Accelerating the formation of regional systems of innovation in Mexico?

Understanding the effects of the Technology Business Accelerator Program in the formation of resources and capabilities to innovate in Mexican regions.

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1. Introduction.

In 2004 the Mexican Government launched the Technology Business Accelerator (TechBA) program, an initiative that seeks to help the best small and medium Mexican technology companies to access and compete in international markets. A distinctive feature of the TechBA program is that rather than just helping companies to place their products and services in the international markets, it locates Mexican companies in the most innovative regions in the world in order to promote their full integration into the financial, market, business, and technological resources of these regions. This institutional innovation has established a two-way flow of knowledge and technology between Mexico and the most advanced innovation resources and capabilities across the globe. In this way, the TechBA program also opens a new conduit to explore the effects that external sources of knowledge and technology have in the formation of systems of innovation in developing countries.

Developing countries have for a long time attempted to upgrade their knowledge base and technological capabilities through such mechanisms as imported technology, acquisition of patents and licenses, attraction of foreign direct investment and multinational corporations, or through education abroad programs. These mechanisms have promoted a one-way flow of knowledge and technology and are based on the assumption that innovation is an exclusive function of the advanced economies of the North (Krugman, 1979). In this view, the role of developing and newly industrializing countries of the South is largely limited to the promotion of knowledge and technology transfer and diffusion throughout their national economies. But as both scholars and policy makers are reaching the consensus that innovation represents the basis for sustained economic development even in developing countries (Ernst & Lundvall, 2000; The World Bank, 2007), access to global flows of knowledge and technology is acquiring wider significance. Given the path-dependent character of innovation processes, the capacity of developing countries to develop new products and services seems to be largely constrained by their weak knowledge and technology base. In this context, it is argued that developing countries need to establish linkages with external sources of knowledge and technology in order to strengthen their innovation systems and shift their current development trajectories (Ernst & Lundvall, 2000).

Technology business accelerator programs, like the one carried out by the Mexican Government, seems to offer a unique potential to foster the innovation capabilities of firms in developing countries. Their strength is not only based on the access they offer to the sources of knowledge and

technology. But in that they enable firms to develop the tacit knowledge that is required to fully exploit the potential of codified knowledge and to sustain a process of learning and innovation. By locating high-tech companies in innovative regions around the world, these kind of program enable the face-to-face interaction required to initiate the learn-how and learn-who processes that are at the core of successful innovation (Jensen, Johnson, Lorenz, & Lundvall, 2007; B.-Å. Lundvall & Johnson, 1994). This is a unique characteristic of a business accelerator program that previous efforts to transfer knowledge and technology to developing countries lacked and which greatly limited their effectiveness (Archibugi & Pietrobelli, 2003; Ernst & Lundvall, 2000).

My research project seeks to investigate how this emerging institutional arrangement, by which governments can promote the access to global flows of knowledge and technology, affects the formation of innovation systems in developing countries. Through a qualitative analysis of the effects that the TechBA program has on the innovation and learning processes within firms and across actors and organizations in the locations where they are based in Mexico, it seeks to identify the effects that access to global flows of knowledge and technology has on the formation of technical, productive, organizational, and institutional capacities to innovate in Mexican regions.

The present paper introduces the theoretical basis, background information, and the methodological framework of the research project that I am presently consolidating and that I will develop in the next two years in order to obtain the doctoral degree in City and Regional Planning at the University of California, Berkeley.

2. **Research on systems of innovation in developing countries, the question of external linkages and local capability formation.**

In the last years, a new development model seems to be taking shape out of the increased recognition that knowledge and innovation constitute the basis of sustained economic development. Scholars have argued that regardless their stage of development, developing countries need to place learning and knowledge creation at the center of their development strategies if they want to effectively reduce poverty (Ernst & Lundvall, 2000). Parallel to that recognition, or probably as a result of it, international development organizations and governments in developing countries seem to be shifting their development strategies away from a blind faith in markets, emphasizing privatization, deregulation, and trade liberalization, to a knowledge and innovation-based development strategy (The World Bank, 2007). And while the idea that innovation is a necessary condition to achieve sustained levels of economic development in developing countries has been floating in the air for quite some time (see for instance, Chudnovsky, 1991), it now seems to be gaining traction with the growing consensus among scholars, international development organizations, and policy makers in developing countries.

For scholars working under the Systems of Innovation framework, an analytical model that emerged out of empirical research on the most advanced economies (Freeman, 1987; B.-Å. Lundvall, 1992c; Nelson, 1993), the shift in focus from North to the South poses new analytical and methodological challenges. Of particular importance is the recognition that in the context of developing countries, a System of Innovation is an "ex-ante" concept, in the sense that very few patters of the socio-economic behavior regarding innovation at national level can be viewed as working in a system-like manner (Arocena & Sutz, 2000). It has been argued that the focus ought to be shifted away from system description and analysis in the direction of system construction and system promotion. As a result, a research agenda has been launched to find ways to capture the formation and evolution of systems of innovation in developing countries (B.-A. Lundvall, Johnson, Andersen, & Dalum, 2002).

It has been further argued that a crucial element for the formation of systems of innovation in developing countries is the access they can gain to external sources of knowledge and technology. Ernst (2002a) asserts that developing countries need to blend diverse international and domestic sources of knowledge to compensate for initially weak national production and innovation systems. He supports his argument with the observation that industry in developing countries is characterized

by a dualistic structure, with widely diverging productivity levels between technologically advanced firms (mostly foreign MNE affiliates) producing for export and weaker domestic firms. With a narrow local knowledge base, and a very weak local base of support industries, a very limited sharing and pooling of resources has occurred within developing countries. Ernst argues that this has resulted in a narrow and incomplete set of domestic linkages that needs to be compensated by external ones.

External linkages are also advocated on the basis that they are necessary to break away from existing development trajectories given the path-dependent character of innovation. As Schumpeter (1911, 1934) pointed out, and Lundvall (1992a) reminds us, innovation may be regarded as a new use of preexisting possibilities and components. In that way, the capacity of a system of innovation is considered to be determined by the existing knowledge and technology base. For Ernst & Lundvall (2000), developing countries are stuck with a truncated sectoral specialization and constrained by the limited size of their domestic market and by the limited size of their knowledge and capital base. Since systems may be locked into a specific path of development that supports certain types of activities and constrains others, the capacity of a country to innovate will be affected by the extent to which its system of innovation exchanges impulses with its environment. The more open a system is for impulses from outside, the less the chance of being "locked out" form promising new paths of development that emerge outside the system (Fagerberg, 2005). But while scholars have been advocating for the need to account for external sources of knowledge and information in the analysis of learning and innovation processes, the question of how external linkages affect the possibilities to build systems of innovation in developing countries remains largely unexplored (B.-A. Lundvall et al., 2002).

Scholars have also pointed out that the relationship between external linkages and local capability formation is not straightforward, but both remain mutually constitutive. Such interdependency was made evident by the pervasive unequal distribution of technological advances despite early expectations of increased technological diffusion as a result of improvements in information technologies (IT). Even while the spread of IT has offered increased access to information, the capacity of developing countries to take advantage of the codified knowledge that can be transmitted over long distances has been demonstrated to be conditioned by their tacit knowledge base (Archibugi & Pietrobelli, 2003; Bathelt, Malmberg, & Maskell, 2004; Ernst & Lundvall, 2000). The

importance of local capabilities in assimilating, adapting, and improving imported technology has long been recognized, but few studies exist on the complex process of local capability formation in developing countries (Ernst & Kim, 2002).

Furthermore, the effects of external linkages cannot simply be assumed as positive. An increased connectivity of firms and regions in developing countries to global resources may enhance the diffusion of knowledge and technology across local economic actors into their regional systems of innovation, and hence provide new opportunities for innovation and economic development. But global integration may equally well erode the strengths of developing countries' regions by driving out existing resources and capabilities and by increasing the divide between firms and districts that have access to knowledge and technology and those that do not (Ernst, 2002b; Ernst & Lundvall, 2000). Whether external linkages are necessary for the formation of systems of innovation in developing countries is a theoretical question that requires empirical investigation. A question that has been elusive to answer given the lack of empirical data to follow the transformations that firms and regions suffer as they gain access to the global flows of knowledge and technology.

The TechBA program of the Mexican government provides a unique opportunity to follow that process. The following sections detail the characteristics of the TechBA program and provide the theoretical and methodological framework that will be used in my research project in order to advance our understanding of the formation of systems of innovation in developing countries.

3. Mexico's Technology Business Accelerator Program

In the year 2004 the Mexican Government launched the Technology Business Accelerator (TechBA) program with the goal of helping the best small and medium Mexican technology companies to access and compete in international markets. Unlike other export promotion programs that help companies to simply place their products and services in foreign markets, the TechBA program seeks a full integration of the Mexican companies into the financial, market, business, and technological resources of the most innovative regions in the world. The program so far is operating in Silicon Valley, California; Austin, Texas; Montreal, Quebec; and Madrid, Spain. In each of these TechBAs, the Mexican Government provides a space and supporting services to the companies participating in the program from which they can interact with local enterprises and other local organizations.

The participation of companies in the TechBA program begins with the once-a-year selection process organized by the Mexican Ministry of the Economy where a committee, comprised of international and Mexican experts in business, technology and venture capital, select the best companies. As part of this "pre-acceleration process", the companies participate in workshops to receive guidance on how technology businesses are conducted in the international arena and also go through a validation of their value proposition. The selected companies then move to the "acceleration process" in one of the TechBAs with the goal of capturing key customers, establish partnerships and major alliances, and access angel and venture capital investment. The companies first establish a foreign subsidiary to facilitate commercial transactions with the country whose markets they want to reach. Throughout one year, they receive guidance from the team of consultants that operate each TechBA and who play a key role in facilitating contacts with sources of capital, management talent, professional services firms, key suppliers, and first customers. Each TechBA also organizes periodical workshops with specialists who provide support in the activities that companies undertake in the process of becoming global players.

The TechBA program focuses on innovative companies related to high-tech sectors with strong presence in the global technology markets, such as information and wireless technologies, biotechnology and bioinformatics, life sciences micro-systems, including semiconductors and MEMS, advanced materials, robotics, multimedia, animation and education services. Throughout the

four years that the program has been operating, one hundred and fifty companies have gone through the acceleration process with different degrees of success in reaching the global markets.

Even when this program might appear to be a government-supported incubator abroad, business accelerators play a different function than business incubators. While an incubator helps entrepreneurial companies to survive and grow during the start-up period when they are most vulnerable, a business accelerator helps small and medium companies that have already developed an innovative product or service to overcome the difficulties they face in their attempt to reach the global markets. Some business incubators have adopted the term "accelerator" in an attempt to differentiate themselves in the market. But the TechBA program of the Mexican Government has a different goal and supplements the extensive network of incubators currently operating in Mexico.

By helping Mexican enterprises become global players, the TechBA program also seeks to stimulate the formation of high value-added clusters in the regions where the companies are based in Mexico. According to the program objectives as stated in the official web page of the TechBA program,

> Regions of innovation in Mexico will also benefit from the market intelligence that each TechBA will be acquiring, helping them to start the acceleration of high value added clusters[1].

The program is conceived as a cycle (see Figures 1 and 2). The companies participating in the TechBA program emerge out, and are selected from, the "regions of innovation" in Mexico. And by becoming global players, these companies are expected to foster the economic development of those same regions.

But despite the goals stated in TechBA's official website, in conversations held with the government officials in charge of the design and operation of the program it became evident that the question of how the institutional set-up of the program or the internationalization of high-tech companies might be affecting the formation of high-value added clusters in Mexico remains largely unresolved. In the four years that the program has been operating, the efforts of the government have focused mostly in helping Mexican companies to gain access to the global technology markets. But government officials are also aware of the limited capacity that the government has in supporting individual companies. They acknowledge that the real potential of the program lies in the wider effects that TechBA can have on the systems of innovation of Mexico. They also recognize the need to promote

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[1]http://techbasv.com/joomlamain/index.php?option=com_content&task=view&id=41&Itemid=72&lang=english

measures to support a process of capability formation. However, their efforts are still limited by their limited understanding of the mechanisms by which the accelerated companies and the learning processes initiated by the program are affecting the formation of resources and capabilities to innovate in Mexico.

Figure 1 - The Technology Business Accelerator Program
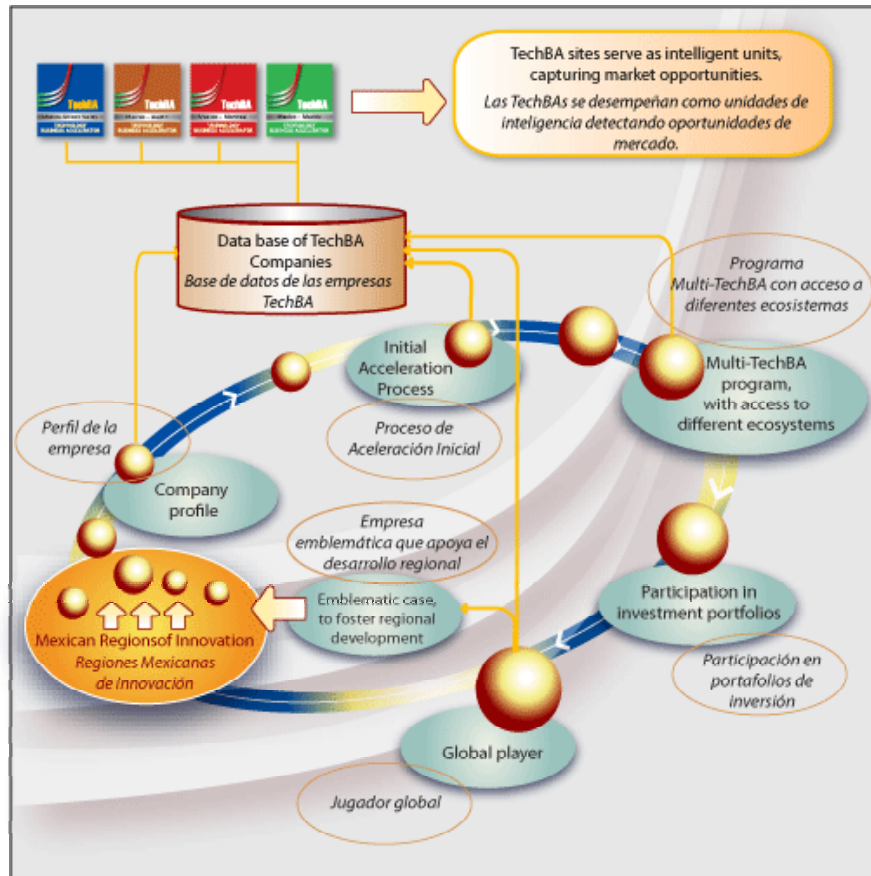
Source: Mexico's Technology Business Accelerator Program official website: http://techbasv.com

Figure 2 - "Connecting Ecosystems"

Source: Mexico's Technology Business Accelerator Program official website: http://techbasv.com

4. Research questions, research strategy, and methodological framework.

The goal of my doctoral dissertation research project is to understand how a government-led business accelerator program affects the formation of regional innovation systems in developing countries. To investigate this question, I will conduct a case study of Mexico's TechBA program to understand how this emerging mechanism to access external sources of knowledge and technology affects the formation of resources and capabilities to innovate through the qualitative analysis of two interrelated sub-processes:

1. The process by which the TechBA program affects the innovation capabilities of the companies participating in the program through their interaction with global sources of knowledge and technology.

2. The process by which the "accelerated firms" and the learning processes initiated by the TechBA program affect the formation of technical, productive, organizational, and institutional resources and capabilities to innovate in Mexican regions.

My research will take a qualitative framework for the design, data collection, and data analysis of the case study. This approach was preferred given that the TechBA program represents a "revelatory" case (Yin, 2003, p.42), a phenomenon which has not been subject of empirical analysis. A qualitative framework was also selected given the focus on *process* of my research, which seeks to explore the *how* and *why* of systems of innovation formation and the influences of the physical and social context on the events and activities involved in such process (Maxwell, 1998).

The development of the case study will follow an open-ended and inductive logic of inquiry, informed by theoretical propositions to guide data collection and analysis (an initial attempt to develop these research propositions is presented in Section 5 of this paper). And while much exploratory and descriptive analysis is expected in the first stages of the research project, the ultimate goal is to develop an explanation of the presumed causal links between global flows of knowledge and technology and innovation systems formation in developing countries through the mediation of a government-led business accelerator program. It is important to note that the goal of my research project is not to generalize from an explicit sample to a defined population. The extension of my case study will follow "analytical generalization", or the development of a theory that can be extended to other cases (Maxwell, 1998; Yin, 2003).

While the TechBA program operates in four sites around the world, each of which could be considered an individual case, a single-case rather than a multiple-case design was chosen because the goal is to understand the effects of the program as a whole. My research seeks to understand not only the innovation dynamics within the individual TechBAs, or within the participating companies, but the knowledge transfer and learning dynamics within and across the companies participating in the program, the different TechBAs around the world, and other organizations in Mexico affecting the process of innovation system formation. For my research project I will analyze the dynamics of at least two of the four TechBAs in operation. The two initial sites selected are Silicon Valley in California and Austin in Texas. These two sites were selected given that while the economic base of both regions comprises industries in the high-tech sector, they present contrasting productive structures, which are expected to affect the capacity of the companies participating in the TechBA program to establish linkages with local companies and organizations (Glasmeier, 1988; Markusen, 1996; Saxenian, 1994). Once identified the companies participating in each of these two TechBAs, in a second stage of my project I will analyze the process of local capability formation in the regions where these companies are located in Mexico.

The primary data collection technique will be open-ended interviews complemented with in-site observations which have the goal of obtaining in-depth information regarding the strategies and practices of the actors directly or indirectly involved in the TechBA program. The potential respondents for my study are what Weiss (1994) calls a *panel of knowledgeable informants*, or a group of respondents with a unique capacity to inform us given the position they occupy in an organization or event. The goal, therefore, is to include as respondents all actors playing a significant role in the two processes under investigation in order to obtain a complete and coherent image of the phenomenon under study. To recruit my respondents I will follow a snow-balling technique, beginning with the government officials in charge of operating the TechBA program, following with the participating companies and finishing with other relevant actors in both the foreign locations and the regions in Mexico such as customers, specialized service providers, venture capitalists, business and professional associations, universities and research institutions, local governments, etc.

Finding appropriate concepts and measures to identify and assess the qualitative transformations that the TechBA program produces, in both the innovation capabilities of companies and in the formation of regional systems of innovation in Mexico, is one of the most challenging tasks of my

research project. Consistent with the qualitative approach of my research project, the creation of concepts and measures will be the result of an interactive process between inductive and deductive analysis. Concepts and measures will result out of a constant dialogue between empirical observations and propositions emerged from the theory developed along the process of data collection and analysis (Neuman, 2003). The following section develops the research propositions that will guide and inform the process of data collection and analysis for the study of the two sub-processes detailed at the beginning of this section.

5. Research propositions

Based on an on-going review of the literature, this section formulates some initial research propositions to guide the process of data collection and analysis. They are intended to provide a roadmap for the kind of evidence needed to identify and measure the effects of the TechBA program on the formation of regional systems of innovation in Mexico. These initial propositions are expected to evolve through an interactive process between theory development and empirical observations into conclusions generalizable to a theory of the effects of a government-led business accelerator program on the formation of regional innovation systems in developing countries. The research propositions are divided in two sections, corresponding to the two sub-processes under investigation, as detailed on Section 4 of this paper.

5.1. Propositions for the first sub-process.

The first part of this research project involves the analysis of the process by which the TechBA program affects the innovation capabilities of the companies participating in the program through their interaction with global sources of knowledge and technology. Why should we expect the TechBA program to affect the innovation capabilities of the participating companies?

As mentioned in Section 3 of this paper, the TechBA program serves a different purpose than a business incubator. It works only with companies that have already gone through the process of developing an innovative product or service. The goal of the TechBA program is "to support top-tier Mexican companies in bringing their innovative technology, products and services to global markets"(Mexican Ministry of the Economy, 2008). The focus is on the commercialization of products and services and in the development of organizational and managerial capabilities within firms. At first sight, it might appear as if the TechBA program would have no impact in the

innovation capabilities of the participating companies since it does not provides any support for the scientific and technical activities involved in the development of new products and services. But if we consider innovation broadly, as "the process of production, diffusion and use of new and economically useful knowledge" (B.-Å. Lundvall, 1992a:2) the activities related to the commercialization of a new product or service become integral to the process of innovation. As observed by Jensen et al. (2007:681), "there remains a bias among scholars and policy makers to consider innovation processes largely as aspects connected to formal processes of R&D". And as noted by Ernst & Lundvall (2000:31) "we have to put emphasis on integration of technology in the complete business environment, production, marketing, regulations and many other activities essential to commercial success. These are the areas where the innovation process is being retarded".

By locating high-tech companies in the most dynamic regions of innovation around the world, the TechBA program enables the face-to-face interaction between users and producers required to develop tacit knowledge, which is at the core of successful innovation (Jensen et al., 2007; B.-Å. Lundvall, 1992b; B.-Å. Lundvall & Johnson, 1994). This is a characteristic of the program that previous efforts to transfer knowledge and technology to developing countries lacked and which greatly limited their effectiveness (Archibugi & Pietrobelli, 2003; Ernst & Lundvall, 2000). And given the interactive character of innovation processes, that involve the participation of actors located in different organizations (Freeman, 1987; Kline & Rosenberg, 1986; B. Å. Lundvall, 1988), we could expect the innovation capabilities of the participating companies to be greatly enhanced once they come into contact with the wide range of specialized suppliers, service providers, advanced research institutions, venture capitalists, and business and professional organizations located in the regions of innovation where the TechBA program operates.

However, it should not be assumed that the simple co-location of user and producer would automatically lead to a process of interactive learning and creation. As Lundvall (1992c) argues, the effective exchange of qualitative information involved in innovation processes is contingent on the development of a common language and in the accurate interpretation of implicit norms and codes. Complex and ever-changing messages, combining explicit information with tacit assumptions regarding mutual obligations, will often be required in interactions involving innovative activities. In this way, cultural, rather than geographical distance among firms, is considered the greatest obstacle

to innovation processes. In fact, this was one of the main arguments used to justify the national character of systems of innovation in the first place.

This leads to our first research proposition: the knowledge accumulated through the institutional and organizational capacity of the TechBA program, as well as the learning processes initiated among the different actors involved in it, will be crucial to overcome the cultural distance that separates the participating companies from the actors and resources of the regions of innovation where the program operates around the world. This proposition is presented as a guide to be validated through empirical investigation. What remains to be investigated in the field, are the specific strategies and mechanisms that the TechBA program and the participating companies are using to overcome this cultural distance. For the participating companies that fail to reach the global markets, we also need to examine the extent to which cultural distance accounts for their failure and the mechanisms through which cultural barriers operate.

Assuming that at least some companies will be successful in overcoming the cultural distance, the question then is how the access to global resources of knowledge and technology affects the innovation capabilities of firms participating in the TechBA program? And related to that, how can we identify and measure the impact of the TechBA program in the innovation capabilities of participating companies? These questions are particularly hard to answer given the "contingent" character of innovation processes. According to Pavitt (2005), innovation processes differ in many respects according to the economic sector, field of knowledge, type of innovation, historical period and country concerned. They also vary with the size of the firm, its corporate strategy or strategies, and its prior experience with innovation. And as Pavitt observes, the difficulties in analyzing innovation processes are compounded by the fact that there is no widely accepted theory of firm-level processes of innovation that satisfactorily integrates the cognitive, organizational, and economic dimensions of innovation processes in firms. However, we can find in the existing literature guidelines to investigate the transformations that companies suffer as they succeed in reaching the global markets.

Building on Lundvall & Johnson (1994), and on an important body of literature on knowledge creation and learning processes, Jensen et al., (2007) provides us with a framework to analyze the different types of knowledge and modes of learning involved in innovation processes within firms.

They distinguish between two ideal types modes of learning and innovation. One mode is based on the production and use of codified scientific and technical knowledge, the Science, Technology, and Innovation (STI) mode. The other is an experienced-based mode of learning based on Doing, Using and Interacting (DUI).

These two learning modes are related to different types of knowledge, which have been usually classified along dichotomies - tacit-codified; local-global. But as Jensen et al. argue, building on Nonaka and Takeuchi's (1995) observation, the zone in between and the complementarities between them are often what matters most. Instead, they offer us a somewhat more elaborate set of distinctions, initially developed by Lundvall and Johnson (1994), to understand the different channels and mechanisms through which learning different types of knowledge takes place.

- o Know-what
- o Know-why
- o Know-how
- o Know-who

Learning the four types of knowledge tends to take place in different ways and through different channels. The STI-mode gives high priority to the production of 'know-why', which relies on very specialized 'know-what'. As these types of knowledge can be easily codified and transmitted over long distance, they tend to be global. In contrast, the DUI-mode typically will produce 'know-how' and 'know-who' mostly through experience and social practice. As these types of knowledge are usually tacit and firm specific, they tend to be local.

This leads to another set of research propositions. Our second research proposition is that, at least initially, the TechBA program will not do much for the development of the STI-mode of learning within firms. Since this mode of learning relies in knowledge that can, in principle, be accessed from distant locations, the simple location of companies next to the sources of scientific knowledge and technology will not represent a significant change in the internal dynamics of the participating companies. This will be expressed by low levels of R&D collaborations between companies and scientists in the universities and research institutions of the regions of innovation where the TechBA program operates around the world. It will also be expressed by low levels of partnerships with

other firms aimed at R&D activities, or by a low incidence of employment of specialized local personnel for those same activities.

Our third proposition, in contrast, sustains that the TechBA program will stimulate the DUI- mode of learning, which will be reflected in a restructuring of the activities and organization within participating companies. According to Jensen, et al., 'know-how' and 'know-who' types of knowledge are acquired for the most part on the job as employees face on-going changes that confront them with new problems. Finding solutions to these problems enhances the skills and know-how of the employees and extends their repertoires. When the process is complex, it will involve interaction within and between teams and it may result in new shared routines for the organization. In this way, as the TechBA program confronts participating companies with the need to develop the know-how and know-who required to commercialize their products and services in foreign markets, we can expect the development of links and communication between sales, marketing, and management departments with the design and production departments. This will be reflected in the creation of new structures within the participating companies, such as new positions or departments to manage these links, or by the development of organizational practices such as project teams, problem-solving groups, and job and task rotation to enhance company's capacity to respond to changes in markets.

5.2. Propositions for the second sub-process.

The second part of my research project focuses on the process by which the "accelerated companies", and the organizational capacity and the learning processes initiated by the TechBA program, affect the formation of technical, productive, organizational, and institutional resources and capabilities to innovate in Mexican regions. Why should we expect the TechBA program to "accelerate" the formation of systems of innovation in Mexico?

As Ernst & Lundvall (2000) observe, learning creates change and promotes innovation. But it is equally true that the change instituted by innovating actors imposes further change for other agents. And as the key to success in innovation is time - that is, to move as rapidly as possible from the original idea to the introduction of the novelty in the market - when strategic agents of change accelerate their activities they will impose the need for more rapid learning on the other agents in the economy. In this way, we could expect that as the companies participating in the TechBA program

develop new knowledge and initiate learning processes as a result of their exposure to global innovation resources, they will in turn serve as catalyst for change among producers, suppliers, and other organizations in the regions where they are located in Mexico. Change could also be stimulated by the same institutional and organizational capacity of the TechBA program through knowledge sharing and learning among the different regions of innovation around the world and the regions in Mexico.

However, while some agents might be stimulated to upgrade by the change imposed by the accelerated companies, some others can be left behind, widening the knowledge and learning gap among economic agents and further reinforcing the dualistic character of developing countries' industrial structure (Ernst, 2002a). And as the companies participating in the TechBA program gain access to the financial, market, business, and technological resources of the most innovative regions in the world, they could also weak their ties to domestic resources impairing the formation of the local linkages necessary for the strengthening of the systems of innovation in Mexico. We cannot assume that the linkages established with external sources of knowledge and technology, through a government-led business acceleration program, will necessary produce positive effects in the formation of systems of innovation in developing countries. We need to inquire on the processes and mechanisms by which such access interacts with local social and productive dynamics and to understand the conditions upon which local capability formation is either accelerated or hampered. In order to illustrate the mechanisms that could lead to the two alternative outcomes, and to guide the process of data collection and analysis, two ideal type scenarios are presented.

In the first scenario, the TechBA program will stimulate the formation of resources and capabilities to innovate through the following mechanisms. Looking at the role of the accelerated companies, they will stimulate local capability formation through backward and forward linkages with suppliers and clients. As the accelerated companies raise their knowledge and technology standards, they will induce the upgrading of their suppliers or provide higher value-added products and services for the production processes of their clients. Accelerated firms will also introduce new management and production practices leading to increased networked production, partnerships, or outsourcing. These practices will serve to disseminate the knowledge (both tacit and codified) and technologies developed through their exposure to global innovation resources. Participating companies will also stimulate the formation of local labor markets, by requiring higher skills or by increasing labor

mobility in the region. And finally, they will have an effect in the institutional and regulatory framework supporting innovation through their increased interaction with local governments or local business and professional associations. Looking at the institutional and organizational capacity of the TechBA program itself, it will further stimulate local capability formation by diffusing knowledge and strategic information acquired through the network of foreign TechBAs to help key actors in Mexico to take decisions and orient policy making.

In the second scenario, the TechBA program fails to stimulate, and even hampers, the formation of resources and capabilities to innovate in Mexican regions through the following mechanisms. Accelerated companies will reduce their reliance on domestic suppliers as they access foreign suppliers and service providers. In this way, they will fail to diffuse the acquired knowledge and technology through the regional economies in Mexico and even reduce the necessary linkages for the formation of a system of innovation. Accelerated companies will also rely on foreign actors for their research or production partnerships or they will simply increase their vertical integration and reduce their reliance on domestic firms for their R&D or production activities. Companies participating in the TechBA program will also reduce their reliance on domestic labor markets by acquiring the necessary skills in the foreign locations and even by re-locating their R&D and management activities to foreign locations. And as these companies reduce their stakes in the regions where they are located in Mexico, the TechBA program will lead to the reduced involvement of the accelerated companies with local governments or business and professional associations, thus failing to transform the institutional and regulatory framework supporting innovation. Regarding the institutional and organizational capacity of the TechBA program, it will fail to diffuse the acquired knowledge throughout key actors and organizations based in Mexico, further increasing the gap between those who have access to knowledge and information and those who do not.

These two ideal type outcomes will serve to guide the analysis of the processes by which the knowledge and technology generated by the TechBA program interacts with local dynamics in the production of resources and capabilities to innovate in Mexican regions. However, the ultimate goal is to identify the factors that might be influencing the outcomes and establish causal relations that could be generalizable to other cases. The following propositions are presented as a starting point to guide this analysis.

Fourth proposition: the effect of the TechBA program on the formation of innovation systems in Mexican regions will be affected by the sector of economic activity of the participating companies. We know from Pavitt (1984) that the sources, nature, and impact of innovations vary by sectors of economic activity. According to Pavitt, sectoral differentiation has implications for our understanding of the sources and directions of technical change, firms' diversification behavior, the dynamic relationship between technology and industrial structure, and the formation of technological skills and advantages at the level of the firm, the region and the country. And while the companies participating in the TechBA program are all "high-tech" or "technology-based", we can still expect to find variation in their involvement with domestic actors based on companies' specific industries or main lines of economic activity.

Fifth proposition: the effect of the TechBA program on the formation of innovation systems will be affected by the industrial structure and clustering tendencies of the regions where the participating companies are based in Mexico. There is an extensive literature on regional economic development that has demonstrated that clustering tendencies are influenced by the industrial and productive structure of a region, the corporate strategies of dominant actors, and regional governance structures (Braczyk, Cooke, & Heidenreich, 1998; Cooke, Heidenreich, & Braczyk, 2004; Glasmeier, 1988; Markusen, 1996; Porter, 1990; Sabel, 1989; Saxenian, 1989, 1994; Storper & Harrison, 1991). We can therefore expect the stimulus provided by the TechBA program to have different effects depending on the particular characteristics of the regional economies in Mexico.

Sixth proposition: the effect of the TechBA program on the formation of systems of innovation in Mexican regions will be affected by the "absorptive capacity" of local actors. Building on Cohen and Levinthal (1990), Ernst & Kim (2002) have recognized that knowledge transfer is not a sufficient condition for effective knowledge diffusion. Diffusion is completed only when transferred knowledge is internalized and translated into the capability of the local actors. How fast and successfully regional actors internalize and translate the knowledge transferred through the TechBA program into their own capability through learning will be largely determined by their absorptive capacity and their ability to upgrade it continuously.

6. Conclusion.

The Technology Business Accelerator (TechBA) program of the Mexican Government signals an emerging mechanism by which governments in developing countries can gain access to global sources of knowledge and technology. This kind of program seem to offer a promising course of action for developing countries that seek to strengthen their innovation systems. Contrary to previous mechanisms to access foreign sources of knowledge and technology that transferred mostly knowledge that it was easy to codify, this type of program enables the development of tacit knowledge that can only be gained through direct experience. But whether or not is sensible for a developing country to embark on a program of this nature is a question that relies on answering another, more fundamental, question. Whether a business acceleration program can enhance the capabilities of the whole system of innovation, and not just of the companies participating in the program.

My doctoral dissertation research project uses the case of the Mexico's TechBA program in order to advance our understanding of this question. Through a qualitative analysis of the effects that the TechBA program has on the innovation and learning processes within firms and across actors and organizations in the locations where they are based in Mexico, it seeks to identify the effects that access to global flows of knowledge and technology has on the formation of technical, productive, organizational, and institutional capacities to innovate in Mexican regions. The present paper has presented the theoretical basis, background information and the methodological framework of my doctoral research project. It concluded by advancing a series of research propositions arising from the literature on systems of innovation, knowledge and learning processes, and regional economic development, that will be used to guide the process of data collection and analysis. These initial propositions are based on an on-going literature review and are expected to evolve through an interactive process between theory development and empirical observations into conclusions generalizable to an analytical model of the effects of a government-led business accelerator program on the formation of regional systems of innovation in developing countries.

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