Rapid Internationalization of New Technology-Based Firms in Emerging Economies: A Perspective from the Triple Helix Model

Abstract

The knowledge acquisition and networks are fundamentals to explain the internationalization of firms. However, little is known about how the New Technology-Based Firms (NTBFs) access them in emerging economy contexts. A theoretical combination of the Triple Helix Model, the Networks and Knowledge perspectives and our understanding about rapid internationalization of firms allows us to develop a new framework for a better understanding about the knowledge acquisition processes and accessing to networks of NTBFs. Our work, based in a case study of four Mexican NTBFs, show that the NTBFs in an emerging country, can lack of knowledge and networks useful for their internationalization and that a way to complement them is participating in university extension programs, as the services offered by a University Business Accelerator (UBA) and interacting with several government institutions. Our study identify a series of important implications to all Triple Helix Model stakeholders: NTBFs, Government and Universities.

Keywords: International Entrepreneurship, High-Tech Start-ups, Qualitative research methods, Triple Helix Model, University Business Accelerator.

INTRODUCTION

In recent decades, the increase and universality of rapid internationalization firms has managed to capture the attention of media, researchers, international institutions and governments (McDougall et al., 2014). Currently this phenomenon is considered as a fundamental factor for growth and survival of firms and the economic development of different regions (Zahra and Mudambi, 2007).

According to some authors (Peiris et al., 2012), the literature on rapid internationalization has been focused mainly on new technology-based firms (NTBFs). However, the NTBFs are susceptible of having limitations in competing in international markets (Cahen et al., 2016). Furthermore, in the context of emerging economies, these companies face additional obstacles related not only with unfavorable institutional conditions, but also with difficulties in accessing or acquiring certain types of resources, such as networks and knowledge (Uner et al., 2013).

In relation to company responses to these barriers, a rich literature has established the importance of collaborative networks, because it promotes company innovativeness by channeling flows of information and resources and facilitating joint problem solving (Rubin et al., 2015). Given the inexperience of NTBFs, these companies need to acquire and integrate various types of knowledge and skills, so it is a necessity to keep abreast of knowledge in all relevant fields (Scillitoe and Chakrabarti, 2010). Collaboration networks are suggested in this sense, as low-cost and flexible alternatives that allow companies to combine and integrate complementary knowledge, including creating new market opportunities (Ahuja, 2000). However, the process of finding and acquiring new knowledge based on these networks has not been studied in depth in the internationalization of smaller firms in emerging economies (Kiss et al., 2012). Therefore, this paper aims to examine how NTBFs in emerging economies develop their collaborative networks and acquire the necessary knowledge to carry out the rapid internationalization.

To identify where and how this knowledge is obtained, the triple-helix model of Etzkowitz (1995) is used and integrated, since it provides important information on knowledge flows in the context of collaborative relationships among institutional actors, i.e. between universities, industry and government (Kim et al., 2012). Therefore, this research also integrate the network and knowledge perspective because of its importance to explain the rapid internationalization of small and new companies. Finally, to address this approach, a multi-case analysis has been carried out with some representative actors of the triple helix in the region of Nuevo Leon, Mexico.

This study offers several contributions. First, it contributes to IE literature, because the phenomenon of rapid internationalization as a result of a process involving the interaction and collaboration between several players in the environment is explained. This is interesting because, in the IE literature, the factors that influence international entrepreneurial activities are generally examined in a situational context each in isolation, rather than representing a holistic approach that examines a co-evolutionary relationship among factors. Therefore, the added value of this study to the IE literature is to show that in economically emerging contexts, the acquisition of knowledge prior to the internationalization can be the result of a collaborative process between the companies with several actors in their environment, particularly with the Triple Helix agents. In addition, this work is a contribution to the Triple Helix Model literature. First because most empirical studies on the triple helix have studied only the relationships between the university and the industry and, therefore, they fail to study the synergistic effects of the university–industry–government relationships. And secondly, because while there have been studies that explain entrepreneurial activities based on the Triple Helix model (See for example, Guerrero and Urbano, 2016), its contribution to international entrepreneurship have been insufficient. In this sense, this paper is one of the first empirical studies that use the Triple Helix model to explain the rapid internationalization of NTBFs in emerging economies.

The structure of this article is as follows. In the next section the theoretical framework is developed, based on the integration of the Triple Helix Model, the perspective of networks and knowledge. Next, the methodology of case selection for this research is presented. In the next section, the results and discussions are elaborated. Finally, the implications of this study are presented.

THEORETICAL FRAMEWORK

In the last two decades, the business environment has benefited from technological development and for an evident accelerated globalization, encouraging many entrepreneurs to internationalize their activities almost from the inception (Oviatt and McDougall, 1994). The rapid internationalization represent a major challenge for new firms, especially for companies in emerging economies with limited resources and operating in less favorable environments (Coeurderoy et al., 2012). However, although the empirical evidence of the rapid internationalization stems mainly from developed economies (Yamakawa et al., 2008), it is clear that nowadays the phenomenon has increased among new firms in emerging economies (Jones et al., 2011).

The governments of many countries are adopting specific policies and programs to enhance the potential of international ventures, based on the premise that their inclusion in global markets, will contribute to an increase in the trade balance and economic growth (Cumming et al., 2015). One type of entrepreneurial business that governments in emerging economies want to encourage is high technology entrepreneurial ventures (Lau and Bruton, 2011). These firms are formed and developed relying mainly on the strength of knowledge and learning ability of its founders, allowing them to exploit new opportunities, even in international markets (Yli-Renko et al., 2001). However, different theories are converging towards the

view that entrepreneurs are not the only participants in this process, because they are involved in a series of relationships with different actors in social and institutional levels (Cooper and Park, 2008). Therefore, the creation of NTBFs will also depend on contextual factors that generate the necessary elements for their further development. This argument has led some authors to point out that the identification of technological opportunities and subsequent operation will vary according to the degree of development of the countries or regions in which the least developed will be less favorable for the formation of NTBFs (Fontes and Coombs, 1996). In this sense, it is suggested that the Triple Helix approach could be an interesting framework for analyze these interrelationships.

The Triple Helix Model

The Triple Helix of the relationships between university-industry-government, is accepted as an important model for regional development (Leydesdorff and Meyer, 2006). The model's success has spread rapidly from academia to policy makers, who use it as a reference when designing policies and support programs aimed at improving conditions for the favorable development of innovation. Related to the model, Etzkowitz and Leydesdorff (2000) note that "in one way or another, most countries and regions are currently trying to obtain some form of triple helix".

One of the important aspects of the interactions of the Triple Helix Model is the transfer of various resources (Van Horne and Dutot, 2016). In this regard, close cooperation between universities and firms, based on an effective transfer of knowledge, might unlock the hidden entrepreneurial potential of regions, and an efficient local government might stimulate development of that potential (Kim et al., 2012).

Although there are few empirical examinations of the effect of collaborations among Triple Helix agents on entrepreneurial activities, from the previous literature it is suggested that these collaborations can promote some entrepreneurial activities, such as the rapid internationalization of NTBFs. In this paper we analyze four specific cases of Mexican technology-based entrepreneurs, who were involved in multiple interactions with an University Business Accelerator (UBA from here) and some agencies related with the Mexican government.

University–Industry relationship

According to Audretsch (2014), the role of the University has evolved considerably over time, and are now considered a central element in regional development. One type of university organization that establishes formal links with the industry is the UBA. A UBA is a new generation of Incubation Centers (ICs) that allows entrepreneurs to take advantage of a variety of knowledge, resources and support services, offered from the academia (Cohen, 2013). Some authors point out that these programs offers different opportunities for networking, education and mentoring (Bruneel et al., 2012). They are also useful for access to investors and other key players in the entrepreneurial environment (Malek et al., 2014). In addition, there is evidence that the firms participating in programs as an incubator or accelerator of business, have had a greater chance of success compared to the companies that they have not.

Industry–Government relationship

Today, several countries have implemented policies that seek to facilitate the creation of favorable entrepreneurial environments, reduce restrictions on entrepreneurship and promote innovation and internationalization (Audretsch and Link, 2012). According to Cumming (2015), policies that promote internationalization encourage companies to export quickly and intensively, so that they can make a sustained contribution to the balance of foreign trade. Other government services that have been recorded in the literature include support for trade missions, sponsorship for participation of trade fair, provision of assistance for tenders,

assistance in consortium formation, exports financing, and support through of foreign offices. Therefore, on the basis of these evidences, it is suggested that the relationship between firms and government are produced through a number of policy tools that influence the ability of creation and development of firms (Browen and De Clercq, 2008).

University-Government relationship

The literature has shown that the mission of universities is no longer limited exclusively to teaching and research but is increasingly committed to entrepreneurial activities and the transference of knowledge to non-academic actors, especially business and the wider community (Audretsch, 2014). In this sense, many countries are providing political and financial incentives for universities to forge collaborative links with industry and place entrepreneurial activities in their internal management agenda. One of the promising policy tools that support innovation and technology-oriented entrepreneurial growth are the Incubation Centers (ICs) (Wann et al., 2017). These are operationalized through science parks, technology incubators, innovation centers and accelerators. However, the most governments promote the functioning of these institutions under the management structure of universities. In Latin American countries for example, around 50 percent of ICs have some relation with a university (Wann et al., 2017). Finally, it is important to emphasize that the collaboration between the university and the government plays an important role in supporting the entrepreneur, since they function as "access portals" to networks, knowledge and subsidies (Audretsch, 2014; Guerrero et al., 2016; Huggins and Thompson, 2015).

Finally, the purpose of next section is to focus on the networks and knowledge perspective that the literature identifies as relevant for the internationalization of firms.

Networks and Knowledge Transfer

Networks approach to the internationalization

The entrepreneurial networks play an important role affecting new venture performance (Xie and Lv, 2016). The network perspective assumes that entrepreneurs are linked to other people and organizations and these links may provide access to resources that may sustain a new venture. Although there are different types of networks (Kontinen and Ojala, 2011), research shows that they are always important entrepreneurial tools that contribute to the establishment, development and growth of small firms (Pinho and Sampaio De Sá, 2014). In that way, when firms build relationships and assume a position in the network, they can obtain relevant information to develop new knowledge, identify and exploit new business opportunities, even in foreign markets (Johanson and Vahlne, 2009). Consequently, the international business literature has broadly and formally recognized the importance of networks for the internationalization of the firm, especially in the case of small and medium enterprises.

This study focuses on new technology-based firms (NTBFs). However, technological entrepreneurs often have a technical background and lack the necessary business skills and market orientation for the commercial development of their ideas (Rojas and Huergo, 2016). They also present problems accessing appropriate business networks (Visintin and Pittino, 2014). Although there are some organizations such as Incubation Centers (ICs) they can fill the lack of resources and accelerate the success and development of ventures. There is evidence that ICs can provide important business networks specific to an industry, within which there are many sources of advice and assistance available to small firms (Löfsten, 2016). Furthermore, ICs linked to a university can provide a wealth of information, knowledge and expertise, which is vital for the survival of the new ventures and young firms and it may also reduce the uncertainty they experience (Scillitoe and Chakrabarti, 2010).

Finally, literature based on ICs tends to focus on the transfer of technological knowledge, and very few examine the transfer of other types of knowledge that can be equally important in

the development of the company. For example, Patton (2014) focuses on how ICs transferred managerial, entrepreneurial and technological knowledge to enhance the business model of new technology firms. Therefore, the following section describes three types of knowledge that have been recognized as relevant to the success and performance of new technology-based firms.

Knowledge approach to internationalization

According to resource-based view of the firm, the knowledge is a relevant factor for obtain a competitive advantage (Barney, 1991; Grant, 1996). Other researchers, such as Macpherson and Holt (2007), have pointed out that the accumulation of knowledge is necessary to "define the shape and trajectory of growth of the firm". Recent research suggests that, for technology-based companies, two specific types of knowledge - technological and market knowledge - can have positive implications for achieving desirable results (Marvel & Lumpkin, 2007). However, in theories related to international expansion, such as the rapid internationalization (Oviatt and McDougall, 1994), appears the need for a third type of knowledge, the internationalization knowledge, that in combination with the technological and market knowledge's, relevantly influence on the internationalization of small and new firms (Musteen et al., 2014).

Technological knowledge refers to the degree of knowledge possessed an entrepreneur about the products, technologies and/or processes that are relevant for their business (Burgers et al., 2008). The acquisition of this knowledge is considered a critical factor in entrepreneurs seeking to develop their technology-based firms, because it would allow them to respond rapidly to the actions of competitors and changing market needs (Clarysse et al., 2011). Similarly, market knowledge refers to knowledge of potential customers, how to enter markets, marketing approaches and business models. Other authors point out that this knowledge is associated with the understanding of the internal culture, institutional frameworks of government, rules and regulations of the domestic market (Fletcher and Harris, 2012). In addition, this knowledge can help small technology-based firms to reduce some of the complexities of the disruptive and dynamic environments in which they operate and take advantage of growth opportunities (Sullivan and Marvel, 2011). Finally, the knowledge of internationalization is a key factor to explaining the rapid expansion international of the firms (Knight & Cavusgil 2004; Oviatt & McDougall 2005). This knowledge type is associated with international experience and knowledge of institutional framework, norms and values that apply in markets where companies operate (Eriksson et al., 1997). It further relates to the knowledge of customers and competitors international, and also the know-how in possession of firms that may help to explore and exploit growth opportunities in international markets.

METHODOLOGY

This research uses an inductive approach based on retrospective cases studies as empirical evidence to create theoretical constructs and propositions. The unit of analysis will be the firm, and multiple cases will be used rather than a single case study. Case studies are powerful empirical descriptions of a particular phenomenon that can help to build theories. Furthermore, in their literature review of rapid internationalization of firms, both Rialp et al. (2005) and Aspelund et al. (2007) emphasized that a qualitative approach guarantees plain understanding of the complexities associated with the internationalization processes of new firms.

Therefore, in this research, a multiple case study is used to explain how the continuous interaction between the actors of the Triple Helix allowed the rapid internationalization of the NTBFs based in emerging economies. For this purpose, multiple sources of information were used to gather data from each sphere of Triple Helix. In this way, a University Incubation Center was identified. This Incubator worked as a University Business Accelerator (UBA), and in this study represents the sphere of the University. In addition, four Mexican NTBFs

represent the sphere of industry, and several government programs for business development that represent the sphere of the Mexican government (e.g., TechBA Program or some programs Mexican Science and Technology National Counsil, CONACYT).

In the case of UBA, evidence was obtained of the business accelerator articulated by EGADE Business School, the Graduate School of Tecnológico de Monterrey, one of the largest and prestigious private universities in Mexico and Latin America. To collect the information, one of the managers of the UBA was interviewed by one of the authors through a semi-structured and open-ended interview, guided by a list of topics. In this sense, the interviewee was asked first to describe the general operations and the processes of selection of participating companies in the UBA. Based on this information, he was asked to describe in more detail, (1) the principal services provided to participating companies, (2) the significant events in the interaction with selected firms in this study, and (3) the relationship between UBA and various government local entities of Mexico.

On the other hand, the criteria for selecting NTBFs were as follows. First, they had to have participated and completed the advisory programs delivered by the UBA. Secondly, the NTBFs had to show clear signs that their internationalization had occurred after and as a result of having participated in the program of the UBA. Finally, these companies had to fit the profile of the rapid internationalization firms, that is, to be internationalized before 10 years since its inception (Milanov and Fernhaber, 2009) and after their participation in the UBA program. Therefore, the selected companies were suitable for this study.

Cases of these firms were prepared according to the methodology proposed by Yin (2014), based on the development of in-depth interviews using structural and descriptive questions (Chetty, 1996). The interviews focused on the entrepreneurs' past experiences, so the guidelines for retrospective studies of Miller et al. (1997) were followed. A retrospective case study is a type of longitudinal case study design in which all data, including first-person accounts, are collected when the events and activities under study have already occurred, and the outcomes of these events and activities are known. In this study, all the facts – i.e., the participation of the entrepreneurs in the UBA program and the rapid internationalization of their firms – occurred before the interviews, which made it appropriate to adopt a retrospective perspective.

In the interview process, all entrepreneurs were asked to describe in detail the process of creating their companies, the reasons why they had decided to participate in the UBA and a description of how he produced the internationalization of their businesses. All the interviews were digitally recorded and transcribed literally. In addition, e-mail communication was used to collect further information and to clarify any inconsistent issues. The analysis of the encoded data, involved the search for common patterns among cases in order to identify some findings that were framed in the context of the IE literature, thereby strengthening the internal validity of the research.

Furthermore, the interviews both with entrepreneurs and managers of UBA, allowed us to obtain relevant evidence about the government role on the process of internationalization of each of these NTBFs. Particularly, evidence of TechBA program is obtained. This is a program of the Ministry of Economy of Mexico operated by the United States-Mexico Foundation for Science (FUMEC) seeking to work with highly innovative companies to bring them to the global market, increase their exports and creating high-value jobs in Mexico.

Finally, Table 1 summarizes the key information on the case firms. The four firms were internationalized before 10 years since its inception, arriving to different international destinations.

Table 1. Information on the Case Firms and their Rapidly Internationalization Process

	Case 1:	Case 2:	Case 3:	Case 4:
Year Founded	2005	1998	2006	2002
Business Model	Sale of hardware and software to hospitals and radiologists	Sale of software developed in collaboration with Oracle as business partner	Development of digital visualization products to solve specific industry problems	Sale of Digital content through partners with established businesses. Development of Software Projects.
Product or Service	Detection of colon cancer through virtual colonoscopy using 3D technology	Business specialized solutions based on Oracle Technology	Applications of Industrial visualization	Digital content distribution by optical means or web platforms. Development of specialized software.
Year joined UBA	2006	2005	2006	2006
Year of Internationalization	2008	2008	2008	2010
Speed of Internationalization (in Years)	3	10	2	8
Internationalization Strategy	Export	FDI	Export	Export and FDI
Scope of internationalization	USA	USA, Chile, Argentina and Peru	USA	Spain, Denmark, Holland, Israel and Canada

Source: Own Elaboration

RESULTS AND DISCUSSION

Findings

University–Industry relationship

Mexican NTBFs whose cases were developed for this article, had a wide variety of interactions, especially with the UBA, entity which collaborated with the firms during their internationalization process.

Case 1: The case 1 is a company dedicated to creating solutions for medical imaging in three dimensions (3D).

Shortly after starting his company, the founder was actively involved in the UBA, through which had access to academics, mentors or coaches experts in business who gave him different types of knowledge, those who helped him in the planning of their strategies and in developing its business plan.

In addition, the Accelerator enabled him access to different networks, which helped him acquire technological knowledge. For example, the EGADE Business School, as an institutional part of a larger organization - Tecnológico de Monterrey, got permission for testing in the Center for Innovation and Technology Transfer in Health (CiTES) of the Hospital San José. From this relationship, Echopixel was able to acquire technological knowledge to validate and further develop its technology and its business model.

On the other hand, the UBA allowed the company to access public and private investment networks, such as the Innovation Fund of Nuevo Leon State, also called FONLIN, the program of Trustees of the Tecnológico de Monterrey and the Entrepreneurs Program of *Nacional Financiera*, NAFIN (a national public financial agency).

In accordance with the founder of this firm, the relationship with the UBA helped the firm to have access to several knowledge and resources that they had no, allowing to define and develop an international market entry strategy. They have also allowed access to different networks that have helped to reduce the development time of its products, to minimize the disadvantages of size and novelty, and additionally, open doors for new industry partners in a region as Silicon Valley.

Case 2: The case 2 is a company created to provide IT solutions to the connectivity in organizations. The founder of this firm, attended to the UBA of EGADE Business School,

because of the affinity he had with his alma mater, the Tecnológico de Monterrey. The founder started the company with a regional mindset. And his participation in the UBA allowed her changing his mind.

The work and the knowledge acquired from the UBA mentors, allowed him to develop a business plan, implement a growth strategy and learn to do businesses in the international market. He also received knowledge about the needs of national customers as well as large international customers such as governments and global companies. Furthermore, the UBA program strengthened some individual skills of the founder, improving their public speaking skills and business language. Finally, during the period of participation in the UBA, the potential of an international business plan was validated, because the SOA Technology, developed by Oracle and offered by this firm, was defined as key to differentiate the offer of the firm in the global market. Regarding the above, the founder points out:

> *To me, it helped a lot communicate with people who had knowledge ... And it was good. I approached the Accelerator EGADE Business School, and I feel it was good. The success is to learn how to change ways of thinking in each market... with the right advice, it is easier…*

Moreover, the relationship with the UBA benefited to firm when the firm apply to the TechBA Program. This favored its expansion to the Silicon Valley region and access to a network of international consultants, who provided to entrepreneurs the internationalization knowledge.

For the founder of firm, his participation in the UBA was fundamental, because the interaction with consultants and researchers in business issues enabled the firm to acquire specialized knowledge. Moreover, networks they delivered market information for firm, thereby reducing the liabilities of size, newness and foreignness. According to him, a valuable characteristic of networks is that the participants made recommendations and these are given as in a laboratory, as in a "controlled environment", which reduces the risk, because not expose it to market.

Case 3: The case is a high-tech enterprise specialized in developing applications for image processing. In 2005 it was accepted in the UBA of EGADE Business School to participate in the Technology-Based Business Development Program. There, he was taught to develop and validate its business model. Likewise, he was provided with the knowledge about potential customers to compete in the national and international market. Moreover some of the individual skills of the founder were reinforced. Thus, he learned how to sell an idea and how to present their project to partners and investors.

The UBA provided the knowledge needed to prepare the international strategy of firm. As part of this strategy, a relationship was made between the firm and the Office of the Mexican Institute of Industrial Property (IMPI), in order to protect the intellectual property of its technological developments. This allowed subsequently make contact with the United States Patent and Trademark Office, USPTO.

For the founder of this firm, his participation in the UBA was very useful:

> *The UBA helped us have a quick overview of the skills required to have a business... we opened the eyes in many ways... as engineers we often think that are more important the technology skills, but through the Business Accelerator, we saw the true proportion of things...*

During his stay in UBA program, this firm was benefited with networks access. For example, was contacted with another company that participated in the UBA of EGADE Business School described in the next section, with whom built a business relationship that would lead to develop the "DARIUS Project" . In this project, this case acted as technology partner and was responsible for the design, programming and implementation of render engine, core

element in this project. Likewise, the UBA contacted the firm with the Ministry of Economy to apply the TechBA Program in Silicon Valley in which was accepted.
Since before participating in the UBA Program, the founder of this firm considered the networks as fundamental in Internationalization.

> *It's like a paradox, because you want to be international, and you can travel and everything, but you do not have the necessary contacts...*

According to the founder, the networks allowed the company to obtain a constant flow of information about the market and industry. In his view, the networks have enabled it to know the plans and actions it takes with its main customers or major industry players, and they have influenced the decision making of the company. In addition, networks have allowed access to specialized information, in particular business issues, helping in the selection and diversification of its markets.
Case 4: This case is a consortium of three new companies in ICTs sectors, which belong to a single CEO and founder. In 2006, the three Group companies were invited to participate in the Technology-Based Business Development Program of EGADE Business School. The participation in the Business Accelerator was fundamental, because it allowed firms to interact with experts in business, which conducted them through a deep assessment of the Group. From that diagnosis, was defined for each of the companies, a strategy of international growth, which was reflected in new business plans. Furthermore, interaction was significant, because some academics and students of the MBA, they developed and provided a complete market research to the 3 companies.
Another benefit that provided by the UBA to Group was access to different types of networks that provide both knowledge's and financing for the three projects. For example, in the search for financial resources, the UBA supported to companies in their interaction with CONACYT, from which they raised funds for the development of the Platform for Digital Content Distribution. Similarly, the UBA it was a bridge to connect the companies with other government agencies such as NAFIN, from whom it obtains market information on the different financing options; and ProMexico from which it obtains relevant information on the international markets.
Furthermore, the UBA Program allowed companies to contact and work with another company that participated in the accelerator program. This relationship allowed to one of the companies in the group, significantly reduce costs of the project for the Center for Advanced Design. Later these companies collaborated on the relevant project, which was to develop a render engine to offer a web service in a global scale. Another relationship allowed by the UBA Program was to promote a commercial agreement between the Group and Alestra - a national leader in the telecommunications sector in Mexico.
Finally, to promote the internationalization of companies, the UBA contacted two companies of group with the TechBA Program of the Ministry of Economy, thus allowing its international expansion to Canada and Madrid respectively.
To the Group founder, the knowledge's and networks to which had access:

> *...Contributed an important value in the internationalization of our companies, allowing us to access knowledge and other resources, as business partners, who in turn gave us access to other clients that otherwise we would not have access. This network of partners reduces the liability of outsidership to the market.*

As noted in the findings, the NTBFs acquired diverse knowledge directly from the UBA. In addition, through the UBA program, instances were created to access important collaboration networks. Literature often points out that networking is one of the most important services offered by modern Incubation Centers such as UBA (Pauwels et al., 2016; Rubin et al., 2015). In this sense, this study considers that the NTBFs acquired directly from UBA different types

of knowledge, but also indirectly through the networks facilitated by UBA. Therefore, this study corroborates the findings found in previous literature.

Industry–Government relationship

In this research, most of the NTBFs interactions with the government were related to access to support programs for internationalization or for accessing financial resources for the protection and/or development of technology or business.

Case 1: The firm experience with the government was supported by its participation in the UBA of EGADE Business School. This allows it to get a government fund of almost $ 30,000 USD to leverage the development of its business. Subsequently, the company receives funds from the state government, through the government programs FONLIN and INVITE. Also participates in the program to support technology-based companies called Entrepreneurs Program of CONACYT–NAFIN.

The government support of greater impact for the firm was the TechBA program in Silicon Valley, sponsored by the Ministry of Economy of the Mexican Government. It was through TechBA that the company had access to resources to expand into the United States and land in the Silicon Valley ecosystem. This allows it to gain access to an extensive network of investors and specialists, who helped to the NTBFs to form an Advisory Board to improve its business proposition, and also it allowed it access to technology, financial and business experts. This eventually triggered the internationalization of the company.

Case 2: The first firm relationship with the government went with the Ministry of Economy to implement the Prosoft Program in order to become certified in the quality system of the Mexican software industry. This qualification helped the firm to document and standardize the software development processes. However, the initiative with greater impact on the internationalization of the firm was the TechBA program in Silicon Valley. This program enabled the company establish a major business relationship with Oracle company, the main supplier of the SOA technology. Further allows it to interact with the major international consulting firms in the region, as well as know the players in the industry. These relationships allowed the case to get their first big customer, the Government of Chile. This project allowed them to later expand the firm to other countries in South America.

Case 3: During his participation in the UBA, the firm obtained a seed fund from the Ministry of Economy. The resources of the seed fund were used to trigger the development of some technological products. The firm also had contact with the Mexican Institute of Industrial Property (IMPI), for the protection of the technological developments that was generating, using the price preference program for SMEs that had this institute.

The TechBA Program, supported by the Ministry of Economy, was the program that ignited the internationalization process of firm. Through this program, this case, had accessed to the ecosystem of Silicon Valley, allowing contact to consultants specialized in technology-based businesses and direct access to information about its technology and its competitors. This relationship strengthens their knowledge related to its business. Moreover, it was through the contact with the networks of TechBA that firm got its first international contract with an relevant American company. Finally, through the funds and other support obtained from TechBA Program was boosted the process of patenting at the USPTO, and a new company in the United States was founded.

Case 4: The experience of the founder of this group of firms with the Mexican government started through the application of the firms to various government funds. For example, one of the companies of group obtained funding from CONACYT for the development of the Platform for Digital Content Distribution and another relevant project. Additionally, two of the companies of group, the government provided support through the TechBA Program for marketing their products and services in Canada and Spain, the latter, with the intention of expanding to the rest of Europe. Also, the group of firms had access to the NAFIN, entity that

invested in the group, allowing strengthen and allowed to complete the implementation of the firm projects. Another government program was used, for example, ProMéxico. This is a program that helps to promote, in abroad, the products or services of Mexican firms.

University–Government relationship

The interactions between the university and the government occurred between the UBA of EGADE Business School and several entities of state and federal government.

This is how the UBA obtained an initial fund of $370,000 USD from CONACYT for the development and implementation of the Technology-Based Business Development Program. Given the success of the program, the Ministry of Economy asked the UBA make a second edition of the program by assigning new funds for an amount of $590,000 USD. The recognition of the Ministry of Economy to the UBA of EGADE Business School, as a business accelerator, allowed them access annually to the funds from the federal government to support companies wishing to obtain their services. It also made it part of the Network of National and International Accelerators, where was the TechBA program, which promoted the internationalization of several of the NTBFs mentioned in this study.

The results of each of the interactions between the triple-helix actors have been previously described. The interaction between the government and the other actors in the triple helix is mainly characterized by the provision of resources. Government is key in this regard for the interaction between UBA and Industry, which is characterized by the transfer of different types of knowledge and the creation / access to important collaboration networks.

Discussions and Propositions

The findings based on the interactions of the actors of the triple helix model, allow to develop some propositions that are detailed below.

First, it has been argued that technology entrepreneurs in emerging economies may have different characteristics to their counterparts in developed economies. The scholars have highlighted some features of the entrepreneur, such as a high tolerance for risk and a higher capacity for innovation. Similarly, some research from the *International Entrepreneurship* field have emphasized that entrepreneurs have a global mindset (Nummela et al., 2009). For example, Harvestone *et al.* (2000) found that the founders of the *Born Globals Firms* had a much more positive mindset towards globalization compared to managers of firms gradually internationalized. In this regard, this research seems not to coincide entirely with existing literature. Some of the cases had not a positive attitude towards internationalization. Therefore, it is likely that the NTBFs-UBA interaction, allowed a change of mentality in those entrepreneurs who have an initial negative perception towards internationalization. This may suggest that some entrepreneurs in emerging economies may need assistance from external agent that generates a positive change of mentality towards international activities. Therefore, the following proposition is proposed:

> ***Proposition 1:*** NTBFs entrepreneurs attitude towards internationalization may be changed by external agents and programs.

In this chapter, it is also suggested the acquisition of different types of knowledge is another factor that triggers a change in mentality among entrepreneurs. International Business literature recognizes that opportunities to expand into new international markets arise from the combination of different sources and types of knowledge (Burgers et al., 2008). In this sense, networks can be important sources of knowledge and of other equally important resources in the process of internationalization of new firms (Johanson and Vahlne, 2009). The results suggest that the resources transferred in the NTBFs interactions with the other actors of the triple helix, are of a different nature.

Regarding to the NTBFs-UBA interaction, this study shows that the four NTBFs in the program of UBA, received a combination of different knowledge types. This makes sense since the UBA program is designed to insert any type of knowledge that participating firms need and thus stimulate their growth. At the same time, the NTBFs who participated in that accelerator program were benefited from access to different types of networks that also provided knowledge. In this sense, we hold that the UBA plays a direct and indirect role in the NTBFs participating. Therefore, the following propositions are presented:

> ***Proposition 2:*** The University Business Accelerators develops a supplier role of different types of knowledge - technological, market and internationalization knowledge - and therefore can directly influence the internationalization of its participating companies.
>
> ***Proposition 3:*** The University Business Accelerator develops a brokering role of knowledge networks, and therefore can indirectly influence the internationalization of its participating companies.

On the other hand, the relationship between technology-based entrepreneurs with the government is summarized in the transfer of two types of resources. First, the government was related with firms through various funding programs. Second, some government agencies acted as intermediaries and facilitators of different types of networks, which in turn facilitated to NTBFs, the knowledge's and contacts with international customers. The figure of the government as intermediary of networks is not strange. Recently, O´Gorman y Evers (2011) showed that an Export Promotion Organization (EPO) from the Irish Government, played an important role in intermediation of knowledge and networks, thus influencing the internationalization of new firms related to the EPO. Therefore, in light of evidence the following propositions are presented:

> ***Proposition 4:*** Governments in emerging economies, through its various programs to support new ventures, play an important role as providers of economic resources and therefore can directly influence the internationalization of new firms.
>
> ***Proposition 5:*** Governments in emerging economies, through some specific programs to support new ventures, develop a brokering role of knowledge networks, and thus indirectly influence the internationalization of new firms.

In relation to the interaction between the Mexican government (through its various entities) with the UBA, a fairly new relationship is demonstrated. Recent literature indicates that governments are using a range of public policies to promote and strengthen links between universities and firms. Under the premise that the university is naturally a business incubator, many public programs encourage universities to enable them to develop commercially viable technologies and thus linked with industry (Yusuf, 2008). Although, there are other support services for firms, the incubators and business accelerators are one of the most effective instruments to stimulate the creation and development of innovative start-ups (Ahmad and Ingle, 2011). In this study, for example, some Mexican governmental institutions, such as CONACYT were an important support for the creation and strengthening of the UBA. In this regard, policies such as driven through CONACYT have the purpose of strengthen the link between universities and firms, so that these can stimulate innovation, improve their competitiveness and projected in the both domestic and international markets. Therefore, in light of the evidence, it is argued that:

> ***Proposition 6:*** Governments in emerging economies, develop public policies aimed at strengthening the links between universities and firms, and therefore can indirectly influence the internationalization of the new ventures.

CONCLUSIONS

This study aimed to investigate examine how NTBFs in emerging economies develop their collaborative networks and acquire the necessary knowledge to carry out the rapid internationalization. For this, a longitudinal case study was carried out, through which it is possible to obtain several contributions aimed to different fields of research. First, it is suggested that this work is an important contribution to the field of IE, since it is the first research that analyzes the entrepreneurial internationalization from the Triple Helix perspective, that includes the interaction between several institutional actors in a specific environment. This paper responds therefore to the call of Keupp and Gassmann (2009), who note that the IE field would benefit from using qualitative studies describing the deployment of resources and the links of firms before and after their internationalization. The findings obtained in this study suggest, in this sense, that the rapid internationalization of some NTBFs based in emerging economies are the result of a dynamic process of interactions between different institutional actors of an environment. These results are in line with Guerrero et al. (2016) who point out that this type of collaboration is reinforced when the enterprise has a high-growth orientation. Second, this paper arises as a contribution to the literature focused on the model of the triple helix. Previous literature has emphasized that the triple-helix actors not only perform their own roles, but also supplement the roles of weaker actors, for example, by transferring various types of resources and knowledge (Guerrero and Urbano, 2016). Therefore, this work contributes evidence that corroborates the findings of previous studies, since: 1) different types of knowledge were transferred, including the technological, market and internationalization knowledge; 2) entrepreneurs were allowed access to important networks of collaboration, and finally, 3) was allowed access to various government financing programs. The synergies produced from the transfer of these resources, materialized not only in the creation of new technologies, but also in the rapid internationalization of NTBFs.

On the other hand, the literature that studies the acquisition of knowledge and its influence on the internationalization of firms, often focuses on direct experience or on some specific networks as sources of knowledge (Freeman et al., 2010). However, this work is somewhat different, because it explains access to networks and the knowledge acquisition of the companies from a broader and more dynamic perspective, focusing on the interaction between actors embedded in an innovation system. Given the management constraints and the environment barriers faced by new technology-based firms in emerging economies (Ciravegna et al. 2014), the findings of this study suggest that these interactions may represent the reality of several technological companies in this type of economies.

It is also worth noting that there are some limitations to be taken into account. First, both the methodology and the number of cases of this research could be considered a limitation, therefore, the results of this study can not be generalized (Yin, 2014). Some authors suggest that the selected cases will be sufficient if they involve a set of sufficient situations to explain the phenomenon raised in the study objective (see for example, Chetty, 1996). We believe this paper meets these conditions. Nevertheless, future research should include quantitative analysis and observe at the influence of triple-helix agents on the entrepreneurial internationalization of firms in emerging economies. Second, the companies in this study were chosen from a group of ventures participating in a program to accelerate technology-based firms of EGADE Business School. Given the entry requirements, most companies can not participate in university-driven business acceleration programs. However, there are several forms of university-industry collaboration, such as the contract research, research consortia, consulting and founding of co-operative research centers, among others. Therefore, future research should explore whether other forms of university-industry collaboration equally impact on the international entrepreneurial behavior of companies. Third, although

this is the first study to propose a research framework emerging from the intersection between entrepreneurial internationalization and the triple helix model, we are aware that the interactions between the institutional spheres, which represent the triple helix model, may vary depending on the context. It is clear that in other countries there may be other institutional actors, which interact in different ways, and even allow access to a greater variety of types and sources of knowledge for the internationalization of new firms. For example, several research suggests the emergence of user-driven innovation models, which represent a fourth helix in an innovation ecosystem (Miller et al., 2016). It may be probable in this sense that users (quadruple helix) can influence in some way the entrepreneurial internationalization. Therefore, future research should take these considerations into account and observe the role of other institutional actors in entrepreneurial internationalization.

Finally, this study has important practical implications for entrepreneurs and public policy officials. For policy makers, this study presents evidence of the importance of institutional collaborative networks. If policymakers in emerging economies are hoping to improve the competitiveness of new firms, there is still a need to improve corporate access to these institutional networks. It is also necessary to strengthen and create new institutions that disseminate key information for entrepreneurs. This work is relevant since it shows that the Mexican government is playing an important role in stimulating the interaction and collaboration between institutional actors. The result is reflected in the rapid internationalization of the four cases in this study. For entrepreneurs, this study provides information on the benefits of interacting with both public and private actors, for example participation in the Incubation Centers. For university managers in emerging economies, the University Incubation Centers and their different variants, are a good example to contribute to the competitiveness of new firms and narrow the gap with entrepreneurs.

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