneurship	1.607	0.156	***	1.604	0.164	***	1.325	0.129	***	1.226	0.134	***
Controls													
	hgeorientation	-0.212	0.441		-0.191	0.467		-0.085	0.407		-0.053	0.382	
	region	-0.044	0.024	*	-0.055	0.026	*	-0.035	0.023		-0.045	0.021	**
	_cons	0.643	0.304	**	0.801	0.324	*	0.532	0.282	**	0.685	0.269	**
Step 1	**Graduate entrepreneurship**	**Coef.**	**Robust Std. Err.**	**P>t**	**Coef.**	**Robust Std. Err.**	**P>t**	**Coef.**	**Robust Std. Err.**	**P>t**	**Coef.**	**Robust Std. Err.**	**P>t**
Entrepreneurship	eecredits	-0.017	0.008	*	-0.017	0.008	*	-0.017	0.008	*	-0.017	0.008	*
education	eegrade	-0.006	0.023		-0.006	0.023		-0.006	0.023		-0.006	0.023	
	eetime	-0.013	0.003	**	-0.013	0.003	**	-0.013	0.003	**	-0.013	0.003	**
	eefailure	1.164	0.415	**	1.164	0.415	**	1.164	0.415	**	1.164	0.415	**
	lneeinvestperstudent	0.741	0.051	*	0.741	0.051	*	0.741	0.051	*	0.741	0.051	*
Infrastructure and	euinfluence	0.173	0.044	***	0.173	0.044	***	0.173	0.044	***	0.173	0.044	***
support measures	eetotal	0.105	0.041	**	0.105	0.041	**	0.105	0.041	**	0.105	0.041	**
	eutotal	0.294	0.118	**	0.294	0.118	**	0.294	0.118	**	0.294	0.118	**
Controls	age	0.080	0.076		0.080	0.076		0.080	0.076		0.080	0.076	
	age2	-0.001	0.001		-0.001	0.001		-0.001	0.001		-0.001	0.001	
	gender	0.105	0.059	*	0.105	0.059	*	0.105	0.059	*	0.105	0.059	*
	Businesscareer	0.194	0.169		0.194	0.169		0.194	0.169		0.194	0.169	
	entrefamilysrolmodel	0.096	0.005	*	0.096	0.005	*	0.096	0.005	*	0.096	0.005	*
	precollege	0.162	0.008	**	0.162	0.008	**	0.162	0.008	**	0.162	0.008	**
	postlaboryears	0.081	0.030	**	0.081	0.030	**	0.081	0.030	**	0.081	0.030	**
	income	0.081	0.036	**	0.081	0.036	**	0.081	0.036	**	0.081	0.036	**
	graduatestotal	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
	graduatetime	0.041	0.019	**	0.041	0.019	**	0.041	0.019	**	0.041	0.019	**
	campus	0.004	0.102		0.004	0.102		0.004	0.102		0.004	0.102	
	hgeorientation	0.698	0.225	***	0.698	0.225	***	0.698	0.225	***	0.698	0.225	***
	region	0.012	0.020		0.012	0.020		0.012	0.020		0.012	0.020	
	_cons	-1.684	0.132	*	-1.684	1.032	*	-1.684	1.032	*	-1.684	1.032	*
N		824			824			824			824		
F(21. 802)		16.34			16.34			16.34			16.34		
Prob > F		***			***			***			***		
R-squared		0.4394			0.4394			0.4394			0.4394		
Adj R-squared		0.4247			0.4247			0.4247			0.4247		

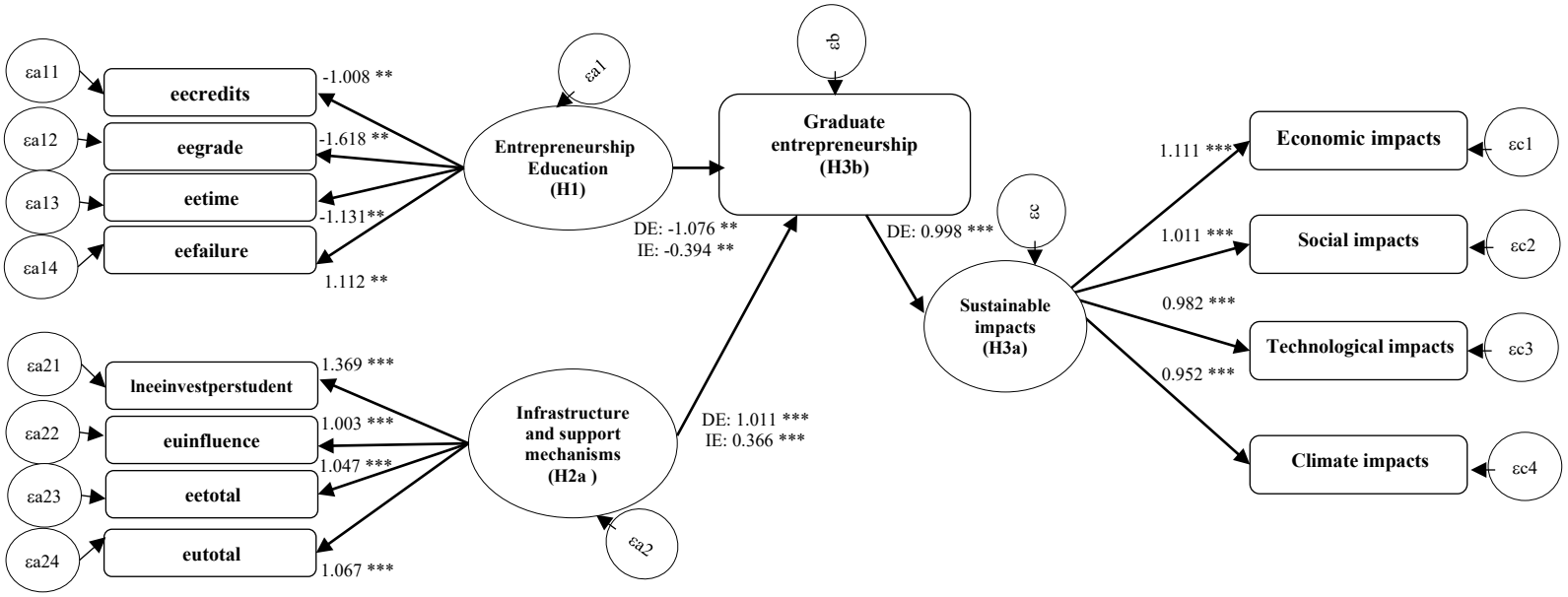
Instrumented: graduate entrepreneurship **Instruments**: hgeorientation region eecredits eegrade eetime eefailure lneeinvestperstudent euinfluence eetotal eutotal age age2 gender Businesscareer entrefamilysrolmodel precollege postlaboryears income graduatestotal graduatetime campus

Note: * p<0.100; ** p<0.050; *** p<0.001

5.2.3 The mediation effect of graduate entrepreneurship

In the 2SLS analysis (Table 4), graduate entrepreneurship was an instrumental variable that captured the effect of entrepreneurial university ecosystems (entrepreneurship education, infrastructures, and support mechanisms) in the first stage. It also contributed to regional sustainable impacts in the second stage. The results overall provided insight into the entrepreneurial university ecosystem's (in)direct effect on sustainable impacts via graduate entrepreneurship (supporting H3b).

As a robustness test of these results, Figure 4 shows the SME analysis of the conceptual model (Figure 3) as well as the previous models. We confirmed the negative effect of the full set of entrepreneurship education metrics [-1.076, $p<0.050$] as well as the positive effect of the full set of infrastructure and support mechanisms metrics [1.011, $p<0.001$] on graduate entrepreneurship. Likewise, graduate entrepreneurship significantly contributed to regional sustainable impacts [0.988, $p<0.001$]. This analysis, then, enhanced understanding of the specific contribution of graduate entrepreneurship on the different metrics of sustainable impacts, including economic [0.917, $p<0.001$], social [0.908, $p<0.001$], technological [0.801, $p<0.001$], and climatic [0.774, $p<0.001$]. Lastly, the model also confirmed entrepreneurship education's indirect influence on sustainable impacts via graduate entrepreneurship [-0.394, $p<0.05$], as infrastructure and support mechanisms' indirect influence on sustainable impacts via graduate entrepreneurship [0.366, $p<0.001$]. Therefore, the results provided evidence of the mediation effect of graduates' entrepreneurial initiatives (supporting H3b).



Mediation Principles	Relationship	Direct			Indirect		
		Coef.	S.E.	Sig.	Coef.	S.E.	Sig.
a	Entrepreneurship education -> Graduate entrepreneurship	-1.076	0.489	**			
ab	Entrepreneurship education -> Graduate entrepreneurship -> Sustainable impacts				-0.394	0.101	**
c	Entrepreneurship education -> Sustainable impacts				-0.174	0.062	*
a	Infrastructure and support m -> Graduate entrepreneurship	1.011	0.024	***			
ab	Infrastructure and support m -> Graduate entrepreneurship -> Sustainable impacts				0.366	0.024	***
c	Infrastructure and support m -> Sustainable impacts				0.122	0.033	*
b	Graduate entrepreneurship -> Sustainable impacts	0.998	0.367	***			
	Graduate entrepreneurship -> Sustainable impacts (economic)				0.917	0.037	***
	Graduate entrepreneurship -> Sustainable impacts (social)				0.908	0.036	***
	Graduate entrepreneurship -> Sustainable impacts (technological)				0.801	0.033	***
	Graduate entrepreneurship -> Sustainable impacts (climate)				0.774	0.032	***

Note: * p<0.100; ** p<0.050; *** p<0.001

SME parameters [x^2 normalized 1.967; CFI 0.900; GFI 0.899 and RMSEA 0.049]

Figure 4: Model 3 [SME analysis]
Source: Author

CHAPTER 6: DISCUSSION

6.1 Discussion

The general objective of this doctoral dissertation was to explore the configuration and impacts of university entrepreneurship ecosystems in the context of emerging economies. To provide insights about the achievement of this general objective, we developed the analysis through the following specific objectives.

6.1.1 Specific Objective 1

SO1: To propose a theoretical model that allows understanding of the configuration of university entrepreneurship ecosystems in the context of emerging economies.

To achieve this objective, we performed a thorough literature review to define the elements present in a university entrepreneurship ecosystem and their configuration in an emergent economy setting. Finally, we contrasted these elements with a group of entrepreneurs and non-entrepreneurs (students and alumni).

The responses obtained showed that entrepreneurship education was the central pillar of the ecosystem—though not necessarily the strongest element for influencing behavior. In addition, an entrepreneurial environment and culture appeared to significantly influence the development of an entrepreneurial mindset, but this was likely more influential for students who had a previous inclination toward entrepreneurship. Another important aspect was the perceived evolutionary nature of the entrepreneurship ecosystem. This was the case because the older group showed a lower recognition of the complexity and size of the ecosystem than the younger group. This work was the base for our next step: empirically testing it using a database generated from different sources, including a survey.

6.1.2 Specific Objective 2

SO2: To explore the influence generated by university entrepreneurship ecosystems on graduates' entrepreneurial behaviors in emerging economies.

To achieve this goal, and based on our theoretical model, we first built a database using different sources of information that would allow us to measure the effectiveness of UDD´s ecosystem on students' future entrepreneurial behavior. We used academic and financial records and a survey that captured alumni´s perception of the degree of influence and magnitude of the different entrepreneurship activities and resources when they were students. The results showed that an approach based mainly on massive, mandatory entrepreneurship courses did not have the expected positive effect on future entrepreneurial behavior. This traditional model is at times the first step for institutions in emergent economies contexts who want to incorporate entrepreneurship within their academic priorities. However, they are at risk of being an insufficient and an undervalued support for those who want to become entrepreneurs. Moreover, the sole presence and use of diverse support mechanisms had a positive effect on the future entrepreneurial behavior of students, and also in combination with entrepreneurship courses (see Table 5). This constitutes a contribution to the area, since this has been conceptually recognized in the past but had not previously been empirically tested. That said, we did not uncover any evidence of the relationship between an entrepreneurial ecosystem and the quality of the ventures created by students.

6.1.3 Specific Objective 3

SO3: To explore the sustainable impacts generated in emerging economies by entrepreneurial individuals who participated in a university entrepreneurship ecosystem.

Using the same survey, we sought the perceived sustainable impacts (i.e., economic, social, environmental, and technological) of individuals who had studied at UDD. The results showed a strong mediator role of graduate entrepreneurship between entrepreneurial ecosystem variables and sustainable impacts (see Table 5). This contributes to the emergent literature on the topic, giving an empirical approach to the importance of universities' role beyond economic impact through human capital development and the expansion thereof to other impact dimensions (e.g., social and environmental).

Table 9: Testing hypotheses

Hypotheses		Findings	Testing
H1a	Entrepreneurship education has a positive effect on graduates' entrepreneurship	The negative effect of the main metrics of entrepreneurship education (credits, grades, and time distance), but positive effect of failure	No strong evidence to support it
H1b	Entrepreneurship education has a positive effect on graduate's entrepreneurship quality	No significant effect of the main metrics of entrepreneurship education (credits, grades, and time distance) on any of the variables related to entrepreneurship quality.	No strong evidence to support it
H2a	The university entrepreneurship ecosystem has a positive effect on graduate entrepreneurship	The positive effect of all metrics used to measure the university entrepreneurship ecosystem	Supported
H2b	The university entrepreneurship ecosystem has a positive effect on graduate entrepreneurship quality	No significant effect of all metrics used to measure the university entrepreneurship ecosystem on any of the variables related to entrepreneurship quality.	No strong evidence to support it
H2c	The university entrepreneurship ecosystem positive moderate the relationship between entrepreneurship education and graduate's entrepreneurship	The positive effect of the interaction (education metrics and UDD investment to foster entrepreneurship) on graduate entrepreneurship	Supported
H3a	The graduates' entrepreneurship has a positive impact on sustainable development.	The positive effect of graduate entrepreneurship on the multiple dimensions of regional sustainable impacts (economic, social, technologic, climate)	Supported
H3b	The graduates' entrepreneurship positively mediates the relationship between university entrepreneurship ecosystems and impacts on sustainable development	The confirmation of the mediation effect of graduate entrepreneurship in the positive relationship between the UEE and sustainable impacts	Supported

Source: Authors

CHAPTER 7: CONCLUSIONS

7.1 Academic implications

This study made several contributions to the research in this area. First, it proposed a framework of the configuration of a university entrepreneurship ecosystem that could enhance understanding of which elements and interactions are present in the ecosystem. Second, the study used an emergent economy setting to explore the differences between other studies focused mainly on developed economies. Third, it empirically tested the framework using a robust methodology. Fourth, this research focused on start-up creation rather than the more commonly used attitudinal dimensions, such as entrepreneurial intentions. Furthermore, we considered sustainable impacts as specific contributions in response to past researchers' calls for more empirical studies examining entrepreneurial ecosystems and outcomes (Belitski & Heron, 2017; Wright et al., 2017).

7.2 Practical implications

From a practical perspective, this work contributed to reinforcing the essential role of universities as active agents for an entrepreneurial society. In 2021, the European University Association (EUA) published *Universities without Walls: a Vision for Universities in 2030*. This report stipulated that universities of the future should be "open, transformative and transnational; sustainable, diverse and engaged." Reaching this goal, it claimed, would require strong innovation ecosystems. For emergent economies, this takes special relevance because an effective university entrepreneurship ecosystem could fill institutional voids present in those contexts. In so doing, they could trigger entrepreneurial activities in students who then contribute to the economic and social development of their country. Another significant contribution was highlighting the complexity of an entrepreneurial ecosystem and its evolutive nature. Entrepreneurial ecosystems should be supported and designed not only

through courses but also by considering different elements (e.g., incubators, infrastructure, mentorships, etc.). Indeed, special importance should be placed on the interaction among those elements and the academic community.

7.3 Empirical limitations

There were some limitations present in this study. For instance, due to the compulsory nature of entrepreneurship courses at UDD, we did not have a control group to measure differences. To address this issue, we used student grades, which is a solution with less internal validity than the traditional comparison between a control and treatment group. In addition, expressed perceptions and self-reported data is commonly used in these types of studies. However, this research did not have record of the participation and involvement of the individuals in those programs and the activities comprising the entrepreneurial ecosystem. Neither did it possess detailed data on sustainable objective impacts of alumni. The lack of these data constituted an issue that should be addressed in future studies to improve the analysis. Finally, although online surveys are an effective way to capture data from a large sample of individuals, certain issues inherent within them—specifically in non-responses to specific questions—affected the results. Their use therefore also impacted the subsequent analysis.

CAPÍTULO 7: CONCLUSIONES

7.1 Implicancias académicas

Este estudio tiene varias contribuciones a la investigación en esta área. Primero, proponer un marco conceptual sobre la configuración de un ecosistema de emprendimiento universitario que pueda ayudar a una mejor comprensión de cuáles son los elementos e interacciones presentes en dicho ecosistema. En segundo lugar, utilizar un contexto de economía emergente para explorar las diferencias con otros estudios centrados principalmente en economías desarrolladas. Tercero, testear empíricamente este marco conceptual a través de una metodología robusta. Finalmente, centrarse en la creación de nuevas empresas, en lugar de las dimensiones actitudinales comúnmente utilizadas, como las intenciones emprendedoras, y considerar los impactos sostenibles, son contribuciones específicas que responden al llamado de la academia para más estudios empíricos en el tema de los ecosistemas emprendedores y sus resultados (Belitski & Heron, 2017; Wright et al., 2017).

7.2 Implicancias prácticas

Desde una perspectiva práctica, este trabajo contribuye a reforzar el papel esencial de las universidades como agentes activos de una sociedad emprendedora. En 2021, la Asociación Europea de Universidades (EUA) publicó Universidades sin muros: una visión para las universidades en 2030. En este informe postulan que las universidades del futuro deberían ser “abiertas, transformadoras y transnacionales; sostenibles, diversas y comprometidas” y la forma de alcanzar este objetivo es a través de ecosistemas de innovación fuertes. Para las economías emergentes, esto cobra especial relevancia porque un ecosistema de emprendimiento universitario efectivo podría, además de lo anterior, llenar los vacíos

institucionales presentes en esos contextos y, de esa forma, detonar actividades emprendedoras de los estudiantes que luego contribuirán al desarrollo económico y social de su país. Otra contribución significativa de este estudio es resaltar la complejidad de un ecosistema emprendedor y su naturaleza evolutiva. Los ecosistemas emprendedores deben apoyarse y diseñarse no solo a través de cursos, sino también considerando diferentes elementos (por ejemplo, incubadoras, infraestructura, mentorías, etc.) y dando especial importancia a la interacción entre esos elementos y la comunidad académica.

7.3 Limitaciones empíricas

Hay algunas limitaciones presentes en este estudio. Primero, debido a la obligatoriedad de los cursos de emprendimiento en la UDD, no tuvimos un grupo de control para medir las diferencias. Para abordar este problema, utilizamos las calificaciones obtenidas por los estudiantes, lo que sigue siendo una solución con menor validez interna que la comparación tradicional entre un grupo de control y uno de tratamiento. En segundo lugar, si bien es usual para este tipo de estudios utilizar la percepción de un individuo, el no tener a nivel individual un registro de la participación e involucramiento de individuos específicos en diferentes actividades y programas de emprendimiento, y en la misma línea no contar con datos detallados de impactos objetivos sostenibles de los egresados constituyen un problema que deberá ser abordado en el futuro por otros estudios y de esta manera mejorar el análisis.

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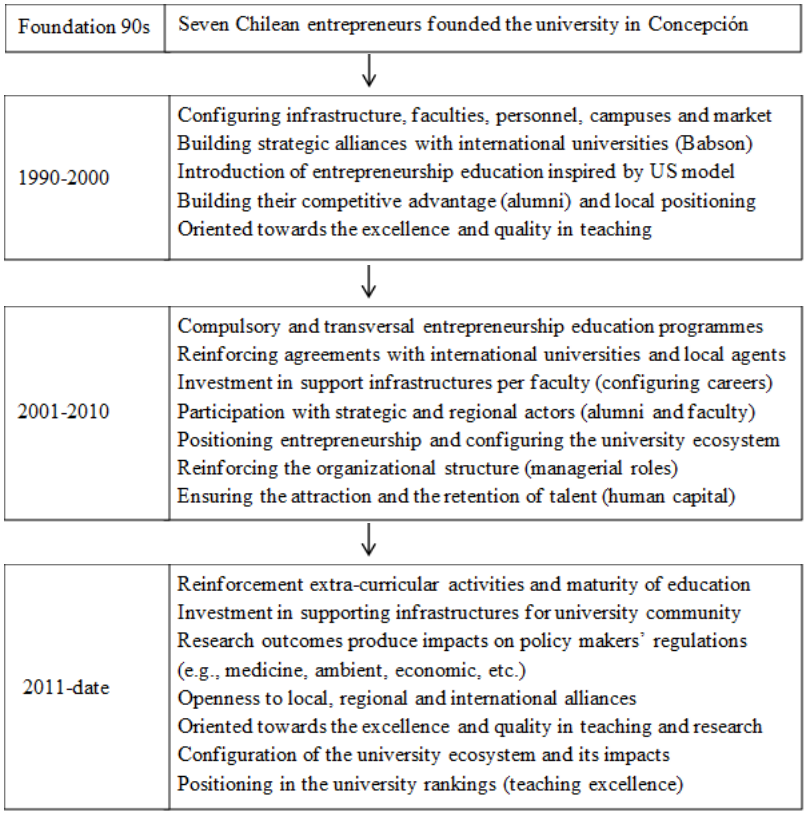
APPENDIXES

Appendix 1: Evolution of the UDD Entrepreneurship Ecosystem



Source: Authors

Appendix 2: Pilot Study (Interviewees' Profiles)

Participants	Focus Group (Entrepreneurs)	Control Group (Not Entrepreneurs)
Graduate students	8 graduate entrepreneurs 28 years old (63% male) 5-10 years of labor experience 37% Business background	7 graduate entrepreneurs 27 years old (71% male) 5-11 years of labor experience 43% Business background
Active students	8 student entrepreneurs 23 years old (50% male) 1-2 years of labor experience (practice) 50% Business background	9 non-entrepreneurial students 22 years old (43% male) 1 year of labor experience (practice) 44% Business background

Source: Authors

Appendix 3: Pilot Study (Alumni and Students' Re-construction of the UDD Entrepreneurship Ecosystem)

Groups		Educational programs							Infrastructures				Extracurricular activities					Access to capital				Informal support				Values					
		CEP	V	GS	NM	MW	EE	IN	AC	ITC	RI	CWS	CLUB	AWC	EVE	IEX	SF	BA	AN	O	MEN	SOC	ENV	INM	RM	EM	DIV	SRC	ETH	FREE
Graduate students (alumni)	AE01	X	X	X	X	X						X		X	X						X			X	X					
	AE02	X		X		X		X								X	X				X		X	X	X	X				
	AE03	X		X		X			X			X	X		X	X					X			X						
	AE04	X																							X					
	AE05	X				X		X							X				X		X			X						
	AE06		X	X										X	X										X						
	AE07	X				X		X	X	X							X				X			X						
	AE08	X			X			X													X	X		X	X					
	ANE01	X		X				X									X								X					
	ANE02	X				X		X									X								X					
	ANE03	X		X			X	X																	X					
	ANE04	X	X	X	X																X				X			X	X	
	ANE05		X																					X						
	ANE06	X																												
	ANE07	X					X	X									X							X	X					
Active students (current)	SE01	X	X	X	X			X	X			X	X		X					X	X				X	X				
	SE02	X		X	X			X					X		X						X			X	X	X				
	SE03	X						X				X									X	X		X	X					
	SE04	X						X	X				X								X		X							
	SE05	X		X	X			X	X						X					X	X				X					
	SE06	X			X			X																X						
	SE07	X	X					X															X		X	X				
	SE08	X				X	X	X				X	X			X	X				X			X	X					
	SNE01	X						X						X	X															
	SNE02	X														X														
	SNE03	X						X																		X				
	SNE04	X						X					X		X										X	X				
	SNE05	X						X	X			X			X															
	SNE06	X					X	X								X													X	
	SNE07	X						X	X			X																		
	SNE08	X					X	X					X	X	X													X	X	X
	SNE09	X	X	X			X	X		X	X					X						X			X					

Notes: CEP = Compulsory education; V = Visits; GS = Guest speakers; NM = Novel methodologies; MW = Minor workshops; EE = Educational exchange; IN= Incubators; Ac= Accelerators; ITC= innovation and technology centers; RI= research institutes; CWS= co-working spaces; Club = Clubs; AWC= Awards and contests; Eve= Events; IEX= International exchange; SF = seed capital; BA = business angels; AN = access to networks; Men= Mentoring; SOC = Social / voluntary; ENV = Environmental; INM = Informal meetings; RM = role models; EM = mind-set; DIV = Diversity; SRC= social responsibility; ETH= Ethics; Free = Freedom

Source: Interviews

Appendix 4: Pilot Study (Alumni and Students' Perceptions about the UDD Entrepreneurship Ecosystem)

Groups		Perception about the university	… about the ecosystem	Entrepreneurial initiatives	Sustainable impacts	Debate
Graduate students (alumni)	AE01 AE02 AE03 AE04 AE05 AE06 AE07 AE08	**(+)** tools, good education, culture and values, open to the world, tolerance, resilience **(-)** stigma, lower connectivity among university faculties **75%** confirm university influenced on their entrepreneurial behaviors and actions. The rest considers that their entrepreneurial initiatives are more linked with their personal motivations (4, 5).	**25%** have used more university elements than just entrepreneurship education **Relevant elements:** entrepreneurship education and Babson visit **Adequate:** 87%. For the rest, the lack of follow-up.	**During their studies**: all of them tried to develop small business **After graduation**: social, technological, and entrepreneurial initiatives	**Expectations**: economic impacts (make money), social (employment and well-being), tech (development of new technologies) **Real impacts**: 21 ventures created after graduation (12 active) and 135 employments	Impacts and follow up
	ANE01 ANE02 ANE03 ANE04 ANE05 ANE06 ANE07	**(+)** good education, good experience, and good relationship with the rest of the world **(-)** lower educational demand **80%** recognized that the university influenced them because of the culture (3, 5) but thought there was not so much support today (4, 6, 7). The other group thinks that indirectly because it is more personal (1, 2).	**0%** have used university elements than just entrepreneurship education **Relevant elements:** entrepreneurship education **Adequate:** 42%. For the 14% is more active today than in the past	**During their studies**: they have developed some social initiatives **After graduation**: two mentioned that one tried to create a business and the other has created a society	**Expectations**: economic impacts (generate income), social (employment, mind-set, and radical changes) **Real impacts**: 0 ventures created after graduation, but they have contributed by their professions	World connections
Active students (current)	SE01 SE02 SE03 SE04 SE05 SE06 SE07 SE08	**(+)** good education, practical focus, work in teams, great experience, constant challenge, good opportunities **(-)** growth, innovation, communication across careers **88%** confirm that the university ecosystem influences their entrepreneurial behavior, focusing on the generation of social and economic value. The 12% consider that it is relative because, in the end, it depends on personal interest.	**25%** have used more elements than just entrepreneurship education **Relevant elements:** entrepreneurship education, infrastructure, mentoring **Adequate:** 80% is very supported but with some deficiencies	**During their studies**, they all tried to find an equilibrium social (students' organizations) and economic (some initiatives). **After graduation**: they performed and improved their economic initiatives	**Expectations**: economic impacts (make money), social (circular economy), tech (sustainability) **Real impacts**: 17 ventures created after graduation (10 active operating with at least 9 employees)	Higher aspirations and expectations
	SNE01 SNE02 SNE03 SNE04 SNE05 SNE06 SNE07 SNE08 SNE09	**(+)** good education, good relationship with the rest of the world **(-)** received a lot of communications but are not interested **66%** recognized that the university influenced them but also recognized that it is not enough for them to become entrepreneurs (3) or considering that being an entrepreneur is an alternative after graduation (1, 2) or maybe because the support is not enough (8, 9). The rest recognized that being an entrepreneur is an individual decision and independent of the university environment (4, 5, 6, 1)	**0%** have used ecosystem elements than just entrepreneurship education **Relevant elements:** entrepreneurship education and infrastructure **Adequate:** 80% but they do not have interest or motivations for becoming entrepreneurs	**During their studies**: they have developed some self-employment initiatives but more social initiatives in non-profit organizations. 33% do not mention anything **After graduation**: not yet	**Expectations**: economic impacts (generate income), social (employment) ,and ambient mind-set **Real impacts**: 0 ventures created after graduation, but they expect to contribute by their professions (now practices)	Over exposition to events, activities, etc.

Source: Interviews

Appendix 5: Pilot Study (Secondary Data Sources)

Source	Perception about the university	… about the ecosystem	Entrepreneurial initiatives	Impacts
Employers' survey perception 2011-date Biannual 1000 respondents	• Entrepreneurship and leadership capabilities • Social responsibility and ethics	• Good positioning in the Chilean higher education system	• Continue improvement in the excellence and quality • Intrapreneurial orientation	• Positive perception about graduate students that entry in the labor market • Adequate knowledge and values
University Managers' survey perception Annual 3000 respondents	• Friendly environment • Demanding	• Supportive environment • Access to different resources and infrastructures • Flexibility to implement new methodologies	• Intrapreneurial projects in at the graduate level • Entrepreneurial projects in undergraduate level	• Technological ventures • Patents • Star-ups • Collaboration projects with strategic organizations
Students' survey perception 2005-date Annual More than 25000 respondents	• Selecting the university as a first option influenced by the entrepreneurial reputation • Good infrastructure and curricula • Good professors and mentors	• Contrasting with other universities in the region, students have a good positioning in the labor market • Favorable environment for studying and developing initiatives • Exposition to contests and events (entrepreneurship week) • Exchange programs with universities such as Babson, Stanford, etc.	• Pushed to be enrolled in several social and entrepreneurial projects during the career	• Social incidence in the society with the development of community programs
Alumni' survey perception 2005-date Annual 14000 respondents	• Good experience and education • Good recommendation and contracting UDD students • Have decided to study a second career or postgraduate studies	• Good contacts with other local agents • Good university support • Good positioning and recognition	• 20% have created ventures after graduation • 15% have evidenced the exit of ventures created after the failure • 5% have evidenced that they acted as investors • Family firms' involvements	• Good positioning in the labor market after graduation • Self-employment with the contribution of generation of employment • Enrolled in social, economic, and political initiatives
Financial records 2010-date Annual e		• Invested money in infrastructure, entrepreneurship courses, extracurricular activities, strategic projects • Exchange programs with universities such as Babson, Stanford, etc.		

Appendix 6: Follow-up Survey

1: Por favor, proporcione la información de su perfil socio-demográfico

1a. Año nacimiento: ____	1b. Género: Hombre Mujer Otro____	1c. Nacionalidad: Chilena Otra _____	1d. Experiencia laboral ____ (años)	1e. Ingresos: Menos de XXXX pesos XXXX – XXXXX pesos XXXX – XXXXX pesos XXXX – XXXXX pesos Más de XXXX pesos	1f. Residencia: Santiago Otro ____	1g. Estatus profesional: __ Estudiante __ Desempleado __ Empleado en org. privada __ Empleado en org. pública __ Emprendedor __ Inversionista __ Otro

1h. ¿A través del desarrollo de su actividad profesional, qué impactos considera que ha generado en la sociedad?

_____ Impactos económicos - Algún ejemplo _____
_____ Impactos sociales - Algún ejemplo _____
_____ Impactos tecnológico - Algún ejemplo _____
_____ Impactos medioambientales - Algún ejemplo _____
_____ Impactos legislativos - Algún ejemplo _____
_____ Otros - Algún ejemplo _____

Si responde Emprendedor / Inversor en 1g., activar las siguientes preguntas

1i. En su experiencia como emprendedor/inversionista, podría proporcionarnos el	**1i. En promedio, podría proporcionarnos más detalles de sus emprendimientos**
Total de empresas que ha creado _____ invertido _____ Total de empresas activas a la fecha _____ Total de empresas que ha cerrado _____ vendido _____ Total de fracasos empresariales _____ Monto promedio de la inversión _____ pesos Número de socios _____	El número de empleados en 2018 _____ La cifra de ventas anuales en 2018 _____ pesos El % de las ventas que corresponde a inversión en I+D _____ El % delas ventas que corresponde a exportaciones _____ % crecimiento en los últimos tres años (2015-2018) _____ empleados % crecimiento en los últimos tres años (2015-2018) _____ ventas Expectativas: % crecimiento en los próximos tres años _____ empleados % crecimiento en los próximos tres años _____ ventas

2: Por favor, podría indicarnos su vinculación actual con la UDD

2a. _____ alumno _____ ex alumno _____ otro	2b. _____ Carrera _____ Generación (año de graduación) _____ Sede (Santiago/Concepción)

3: Por favor, podría indicarnos al menos dos aspectos positivos y tres aspectos negativos que definen su experiencia en la UDD

3a. Experiencias Positivas	**3b. Experiencias Negativas**

4: Durante sus años de estudio, podría seleccionar qué tipo de medidas de apoyo al emprendimiento e innovación existían en la UDD (No es necesario que haya participado).

_____ Programas educativos (cursos obligatorios o electivos, charlas, testimonios, visitas a empresas, otros)
_____ Programas de incubación o aceleración de Negocios (UDD Ventures, IncubaUDD, Start-up UDD, Acceso a Tutores, otros)
_____ Iniciativas extra curriculares (ferias de emprendimiento, clubs, charlas abiertas, concursos de emprendimiento, otros)
_____ Acceso a capital financiero (capital semilla, acceso a redes de inversionistas, otros)
_____ Una cultura favorable al emprendimiento

5: Durante y/o después de sus estudios en la UDD, participó en alguna iniciativa emprendedora e innovadora?

5a. Durante sus estudios	___ Ninguna ___ Iniciativa emprendedora (desarrollo de una idea de negocio, creación de una empresa) ___ Iniciativa de inversión (aporte de capital a algún proyecto emprendedor) ___ Iniciativas tecnológicas (desarrollo de tecnologías) ___ Iniciativas intra-emprendedoras (proyectos de crear nuevos productos, servicios, procesos al interior de organizaciones existentes) ___ Iniciativas sociales (proyectos de apoyo a la comunidad) ___ Otro tipo de iniciativas personal / laboral _____
5b. Después de sus estudios	___ Ninguna ___ Iniciativa emprendedora (desarrollo de una idea de negocio, creación de una empresa) ___ Iniciativa de inversión (aporte de capital a algún proyecto emprendedor) ___ Iniciativas tecnológicas (desarrollo de tecnologías) ___ Iniciativas emprendedoras o innovadoras al interior de una organización (creación de nuevos productos, servicios o procesos) ___ Iniciativas sociales (proyectos de apoyo a la comunidad) ___ Otro tipo de iniciativas personal / laboral _____

Si responde “ninguna” en AMBAS preguntas pasa a la pregunta 8

6: Su paso y experiencia en la UDD contribuyó en el desarrollo de alguna o todas las iniciativas antes mencionadas?

6a.	SÍ	No

Si responde Sí, pasa a la pregunta 6b. Si responde No, pasa a la pregunta 8.

6b.	Seleccione cuáles de los siguientes elementos recuerda cuando realizó sus estudios en la UDD									
(EP) Programas Educacionales		(IF) Infraestructuras		(EC) Iniciativas Extra-curriculares		(FSC) Acceso a capital		(OS) Otros apoyos		(CV) Cultura, valores y modelos de referencia	
	Cursos obligatorios o electivos de Emprendimiento		**Programas de Incubación** (IncubaUDD, Startup UDD, Club de emprendedores, Factoria)		**Clubs** (Start-up café,)		**Seed funds** (Internal: RAIN; External: Corfo, Innova Chile, Fundación Chile, TECHO, Endevor, BCI)		**Mentoring** (Boot Camps, Hackathon)		**Role models** (diffusion of entrepreneurs, pasillo emprendedor)
	Visitas a empresas u organizaciones locales		**Programas de Aceleración** (UDD ventures, AceleraUDD)		**Awards** / **contests** / fellowships		**Business Angels** (private, networks)		**Social** community / voluntary		Emprendedora e innovadora

	Exposiciones de invitados emprendedores en algún curso		**Innovation and technology** (iCono, Smartlab, Medialab, Area IX,)		**Events** (speakers, workshops, TED, entrepreneurship week)		**Access to networks** (Telefonica, Ashoka, Stanford, Babson, ..)		**Environmental** and sustainability		Diversity and no discrimination
	Uso de metodologías para emprender o innovar		**Research institutes** (Innovación social, CICS, ICIM, CIC, Emprendimiento)		**International exchanges** (Babson, STVP, E-ship, Expedition program,				**Informal meetings** (professors, researchers, etc.)		Social responsibility
	Talleres o programas de innovación (dLab, minor en innovación)		**Co-working spaces** (Espacioi, Ferias)								Ethics and values
	Intercambio en el extranjero o pasantías cortas										Freedom
	Other		**Other**		**Other**		**Other**		**Other**		**Other**

6c.	Seleccione cuáles de los siguientes elementos recuerda haber utilizado para llevar a cabo sus iniciativas											
(EP) Programas Educacionales		(IF) Infraestructuras		(EC) Iniciativas Extra-curriculares		(FSC) Acceso a capital		(OS) Otros apoyos		(CV) Cultura, valores y modelos de referencia	
	Cursos obligatorios o electivos de Emprendimiento		**Programas de Incubación** (IncubaUDD, Startup UDD, Club de emprendedores, Factoria)		**Clubs** (Start-up café,)		**Seed funds** (Internal: RAIN; External: Corfo, Innova Chile, Fundación Chile, TECHO, Endevor, BCI)		**Mentoring** (Boot Camps, Hackathon)		**Role models** (diffusion of entrepreneurs, pasillo emprendedor)
	Visitas a empresas u organizaciones locales		**Programas de Aceleración** (UDD ventures, AceleraUDD)		**Awards** / **contests** / fellowships		**Business Angels** (private, networks)		**Social** community / voluntary		Emprendedora e innovadora
	Exposiciones de invitados emprendedores en algún curso		**Innovation and technology** (iCono, Smartlab, Medialab, Area IX,)		**Events** (speakers, workshops, TED, entrepreneurship week)		**Access to networks** (Telefonica, Ashoka, Stanford, Babson, ..)		**Environmental** and sustainability		Diversity and no discrimination
	Uso de metodologías para emprender o innovar		**Research institutes** (Innovación social, CICS, ICIM, CIC, Emprendimiento)		**International exchanges** (Babson, STVP, E-ship, Expedition program,				**Informal meetings** (professors, researchers, etc.)		Social responsibility
	Talleres o programas de innovación (dLab,		**Co-working spaces** (Espacioi, Ferias)								Ethics and values

	minor en innovación)										
	Intercambio en el extranjero o pasantías cortas										Freedom
	Other		**Other**		**Other**		**Other**		**Other**		**Other**

7: Qué tipo de impactos sostenibles ha generado en la sociedad a través de esas iniciativas emprendedoras/innovadoras?

____ Impacto Económico (ingresos, competitividad, atracción de inversión)
____ Impacto Social (empleo, bienestar, atracción de talento,
____ Impacto Tecnológico (especialización sectorial, nuevos sectores, transferencia de conocimiento, spillover,
____ Impacto Ambiental (sustentabilidad, contribución al medio ambiente)
____ Otro tipo de impactos _____

8: Considera que la UDD es un entorno adecuado en el que los estudiantes y la comunidad universitaria puedan llevar a cabo iniciativas emprendedoras e innovadoras?

8a.	Sí	No

Source: Authors

Appendix 7: SME validity analysis

Construct	Items	Item to total correlation	Confirmatory factor analysis
Entrepreneurship education	eecredits	1.008	KMO 0.747
	eegrade	1.618	x^2 282.91
	eetime	1.131	Sig. ***
	eefailure	1.112	
Infrastructure and support mechanism	lneeinvestperstudent	1.369	KMO 0.702
	euinfluence	1.003	x^2 278.65
	eetotal	1.047	Sig. ***
	eutotal	1.067	
Sustainable impacts	economic impacts	1.369	KMO 0.787
	social impacts	1.003	x^2 248.87
	technological impacts	1.047	Sig. ***
	climate impacts	1.067	

Note: *** p<0.001