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Mature and developing ecosystems: a comparative analysis from an evolutionary perspective

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*“Mature and developing ecosystems:
a comparative analysis from
an evolutionary perspective”*

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Mature and developing ecosystems: a comparative analysis from an evolutionary perspective

Hugo Kantis

Abstract

This document provides relevant findings of the emergence and development of some ecosystems. Firstly, it looks into the long-term trajectory of two advanced ecosystems such as Silicon Valley (USA) and Tel Aviv/ Israel in an attempt to grasp their emergence and evolution. Secondly, it analyzes the similarities and differences between two Latin American cases –the cities of Buenos Aires (Argentina) and Santiago (Chile). Thirdly, it attempts to compare the cases presented, understand their roots from an evolutionary perspective and explore some implications for developing ecosystems. The cases were selected considering their salient features as both Silicon Valley and Tel-Aviv/ Israel are state-of-the-art ecosystems with interesting differences in their evolutionary process. The cities of Buenos Aires and Santiago are relevant developing ecosystems in the Latin American context.

Keywords

Ecosystem – Evolution – Silicon Valley – Tel Aviv/ Israel – Buenos Aires – Santiago de Chile

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Introduction

It is broadly known that some successful ecosystems such as Silicon Valley or Tel Aviv/Israel are non-replicable. However, although replication attempts are often discouraged, initiatives are usually implemented without an adequate understanding of the contexts and the differences among them.

Based on previous definitions an entrepreneurial ecosystem could be considered as a set of actors, factors and relations influencing the fertility and dynamics of a particular territory in terms of startups and scale ups (Prodem 2017: Spilling 1996, Neck and others 2004, Isenberg, 2011, Mason and Brown, 2014).

Different authors have attempted to draw a long list of possible ecosystem components: the entrepreneurs, the pool of talents, the market and the firms, the culture and the mass media, the educational institutions, the supporting institutions and the mentors. They also include finance, the Government and its programs and the regulatory framework influencing the entrepreneurial activity directly or indirectly (Isenberg 2010, Stam 2015, Stam and Spigel 2016, Brown and Mason 2014, 2017, Audretsch and Belitski, 2016, Acs et al., 2017).

This approach designed to identify the ecosystem pillars has been criticized due to its static condition and the lack of an explicit elaboration of the causal relations among the different dimensions (Brown and Mason 2017, Spigel 2015, Stam and Spigel 2016). Sharing the need of adopting an evolutionary viewpoint does not imply to assume the existence of a unique trajectory. On the contrary, the focus should be widened to encompass a typology of ecosystems and evolutionary paths, thus acknowledging the existence of diverse patterns and dynamics.

In this article, we analyze the long-term trajectories of diverse ecosystems in an attempt to understand the history of their development and dynamics. In the first section, we will analyze the cases of Silicon Valley (USA) and Tel Aviv/Israel. In the second section, we will look into two Latin American cases, the cities of Buenos Aires (Argentina) and Santiago (Chile). In both sections we will identify and discuss its similarities and differences. In the third section, we will elaborate on the contrast and similarities between mature and developing systems and will advance an understanding of their roots from an evolutionary perspective and their implications for developing ecosystems. The selection criteria considered that both Silicon Valley (USA) and Tel Aviv (Israel) are state-of-the-art ecosystems with significant differences in their history and actual configuration. The cities of Buenos Aires and Santiago are chosen because they are relevant developing ecosystems ranked positively in the Runner Up category of the Global Start-Up Ecosystem Report.

Emergence and development of mature ecosystems. An evolutionary view of the cases: Silicon Valley (USA) and Tel Aviv (Israel)

In the last decade, the trend has been toward generalizing the concept of ecosystems mainly based on the case of Silicon Valley. However, the mainstream approach has shown some limitations. It is seen as static because it does not help understand relevant issues in ecosystem development such as the endogenous dynamics that contribute to their emergence and development. This approach implicitly suggests the existence of a unique pattern guiding the activity. In an attempt to grasp the dynamics of two emblematic cases such as Silicon Valley (SV) and Tel Aviv/Israel, we look into their similarities and differences in the following pages. In the analysis, we used data from different sources such as information collected during trips to these ecosystems; interviews carried out by the author, and a review of the literature.

THE SILICON VALLEY: RAINFOREST OR EMERGENT STRATEGIES?

Two essential building stones in SV's prehistory should be analyzed, the role of Stanford University and the project devised and led by Frederick Terman who was a professor at Stanford University and a former member of MIT (Kaplan 2000, Blank 2008). At the first decades of the 20 century, Stanford graduates had to migrate to find jobs on the Eastern Coast. This adverse situation has led Stanford University to build a vision and an institutional project for change, being Professor Terman a key actor. Based on that vision, this would later help to capitalize the opportunities offered by a context that favored leveraging capacities and institutional resources. For instance, R&D projects from national government.

In this context, the creation of the firm Hewlett-Packard played a pioneering role at the end of the 1930's. Hewlett and Packard were both Terman's disciples. This professor encouraged his students to open their own firms, and even invested and mentored some of them. In the case of Hewlett-Packard, its founders gained experience in Eastern coast companies and returned to the Valley following Terman's advice. The experience in another environment strengthened their idea to set up their firm (Blank 2008). Mr. Jobs and Mr. Wosniak would later work at HP for some years.

Over time, some others followed their steps. Iconic Silicon Valley firms like Litton and Varian Associates also based their innovative technological developments on the knowledge platform fostered by Stanford University. Graduates' and students' entrepreneurial initiatives would find an unparalleled place to develop ideas and a potent "feed" in the agreements that Stanford reached with the Department of Defense thanks to Terman's proactive leadership. Again, this process did not occur in the vacuum. It stemmed from the

knowledge constructed from researching in some extremely useful technologies in the Second World War, such as the developments coming from the Radio Institute or the Microwave Laboratory. During the 1950s Stanford's scientific and technological park was created. This lured companies such as IBM, G.E, Westinghouse, Ames Research Center and Lockheed Aircraft to establish in the Valley, and gave room to some 150 companies (Kaplan 2000).

We cannot state that Terman and Stanford University had a deliberate strategy to build an ecosystem such as Silicon Valley. However, we can underline the role of technology in seeding some environmental conditions, i.e., the knowledge base and the entrepreneurial spirit. These two factors would let grow some other unforeseen ones which were vital to enhance the growth and excellence of Stanford's knowledge platform and the emergence of the ecosystem. In an evolutionary logic, it can be argued that an ecosystem development occurs in geological layers, not being possible to identify a sort of big bang, after which the whole ecosystem emerged.

By mid-twentieth century, new companies were created in the Valley and became iconic. Fairchild Semiconductors was emblematic of what would change the life in the valley. Eight engineers with outstanding academic credentials founded this company after leaving a laboratory team put together by William Shockley. Before coming back to the Valley to start up his company, Shockley had worked for Bell and had received a Nobel Prize for his developments in the emerging transistors industry. These eight "traitors" (as he used to call Fairchild Semiconductors' founders) left his company because of a reputation of a hot-temper manager with poor management skills. In the absence of venture capital industry, these eight engineers persuaded the industrialist Shairman Fairchild from Nueva York to invest in their project. Fairchild was interested in researching on satellite and missile systems and the relevance of transistors (semiconductors). They lured him with the idea of becoming the primary partner in a hybrid company that would be both a startup and an affiliate of Fairchild Company. Fairchild Semiconductors was key in the Valley's technological revolution by generating many spin-offs.

Intel would follow this wave of spin offs in the 1960's. Thus, a wave of new firms grew driven by the opportunities that technology offered. The flow of new companies was incubated inside the older companies where future entrepreneurs were working. At the end of the 1950's, the first IPOs from Varian Associates (1956), Hewlett Packard (1957) and Ampex (1958) took place. Again, Fred Terman, dean of the School of Engineering at Stanford, had links with them (Blank 2008). During the following years, a small group of angel investors, self-called "the group", became stakeholders in the new flourishing electronic companies in the valley.

These events laid the foundations for the increasing emergence of new companies that enhanced the Valley's prior conditions and contributed to building a stronger base. Diverse symbolic and real spaces facilitated the creation and development of institutions that operated as bridges between the entrepreneurs and mentors on one side, and the companies and the knowledge base on the other. These paved the way for the emergence of new specialized service providers, such as law firms, accounting firms, specific industries and technologies, among others.¹

But the significant qualitative leap towards the emergence of the risk capital industry took place when the Small Business Investment Company (SBIC) Act was passed in 1958. This regulatory initiative would foster the financing of new innovative companies together with other governmental instruments such as NASA, DARPA, Space Race, and so forth that were adopted after the Soviet Union launched Sputnik-1. If a private company invested US\$ 1, the government would invest US\$ 3 (up to US\$ 300,000). Thus, only in the 1960's, several venture capital firms would start their business levered with public resources.² Before then, military contracts and traditional bank loans had been the only financing option. Venture capital funds such as Sequoia Capital, Kleiner, Perkins, Caufield & Byers –KPCB–, Greylock, New Enterprise Associates and Accel, Andreessen Horowitz, Founders Fund date back to the 1970s and 1980s.

In this phase of the ecosystem, the confluence and co-evolution of different companies, on the one side, and investors, on the other, shaped a virtuous cycle with the universities. The latter provided their knowledge base and often facilitated contacts because of the dual activism displayed by the academics participating in both the academic and the business sectors. Over time, the trust base grew stronger and favored the appearance of a network whose social capital was an open, creative and horizontal culture supported by the territorial proximity typical of the Western Coast of San Francisco. This led to developing informal spaces, events, and the emergence of dealmakers who moved from place to place laying bridges to make things happen and giving room to new possibilities (Napier and Hansen 2011, Brown and Mason 2014, 2017).³

¹ A recent Endeavor study helps understand how Silicon Valley has become Silicon Valley based on a graph showing the connections between mother companies and their offspring (Endeavor, 2016).

² For example, Bank of America, American Express, Continental Capital, Pitch Johnson & Bill Draper y Sutter Hill were created to make use of the public funding channeled through the Small Business Association.

³ Dealmakers are people wearing different hats. They help circulate the information and develop contacts among different parts and people in the ecosystem. For example, they are members of the boards of different organizations/ investment funds or universities (Napier and Hansen 2011). Dealmakers can be different actors playing more than one role in the ecosystem, entrepreneurs, mentors, investors, academics, professionals in the industry and accelerators dealers.

Technological development triggered new business opportunities. The incipient innovative firms drove the growth of the ecosystem and its diverse organizations. These businesses based on Schumpeterian technological regimes featured significant innovation and low entry barriers with the new companies playing a crucial role. Since the process took place in different technologies over time, it helped mature Silicon Valley ecosystem. The business capacity of the Valley faced challenges such as the end of the Cold War (and its impact on defense contracts), and the Japanese competition starting in the 1980's. These events could lead to a severe declination in other regions but not in the Valley (Saxenian 1996).

In this context, the spinoffs have been the most significant component in Silicon Valley dynamics for decades. Without them, the system could have never matured. However, this platform of newly created firms developed, scaled and coevolved together with the venture capital industry. The phenomenon of the so called “entrepreneurial recycling” has enhanced this dynamic (Mason and Harrison, 2006). The successful entrepreneurs have contributed as serial entrepreneurs or by creating new organizations in the ecosystem, i.e., venture capital funds, accelerators, etc., together with executives from technology companies.⁴

In sum, from an organizational perspective, Silicon Valley is an ecosystem defined as a naturally emerging collective endeavor that did not appear in the vacuum. Certain pre-existing conditions have contributed to transform the Valley into a fertile ground due to the presence and dynamic emergence of some factors and actors, each one with its institutional and entrepreneurial logic and drive. They have acted as catalysts of the Valley development through qualitative leaps in the ecosystem life. However, the process took place without an explicit, collective leadership or a deliberate shared and devised strategy. It was the confluence of different forces and its interaction with the opportunities and resources existing in the broader national context. Openness is, therefore, a key ingredient of Silicon Valley's emergence and development.

In this field, entrepreneurs, mentors, investors, academics and other actors in Silicon Valley have been lured, and are today lured, by business opportunities or the probability of profits from their successful entrepreneurial endeavors. Yet, the calculative logic or the mere desire of becoming millionaires has not been the necessary precondition for such vigorous dynamics. On the one hand, this ecosystem culture has always been open and risk tolerant. On the other, there has been a diverse formation and educational space of the

⁴ Accelerators have not always been present in Silicon Valley. They can be considered as another signal of maturity but not the reason for its success. One of the most important signs is the productive business activity and the innovation. To some extent, the causal relation is just the opposite. Accelerators have flourished since the emergence of Y Combinator (2005) and Plug and Play (2006). A second wave of 500 startups emerged between 2010 and 2012.

entrepreneurial energies in universities and companies. In different socializing environments, actors have played the role of intermediaries, with the skills and resources to invest and provide sophisticated services as part of the scene. The socio-economical compounds have shaped the ecosystem.

Most spaces and connections have grown informally and spontaneously, i.e., people intermingling in coffee lounges. However, academics and entrepreneurs have been crucial as mentors and investors facilitating the emergence of social capital. Also, lawyers have acted as business builders bridging entrepreneurs and investors or in some financial institutions such as the Silicon Valley Bank. These dealmakers wearing different organizations' hats, for example, as members of different boards, have been vital to knit networks and facilitate the emergence of new firms. They have furnished entrepreneurs with new ideas, data, advice and resources, not only in the individual processes but also in the development of a collective dynamics. They are known as the *ecosystem glue* in the literature.

TEL AVIV/ISRAEL: THE ENTREPRENEURIAL STATE AND THE PUBLIC-PRIVATE PARTNERSHIP

The Tel Aviv/Israel ecosystem shows different features. There has been a clear governmental leadership for many decades and the business supportive institutional platform has relied on a public-private partnership, with public and private components levered over time.

In the initial phase, the State played a stellar role by laying the foundations for a considerable investment process that gave rise to entrepreneurial groups. This has contributed to building primary housing infrastructure, defense industry and universities (Nitzan and Bichler, 2002). The State proactively led the process by attracting and absorbing several immigration waves that contributed to a population increase from one million inhabitants at the foundation of Israel (1948) to almost nine millions today, forging an extremely open culture led by pioneers. It has been said that the whole process of State building was entrepreneurial itself, being the collective farms (*kibbutzim*) one of the more clear expressions of this entrepreneurial spirit.

Some decades after this initial phase of the pioneers, a crucial event occurred after the Yom Kippur war. A Jewish engineer who had been one of the first employees at INTEL- Silicon Valley convinced the company to set up an innovation center in Israel under his entrepreneurial leadership (Senor and Singer, 2009). This center was vital to Intel's technological development globally. The feasibility of this process showed that the country could become a platform to welcome other international tech companies as from 1990. Despite the ongoing conflict in the region, this process took place amidst the tech revolution acceleration due to internet and telecommunications.

Thus, Intel's experience may be seen as emblematic. It showed that some actors had a pivotal role in opening paths in the ecosystems, in this case, towards other international tech companies. It also showed the proactive Jewish diaspora protagonism⁵. From a more general perspective, some talents helped place some building stones in the emergence and development of the new ecosystem (from the foundation of the collective farms or kibbutzim to the setup of firms' technology centers)⁶.

However, the hyperactive role of an "entrepreneurial state" became vital to build the science and technology platform. The pillars were the weight of higher education, a high number of engineers and physicians with international credentials, excellent universities and massive public subsidies coming from the Chief Scientist Office (CSO) to foster research and development (R&D) oriented towards potentially commercial lines. This base would place Israel on the top list of countries with higher investment in R&D globally (Avnimelech and Teubal, 2004).

Crucial talent generation with tech knowledge and entrepreneurial skills has been produced not only by the well known Technion University or Tel Aviv University but also by the Israeli Army. In fact, one of the first successful waves of startups in the 1980's can be attributed to entrepreneurs coming from the elite military school (Talpiot), where students learn how to solve challenges with tech solutions, and from the intelligence unit of the Army technology development area (Nitzan and Bichler, 2002). The most salient examples are the tech companies Comverse, DSCP and Libit founded in the 1980's or Checkpoint in the early 1990's (Senor and Singer, 2009; Avnimelech and Teubal, 2004). Their founders are also thought to have founded some thirty startups in the so-called infant phase of this ecosystem.⁷

However, the development of entrepreneurial skills in the army has not been restricted to elites. During their two or three year of military service, youngsters gain experience - quite unintentionally - in one of the most effective schools for entrepreneurs. Individuals learn hands-on how to lead teams, assume responsibilities, run risks, solve problems, face challenges, and so on. Therefore, the foundations for entrepreneurial human capital have

⁵ This particular relevance of the diaspora can also be found in other ecosystems like Silicon Valley and India (Gonzalo and Kantis, 2017).

⁶ Somewhat similar had occurred just after the Nation State was born. An American Hebrew engineer arrived at Israel and laid the foundations of the military aircraft industry. This paved the way to found the first pioneering firm in the sector that would later become a key international player. The firm started repairing Second World War aircrafts for a nation that did not have their own fleet when many believed it was an outrageous adventure.

⁷ Military expenditure cuts in the 80's (in the midst of a macroeconomic crisis and the drop of many projects in the military sector released many human resources that became either entrepreneurs or highly qualified labor force for technological firms.

broadened. Since Israeli citizens are taken for a period of reserve duty every year, the Army becomes also a potent source of contacts in their lifetime that help them build networks. Social capital is string in Israel.

In the 1990's, when the financial model changed due to a more global economy and the acceleration of the tech revolution, the State started playing a dual role as animator and catalyst of the ecosystem development. After a relatively short period of adolescence, the system reached maturity after two significant moves. One was the need to face the challenge posed by an increasing wave of Hebrews migrating from the former Soviet Union with broad scientific and engineering background. This led to the creation of the state/public incubators programs at the early 90's. At the same time, these human resources would become an important feed for the technology move in the startups or were hired by already settled firms. The State financed the installation of these organizations that were usually created by municipalities and universities. The aim was to contribute to transforming R&D efforts into market solutions with technology⁸

The ecosystem showed starting conditions with some “nutritional factors” favoring its development. In this context, the second move was the public decision to step forward with the private sector with risk capital. This move stemmed from the lessons learned in the public sector and led to one of the most successful international initiatives that fostered the venture capital private industry. The State came to be an example of proactive institutional entrepreneurship in the context of a public-private alliance (Mazzucato, 2014). This initiative allowed for the system growth towards the youth phase and after that, early adulthood. It multiplied the venture capital offer and accelerated the increase of startups.

⁸ Frenkel, A., Shefer, D. and Miller, M. (2005) “Public vs. Private Technological Incubator Programs: Privatizing the Technological Incubators in Israel” STE- Working paper 26, Technion – Israel Institute of Technology.

Venture capital policy: Yozma

This initiative was launched in the early 1990's. It consisted of the creation of a Fund of Funds. The State funded public interest initiatives that did not attract private investment. Yozma was aimed at opening venture capital firms that invested in companies' early phase. It created associations of investors, Israeli financial entities and important venture capital funds from international financial institutions, mainly from USA. The return of investment of the selected funds would be up to 40% (a maximum of U\$ 8 M). However, the up-side incentive was its most salient feature. In the 6th year, the fund would have the choice to acquire the public stake at almost cost price with low interest. If the investment were negative, the State would be liable in the first place. With a U\$ 100 M one shot and a proactive attitude to hunting foreign funds and introducing them to potential Israeli partners, renown foreign funds were lured to become limited partners with local actors as general partners (many of them were former technology entrepreneurs who would give the tone in the early phases). In few years, Israel became the second country in the world with greater venture capital industry and more tech startups per capita. The number of startups grew from 110 financed with venture capitals in 1991 to 200 in 1996 and 513 in 2000 (Avnimelech and Teubal 2002). Also, in the 6th year, the whole public investment was recovered and public funds were handed over the private sector.

80% of the U\$ 100 m was invested in Funds while the remaining 20% was invested in firms through their own homonym Fund.

At the beginning of the 2000's, the ecosystem was guided to a new stage. The incubators were reconverted into a system led by private actors strongly levered with public resources. These resources consisted of a generous subsidy of pre-seed capital or seed capital for entrepreneurs. The previous development of the ecosystem enabled investors, enterprises and former entrepreneurs to develop skills and to take over the incubators. They were able to engage with high-risk new companies on the basis of their previous experience. The "private" incubators, leveraged by public resources, allowed them to be better equipped to see where to invest and channel the resources in the next phases. In turn, the State partially recover the investment through royalties. In sum, the privatization of incubators has to be understood within a context of public-private alliance and from an evolutionary perspective since it demanded the prior development of venture capital industry and technology entrepreneurs.

A second moment of this "privatization" phase of the incubators occurred when the licensing system to run them was institutionalized and multinational companies were invited to join in. Thus, a pool of venture investors, former entrepreneurs and large international firms came to be the head of the incubators. Recently, a current flow of investments in technology firms has also played a pivotal role in incubators by setting up their innovation centers and profiting from the innovative capacity of the ecosystem.

Over time, this ecosystem has become a “manufacturer of startups and innovations”. It has featured a highly increased investor activity and a high exit rate. However, it is debatable the degree of appropriateness of the ecosystem generated value versus the acquiring international companies. A positive impact could be the highly qualified positions, i.e., engineers and human resources in the transnational companies purchasing the startups. Also, the exit impacts on entrepreneur’s recycling leading to new serial entrepreneurs and individuals founding new organizations in the ecosystems. However, the detractors claim that the number of early exits is still high and argue for greater local appropriateness. Statistics on venture capital association in Israel have shown that, lately, startups have been sold in more advanced stages with higher rate value.

Therefore, we can identify salient features in this ecosystem trajectory. But it does not mean the existence of a defined roadmap from the start. In fact, there was a strategic idea for transforming the country economy through technology and innovation. Some opportunities and challenges emerged on the road and the State capitalized them with high pragmatism, flexibility and learning capacity. The State, as a dynamic entrepreneur, has learned to change with time and provided the conditions for creating an ecosystem from very early stages leveraging on existing pre-conditions. Over time, it handed the leadership over to the private sector when the development and the dynamics were gaining momentum but it never dropped its stellar role, as incubator franchisor, pre-seed/seed capital provider, infant industries promoter, and so forth.

SIMILARITIES AND DIFFERENCES BETWEEN TWO MATURE ECOSYSTEMS

The analysis of both advanced ecosystems shows some similarities but also and differences. The culture is open, horizontal and welcomes risk. Service platforms are mostly privately-owned. Deal flow volume and quality are high. Skills and resources are in abundance (investors, professionals, mentors, universities, academics and talents). The role of foreign participants is significant as well as the interpersonal trust that facilitates networking.

These aspects are vital in defining the companies’ scale of the market, becoming attractive business drivers. They showed the existence of a critical mass in each hub of the ecosystem network and the relationship density facilitated by active dealmakers and fostered in various informal social spaces. The platform build up is highly specialized with spontaneous interactions among individuals and institutions. In the Israeli case, there has been a higher vertical integration between incubators, investors and large companies as incubators owners. The State role has been crucial to leveraging the private profitability and lowering the risk at very early stages.

From an evolutionary perspective, it is possible to trace the similarities and differences in their trajectories. The preconditions leading to the rise of the ecosystem are the critical role played by the scientific and the technological knowledge platform of some excelling universities (Stanford, Berkeley, Technion, Tel Aviv, etc.), their research centers and their graduates' academic background. Also, some laboratories and technological development centers are crucial in the face of challenges (Radio Institute, the Microwave Laboratory, Talpiot Institute, etc.). In fact, techno-firm pioneers emerged from economic and social engineering that capitalized on the knowledge platform and the entrepreneurial capacity. In the Israeli case, the Army role as educator and network facilitator has been indisputable. Several of the first companies became wells for further spin-offs.

The visionaries with institutional and strategic long-term projects are another remarkable pillar. These actors can build on emerging opportunities around technology fueled by the Defense sector, responding to the demands and challenges in Silicon Valley or generating skills in Tel Aviv. In Silicon Valley, the behavior of some organizations and firms led to an emerging collective without clear leadership. In Tel Aviv/Israel, an incredibly dynamic public-private alliance was forged at country level and with clear strategic leadership.

Both cases share the capacity to build a favorable cultural and productive environment rich of social capital. The ecosystem should be understood as a complex system in which the networks are informal, and flexible organizations provide dynamism.

Both ecosystems show that projects and institutions play crucial roles in ecosystem development. Ecosystems are human constructions with an emerging feature, i.e., bottom-up strategy in Silicon Valley or a mix of bottom-up/top-down in Israel. They are neither natural nor accidental, even when their influence is uncertain. It is vital to understanding that public or private entrepreneurs, working as constructors, lead the organizations. It means the existence of an institutional dimension that should be considered and it also highlights the crucial role of institutional entrepreneurs in the early stages of the ecosystem. Other key roles are also plaid by individuals ones the "game" starts, i.e., mentors, dealmakers and members of informal networks.

In Silicon Valley, dynamic projects could be identified over time. It started with Stanford, and then other universities and laboratories joined. Resources from public programs were capitalized. Thereafter some pioneering firms arrived and produced different spinoffs and new companies. The game was enhanced and accelerated in the process of attraction, rise and multiplication of venture capital investors some decades later. In time, the latter became vital to aligning the value chain.

In Tel Aviv/Israel, however the Government has kept the leading proactive role in the long run with some institutional entrepreneurs leading the buildup of the incubator & entrepreneurial capital industries. Over time, the private sector had taken a leading role in a context of a *de facto* public –private alliance.

Emergence and development of ecosystems in Latin America. Two cases: Santiago de Chile and Buenos Aires

SANTIAGO DE CHILE

The first information about Santiago entrepreneurial ecosystem dates back to 1992. Following the experience of Barcelona Activa, the first Chilean incubators were created under the umbrella of Santiago Innova, supported by the Municipality of Santiago. The aim was to promote economic development and employment creation. Six years later, Endeavor settled in Chile, but this pilot experience did not meet the expectations. Even when dotcoms were at their highest peak of success, Endeavor decided to close its operation due to the lack of support from people in business and government. It would reopen its office only two years later.

This event could be considered the prehistory of the ecosystem in a society featured by a hierarchical culture, a narrow middle class, low social capital, high entry barriers in the upper level of the educational system. Economic success relied on big companies exploiting natural resources from mining, the agribusiness, the services areas framed in a highly concentrated economy. In the ITC sector, Sonda, a Chilean company, was created in the 1970's and turned into a "Multilatina". For some Chilean colleagues, this socioeconomic structure profile provides relevant data to understand the development of the Chilean ecosystem.

Within this framework, the State has been and still is the key actor to understand the development with CORFO as the ecosystem "leader". In the late 1990's, Chilean State launched some regulatory initiatives. With the Multilateral Investment Fund of the Inter American Development Bank, it created a pilot fund managed by an American company due to the absence of capabilities needed in this sector. Then, it introduced the first financing lines to develop the private venture capital (VC) industry. The funding tool was a long-term loan considered as a quasi-capital. This loan would be paid back if results were positive, but CORFO would share the risk with investors in case of financial loss. However, results were disappointing.

At that moment, the diagnosis, showed that there was neither an ongoing flow of projects of innovative deal flow nor a venture capital industry. Initiatives focused on creating a

financial offer without a major innovation and a powerful entrepreneurial human capital seemed to be the wrong strategy (Rivas, 2014). Shortly afterward, CORFO decided to address these gaps at least partially. Therefore, in the early years of the 2000's, the seed capital programs and the incubators contributed to the beginning of the early phase of the ecosystem. Since then, the different versions of these tools have allocated a significant amount of public resources to investment. These instruments are crucial to grasping the way these programs have shaped the institutional architecture of the ecosystem.

This ecosystem phase also encompassed some new more sophisticated instruments, like supporting angel investors' networks or the spin-offs platform, they did not meet the expectations, though. While the co-financing percentage for venture capital rose, the number of investors and their profile was disappointing. At the bottom line, the private sector's response to CORFO's incentives seemed to show the ecosystem immaturity. It was not a sign of the beginning of a powerful cycle creating dynamic firms or generating a venture capital industry.⁹ Beyond the possible deficiencies perceived in the public incentive program, it should be understood that they never occurred in the vacuum. The addressed actors' profiles, their skills and the opportunity costs associated with the existing alternative businesses platform significantly affected the results too.

By the end of the last decade, CORFO carried out several studies to evaluate its performance. The main results showed, on the one hand, that businesses exhibited low capacity to internationalize their ventures as well as to raise external capital. On the other hand, these evaluations pointed out some deficiencies of the business incubators such as closedowns, limited capabilities, low quality service, and the lack of a clear incentive scheme based on entrepreneurs' success or failure.

These conclusions triggered a second phase in the ecosystem development. Although the initiatives applied early in the last decade seemed not to follow any articulated strategy, the main central issues were: (i) the redesign of the Seed Capital program, (ii) the implementation of new incentives to incubators and (iii) the launch of Start-Up Chile.

In the first case, the steps taken to decentralize the mechanism helped it become more agile and flexible. An incentive system was applied to align the incubators behavior with positive results (Navarro, 2014), while the basic subsidy financing the operations of incubators remained.

⁹ Other instruments implemented have been the Support to the Environment Program to promote culture and skills development, and Global Connections aimed at internationalization. However, they did not reach the Seed Capital and Incubators' relevance.

Within this framework, a new generation of incubators was born. Many of them have profited from CORFO's flexible funding, and advanced towards becoming accelerators or have already become ones. University incubators have become stronger over time and new organizations came up such university-based organizations like Fundación Chile or others led by entrepreneurs.

Start-Up Chile was born to strengthen and invigorate the entrepreneurial environment by attracting foreign entrepreneurs to set up their businesses in Chile. The initial diagnosis revealed that strong entrepreneurs were needed after nearly a decade of entrepreneurial policies. The option was to attract people from abroad.¹⁰

At about the same time, new private players also came up. For example, in 2011, Wayra, the Telefónica accelerator. In the same year, two programs, "Emprende Claro" and UAI, were launched. More recently, MasisaLabs, Masisa's innovation platform to incubate and foster technological firms has been created. Other examples are 3M's entrepreneurial program and innovation center, and Telefonica's international R+D Center an alliance between Telefónica and Universidad del Desarrollo supported by CORFO. These initiatives are crucial because their operations laid on business structures not known for being innovative. Another relatively recent phenomenon has been the design of accelerators following American acceleration models such as Ycombinator and some regional ones like NXTPLabs, with an operation center in Santiago.

After the change of government in 2014, the analysis of the results suggested the need for an evolution towards a scaling phase. Inti Nuñez, CORFO's new entrepreneurship manager at that time, delivered a presentation where he wondered whether the ecosystem could be seen as a 'bag full of feathers', i.e., a huge bulk with little content. To modify this situation, he announced a new policy of dynamic entrepreneurship including a scale-up tool to raise the number of Start-Up Chile entrepreneurs finally abiding in Chile (a 15% at that moment). This new policy addressed pending issues by providing incentives to venture capital funds in an early phase. It also created networks of mentors to enhance support services to

¹⁰ The program kicked off by giving a U\$ 40,000 subsidy for running projects during six months and a temporary one-year visa. The selection process is performed by a Silicon Valley consultancy firm together with outstanding Chileans in the innovation sphere. Also, the newcomers are provided with a work site and a contact list of mentors and potential investors. As a counterpart, they had to perform a set of awareness activities in the ecosystem. Chilean authorities established the goal of 1,000 new organizations and at least 2,000 new jobs in the country plus expecting the creation of an innovative Google-or-Facebook-like company (Rivas, 2014). Shortly afterward, due to the local pressure, the program welcomed Chilean entrepreneurs and reoriented its initial vision. However, it has possibly benefitted from integrating and developing networks among Chilean and foreign entrepreneurs.

entrepreneurs, thus acknowledging the incubators limitations. It became more regional oriented, offering seed capital tools to communities located in the interior of the country, i.e., making Start-Up Chile regional. Finally, it fostered social innovation by increasing CORFO's investment.

An analysis of the ecosystem at present reveals the status of the evolution. Most of the fellow Chilean colleagues interviewed agreed that Start-Up Chile has been a turning point in the ecosystem. This supports the idea that Chile became on the radar of entrepreneurship at a global level. Start-Up Chile has been one of the most broadly publicized initiative worldwide devoted to fostering entrepreneurship.¹¹ In addition, some studies show the improvement in Chilean entrepreneurs' quality due to greater cultural openness and strengthened self-confidence (Leatherbee and Eesley, 2014; Lerner et al., 2012).

Incubators and the Flexible Allocation Funds have also shown advances. We took part of a recent assessment that reveals improvements not only in the processes of capturing entrepreneurs to achieve better commercial results but also in the service models of a set of incubators. However, the added value varies and the dependence on CORFO resources tends to remain high. Moreover, there is limited available evidence on the ventures' performance.

However, this significant ecosystem development at the institutional level coexists, with some doubts on other key dimensions and the on relevance of the phenomena usually associated with the ecosystem maturity. The indicators of this maturity are the number of new dynamic companies and spin-off processes, the depth of innovation processes, the progress towards the development of a venture capital private industry, the existence of dealmakers and social capital or the 'entrepreneurial recycling' phenomena. An imaginary scale of the ecosystem has CORFO's performance on one side and the different private efforts on the other, showing a clear unbalance in favor of the former. It is an unevenly developed ecosystem which is much more advanced at an institutional level but it heavily relies on public resources instead of the entrepreneurial ones.

THE CITY OF BUENOS AIRES

Buenos Aires' city ecosystem has emerged and evolved over time based on a set of positive ingredients, such as the significant role played by the middle class, the economies of agglomeration typical in major urban areas and a cultural DNA showing the traces of

¹¹ It was the topic of 10,000 news articles, most of them favorable. It has supported about 4,000 entrepreneurs from 79 countries and 1,400 start-up companies which, according to the program report would have created 5,000 jobs, 1,500 of them in Chile. Capital has risen to US\$ 420 millions.

successive immigration waves. Throughout its history, this set has contributed to forging an environment-friendly to entrepreneurship, tolerant and open to networking.

To understand the current state of the ecosystem, it should also be stressed the role played by tuition-free public universities that allowed the continuous formation of talented people. Since 1960, these institutions have collaborated to constructing a sound knowledge base in basic science and technology. In the following decades, especially since the 90s, this has produced a large number of professionals who founded enterprises in the emerging software and biotechnology industry

This was a source of new entrepreneurs. Along several entrepreneurial waves they has been giving birth to the development of an industry structure that started at the turn of the twentieth century. And it continues the pioneering task of the European immigrants that came and found their firms in more traditional sectors. A large number of small and middle-sized companies have been coexisting with domestic and foreign large firms that operate in the city, such as banks and insurance companies, among others.

Against this background, we could trace back the first steps of current ecosystems to 1990's. At that time, some large software companies, such as Microsoft, SAP, Oracle, Symantec and others, settled in the country. They had been created in the decade before in the midst of the technological revolution. In particular, an early group of new IT service providers seized the opportunities given by such big companies in the banking and insurance sectors, giving birth to a new wave of new firms.

The internet wave brought some successful cases at the regional level. Patagon.com (Wenceslao Casares) and Officenet (Andy Freire and Santiago Bilinkins) visibilized this phenomenon and caught the attention of the investment business, attracting the first foreign venture capital.

Also in the 1990's, Biosidus managed to gain share. This biotechnology company created years before would be home to some entrepreneurs. It laid the foundations of a sector, which would start gaining momentum in the following decade. Similarly, a previous platform of pharmaceutical companies and universities can be seen as crucial to understanding the emergence of a hundred biotechnology companies, particularly in the last fifteen years. While these firms have played a pivotal role as sources of entrepreneurs and opportunities, universities have provided their research findings and knowledge (Endeavor, 2016; Gutman, Lavarello and Grossi, 2006).

In the IT world, even after the burst of the dotcom companies bubble, some high impact ventures kept on emerging. The Argentinean unicorns, Mercado Libre, Despegar, and

Globant, among others, have become iconic and role models, the symbol of a new wave of entrepreneurs who would feed the dynamics of an incipient IT sector (Endeavor, 2016).

However, this period coincided with the 2001-2002 economic turmoil in the country.–This crisis affected in different ways. Many mature and new companies closed down. At the same time, it strongly influenced many professionals who, years before, had been attracted by the business opportunities in the Internet sector, and were then experiencing the insecurity of big companies' jobs. In addition, after the crisis those risk-taking people in innovative ventures with high potential dynamism and global orientation were able to access to certain resources (human talents, providers, workshops, etc.) in an unprecedented fashion for entrepreneurs. Moreover, a favorable exchange rate enabled them to offset the typical inefficiencies of a company's first years. This background was the breeding ground for a new generation of entrepreneurs that was going to lead the strong economic expansion when the crisis was over, boosting the creation of new companies in most sectors, in particular in the digital industry and biotechnology.

On the institutional dimension, a snapshot of the ecosystem taken early in the first decade of the 21st century pictured the actors that built its current status. Some few entrepreneurial centers and private universities stood alone, such as el Instituto de Altos Ejecutivos de Empresa de la Universidad Austral (IAE Business School), the Instituto Tecnológico de Buenos Aires (Buenos Aires Technological Institute, ITBA) or the Universidad de San Andrés (San Andrés University). These institutions were joined by a fluctuating Empretec, settled as from the mid-1980s, and the newly landed Endeavor Foundation.¹²

At this time, the Buenos Aires City Government opened the Centro Metropolitano de Diseño (CMD- Metropolitan Center for Design), and in this context, it created Incuba the public incubator in design and tourism industries, which catalyzed all the creative entrepreneurial energies around these sectors. Shortly afterward, the Government gave birth to Baitec –a technology-based incubator. By the same time, The Facultad de Ciencias Exactas y Naturales de la Universidad de Buenos Aires (Faculty of Exact and Natural Sciences - University of Buenos Aires) also launched its business incubator.

The robust economic recovery after the strong 2001-2002 crisis and some public policy initiatives, like the Software Law and the Sectorial Fund FONSOFT (Software Sector Act) provided specific incentives and improved the entrepreneurial development in this industry¹³. IT entrepreneurs managed to seize opportunities offered in the local market and by the growing trend towards worldwide outsourcing. In this way, it became one of the most

¹² Although these universities are located in the outskirts of town, they are within the City reach.

¹³ The Software Act offers tax and retirement advantages for companies in the sector, while FONSOFT offers subsidies for new product development and quality improvement, among other activities.

dynamic vertical drivers in the Buenos Aires ecosystem and contributed to the significant increase of the number of companies and jobs during that decade.

In 2003, the government of the City of Buenos Aires launched Buenos Aires Emprende (BAE- Buenos Aires Starts up). It was a crucial milestone in the development of the ecosystem's institutional dimension. It links, in an only package, a seed capital fund for entrepreneurs and a group of sponsoring institutions that followed them for a year. These institutions were, in turn, rewarded for their participation in the pre-selection process and the follow up of the winning projects. External consultancy firms positively assessed the impact of the program on the emergence of companies (Ruffo et al., 2012; Cristini and Bermúdez, 2012).

During BAE lifetime, the program rewarded an average of 60 projects per year out of the 100 initiatives submitted. It also helped expand the ecosystem organizational capillarity through intermediaries. Several institutions operating today started working under a program that remains in successive governments.¹⁴ BAE produced an institutional architecture of centers following up the entrepreneurs who received the seed capital from the government. Moreover, some of them organized some additional activities aimed at promoting the entrepreneurial culture (Kantis et al., 2012; Alvarez Martínez et al., 2016).

Some years after the launch of BAE, already in the 2010 decade, some novelties emerged. First, some seed accelerators started their activities. Among them, we can mention Wayra from Telefónica Group and NXTPLabs. NXTPLabs is particularly relevant because it was founded by former successful entrepreneurs that put together about 40 mentors and investors who financed the first wave of ventures. This phenomenon of 'entrepreneurial recycling' offers other examples such as the creation of the Kaszek Ventures Fund by two former Mercado Libre cofounders. Both became the most dynamic actors in the region. New actors have joined this finance chain, the MELI Fund created by Mercado Libre, Nazca Ventures (present in Argentina, Colombia and Chile), Lyon Ventures and 54 Ventures. Despite this situation, the availability of financing, particularly in the early phases, is still embryonic and mainly biased towards the IT sector. Even more, some funds that started operating in a mid-twentieth century are not investing today.¹⁵

¹⁴ This network have nurtured from organizations in the ecosystem, such as the university centers for entrepreneurs at IAE, San Andrés, ITBA or Endeavor. It has welcome some other educational institutions such as Ciencias Económicas -Universidad de Buenos Aires; UADE, CEMA, ESEADE, UAI, and entities such as Consejo Profesional de Ciencias Económicas, FUNDES and el Instituto de Emprendimientos Científicos y Tecnológicos (IECyT). The ecosystem institutional network in the city of Buenos Aires has also widened under the Programa Desarrollo Emprendedor. This governmental initiative fosters the strengthening of entrepreneurial skills. The program financed a set of organizations providing training and educational services and they also worked as patrons in the BAE program.

¹⁵ As well, other funds such as Pymar/Ax Ventures and ILEX from Fundación Empresa Global y Capital para Pymes SA which have invested in the past are not active in the present.

In 2014, the Government revised the strategy and reoriented Buenos Aires Emprende program. It became a tool to co-finance the operation of a reduced number of accelerators, using subsidies in exchange for their commitment to invest with the State as a co-investor in their ventures. These changes faced substantial difficulties in procedures and deployment times associated with governmental administration. Red tape has made it difficult to redirect resources to accelerators. Although the same political party has been ruling the City of Buenos Aires for long, when the government administration changed, it carried out a critical assessment and decided to discontinue this program at the local level¹⁶. It was transformed into a public seed capital tool with technical support, but the model is still under development.

The organizations in the ecosystem had to re-engineer in a new scenario when the Government decided to leave its role as an activator. Some of them seemed to have managed to do so, such as Emprear, with its network of investors and acceleration program. However, the overall feeling is that the platform supporting entrepreneurs has downsized. Also, co-working has become the growing phenomenon following the global trend.

When the national government changed in 2015, a new phase in the entrepreneurship encouragement policy started. The Argentinian Congress has passed the Ley Fomento del capital emprendedor (Venture Capital and Entrepreneurship Act). By creating incentives for accelerators and expansion venture capital funds this will likely influence the dynamics of the ecosystem positively. Being Buenos Aires city the most vibrant in the country it will be benefited by the dynamic this Law will boost.

SIMILARITIES AND DIFFERENCES BETWEEN TWO DEVELOPING ECOSYSTEMS

Santiago de Chile and Buenos Aires are the capital cities of Chile and Argentina respectively. They are the two most important economic and population centers in each country with a high number of large national and transnational companies located as well as most of the central universities. Both cities are the core of the most sophisticated consumption due to a high concentration of middle segments of the population. Nevertheless, there are significant contrasts in the overall living conditions. The Chilean case stands out because of its institutional stability and robustness while, on the other side of the Andes, it has taken place a succession of economic and institutional crises followed by recoveries.

Compared to Santiago, Buenos Aires shows a lower degree of social polarization and a stronger cultural and economic middle class. Its culture shows greater horizontality, which is a relevant aspect of weaving contact networks (social capital). At the educational level, university access is easier. Its economic activities are more diversified with a significant

¹⁶ Since 2017 this program is being implemented at the national level.

cultural industry and a higher share of small and medium-sized industries. Though there are similarities at the starting point, they differ in many ways. These aspects influence not only the emergence of entrepreneurs but also the rise of business opportunities.

A more in-depth analysis reveals that both cities represent the more evolved ecosystem in each country. Although some initiatives undertaken by higher education institutions as well as foundations such as Endeavor were important, this institutional development has been mainly encouraged by governmental incentives, being national in Chile and local in Argentina.

Santiago has met its goals with intense efforts and incentives and much better diverse instruments. In fact, the model applied in Buenos Aires followed the first version of CORFO seed capital. However, in Buenos Aires, the institutional platform was guided by a strategy focusing less in incubators and more in the emergence of different types of institutions (universities, foundations, and business associations, among others). The Chilean public support has increased and become more sophisticated, whereas it has decreased significantly in Buenos Aires over time.

Finally, Buenos Aires has achieved the development of an entrepreneurial human capital dimension, which is the heart of the ecosystem. This fact could seem to be found in the same size in Santiago considering the opinion of key informants. Some examples are the existence of four unicorns, the IT development fueled by national policies and the emerging biotechnology companies, both resulting from spin-off processes. To understand these achievements in Buenos Aires it may be necessary to look deeper into the overall starting conditions on which the governmental initiatives acted upon that differ from the Chilean case at the social and economic level.

To sum up, although the State has contributed to developing the ecosystems' institutional dimension in both cities, the intensity and diversity of the efforts associated with the public programs have been and are much greater in the Chilean case. There, the institutional platform is more sophisticated than in Buenos Aires. The later, in turn, exhibits specific achievements in the entrepreneurial dimension which could be attributed to the overall conditions in which the ventures have emerged during the ecosystem development.

Differences between mature and developing ecosystems

The concept of the ecosystem has spread during the last decade. However, the mainstream idea shows some limitations already presented at the beginning of this document (Brown and Mason 2017, Spigel 2015, Stam and Spigel 2016). On the one hand, its static feature does not allow the understanding of the ecosystem emergence and development. On the other hand, this suggests the existence of a unique pattern guiding the activity, despite it is widely known that they are non-replicable. In this third section, we attempt to look into the differences between mature and developing ecosystems and the implications for Latin American countries.

In the first section, we analyzed the evolutionary process of two mature ecosystems: Silicon Valley and Tel Aviv. In the second section, we focused on two developing ecosystems, Santiago de Chile and Buenos Aires. Both analyses have helped identify the relevance of the starting point or systemic preconditions, the institutions that contribute to the emergence of entrepreneurs, the cultural aspects, the social capital and other issues that generated opportunities and demands as well.

It is crucial to understanding these preconditions and the idiosyncrasies molding the ecosystem. The analysis has contributed to spot the differences between the cases, particularly between mature and developing ecosystems, for instance, the existence of knowledge platforms and educational institutions, as well as the opportunities regarding cultural aspects and social capital. This has been useful to compare Buenos Aires and Santiago.

Based on these conditions, some dynamics and their interrelations have been molded. While some are explicit and deliberate, others have emerged over time. As it was seen, the emergence and development of an ecosystem could be conceptualized as the result of the interaction between a particular initial configuration of some specific conditions (i.e.: culture, demand side conditions, industry structure, social capital, etc.) and the dynamic of five dimensions (forces) that interact each other by the way of incentives or direct personal engagement:

Entrepreneurial dynamics (A): It is the main focus of the ecosystem. It encompasses the entrepreneurial processes taking place in new firms that follow different paths (i.e.: growth, decline, exit) and explain the density and emergence of economies of agglomeration. They become the source of spinoffs, serial entrepreneurs, entrepreneurial recycling, nurturing the entrepreneurial dynamics, venture/investment dynamics and the emergence of institutional entrepreneurs that feed the institutional dimension.

Governmental and policy dynamics (B): It encompasses the deliberate or de facto interventions. They may include incentives that feed demands towards businesses (for instance, defense expenditure) or direct programs, and incentives focused on organizations, such as incubators and accelerators, and entrepreneurs. It also bonds with the investment dynamics and helps emerge the venture capital industry.

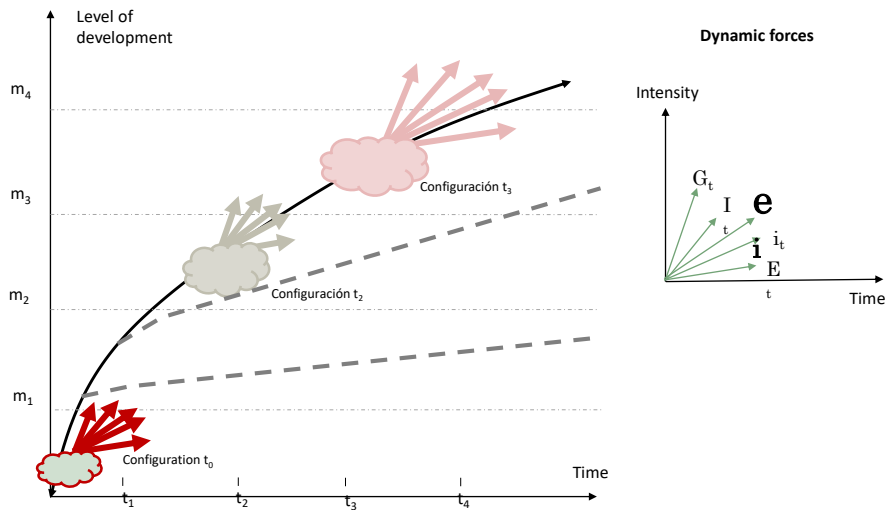
Institutional Dynamics (C): it includes the role played by organizations such as universities, incubators and accelerators, among others that foster entrepreneurship..

Entrepreneurial and business dynamics (D): This implies large companies' moves towards entrepreneurship (for instance, corporate venturing initiatives, open innovation, fund investment, and so forth) but also the rest of existing businesses. It is the source of spin-offs, potential mentors, and dealmakers (connecting actors and networks). It feeds the entrepreneurial dynamics, the institutional dynamics (i.e.: mentors) and the investment dynamics (i.e: corporate venture capital).

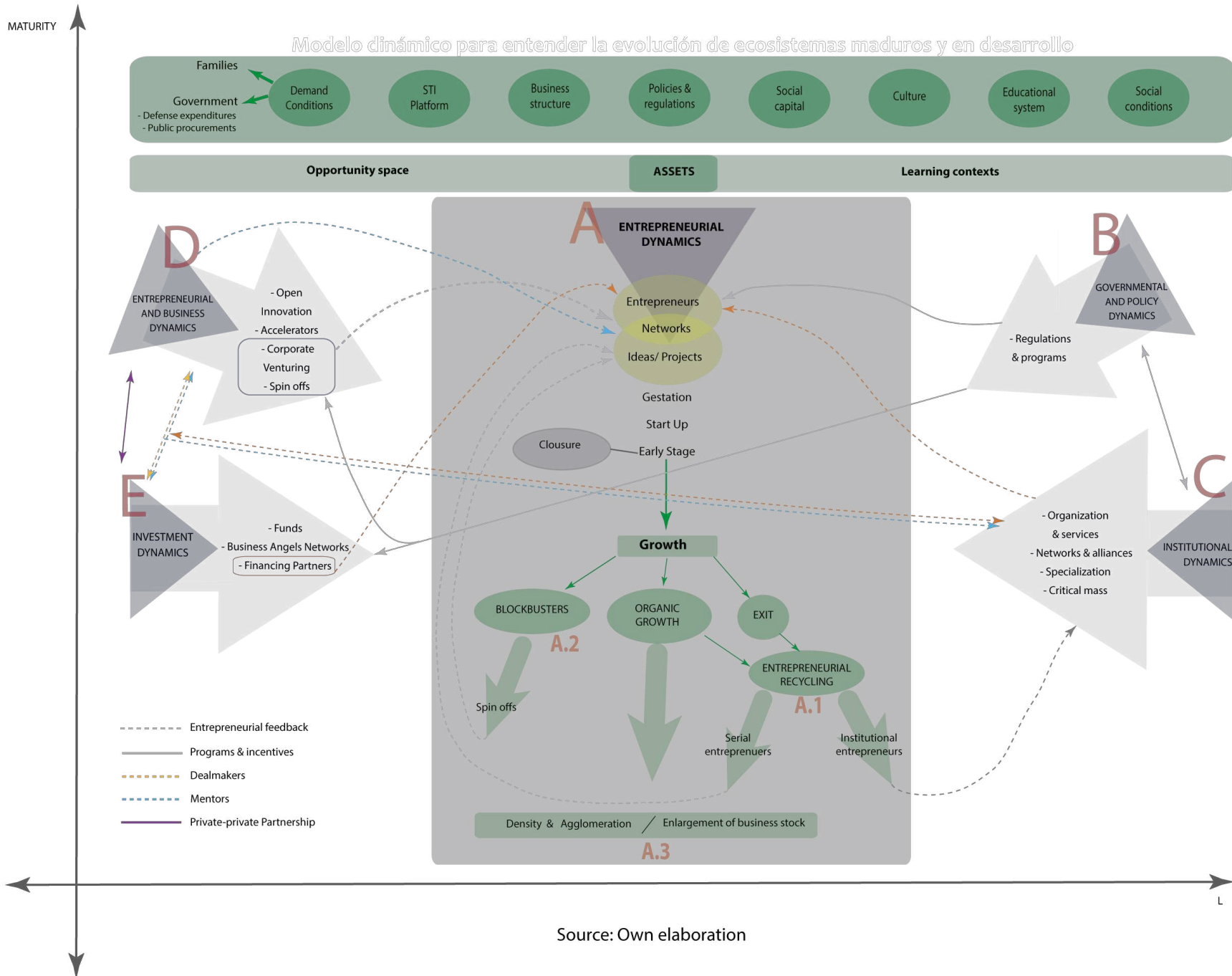
Investment dynamics (E): The creation and operation of venture capital funds, business angels networks and the traditional business partners influence directly on the entrepreneurial dynamics. It can provide the ecosystem with mentors and dealmakers.

The following chart shows a simplified version of this model, aimed at facilitating a first view, followed by a more elaborated version of it.

The ecosystem from an evolutionary approach



The dimensions, dynamics and interrelations could be better identified in this second chart. Following the alphabetical order, the multiple determinations (connecting arrows) show the complex relations in the system. The horizontal axis represents the time and the vertical one the level of development of the ecosystem.



Source: Own elaboration

Some examples can help. In Silicon Valley, Stanford University's deliberate institutional strategy and Terman's leading role as an intra-entrepreneur can be considered key part of the ecosystem preconditions or the initial configuration. The first start-ups generated certain entrepreneurial dynamics, leading to the emergence of spin-offs and serial entrepreneurs (Kaplan 2000, Blank 2008). From the governmental dynamics, the contracts in defense and airspace were crucial to fueling the qualitative ecosystem development toward a much more potent phase. Also, the deliberate strategy of the governmental program Small Business Investment Companies (SBICs) contributed actively to the emergence and development of the investor/venture dynamics which were vital in its later maturity. As public contracts gradually lost the relevance they had during the 'Cold War', the entrepreneurial wave was able to reorient their businesses. This did not happen in other USA regions. The ecosystem, its environment and actors incubate and accelerate together with the somehow formal and informal protagonism of mentors and dealmakers.

In the Israeli case the cultural and social capital, the entrepreneurial capacities molded by the army and the technological and scientific knowledge platform fostered by the government (Nitzan and Bichler, 2002; Senor and Singer, 2009) were the preconditions that sparkled entrepreneurial dynamics. In the 1980's, the public research and development efforts and the incubators influenced the institutional dimension. Later on, thanks to Yozma, the Government pioneered the investment dimension. This pushed the ecosystem development a qualitative leap forward. Another significant evolutionary change took place due to successive reforms in the incubation model. All this took place in a general context of increasingly shared leadership, in which the private sector was relevant but the State fueled directly the entrepreneurial and institutional dynamics and indirectly the investment dynamics (Mazzucato 2014; Avnimelech and Teubal 2002; Frenkel, Shefer and Miller, 2005).

In Buenos Aires, certain favorable preconditions such as public tuition-free universities, the heavy weight of the middle segments of society and open and not- so hierarchical culture, among other aspects, fostered the emergence of some entrepreneurial dynamics. However, it was strongly affected by the successive macroeconomic crises in the country. Universities and civil society organizations moved in tandem fostering the institutional dimension. However, the City government initiatives such as Buenos Aires Empeñe program and, more recently, the emergence of organizations led by recycled entrepreneurs (Álvarez Martínez et al., 2016) have become a qualitative leap forward. Interestingly, the local government dimension fed the institutional dynamics but then the entrepreneurial dynamics and entrepreneurial recycling are catalyzing them.

Finally, it seems difficult to describe the emergence and evolution of Santiago's ecosystem over time without acknowledging the role of the national government dynamics in molding it. The initiatives, the seed capital, the incubators can account for the transitions in the evolutionary steps. They provided the dynamics at the emergence of the ecosystem, in the subsequent reforms and the launch of Start-up Chile in the following decade. Government accumulative capacities facilitated the process, together with the learning phenomena and the surviving incubators that adopted SSAF flexible model. When the government changed, the ecosystem scaled up with a new program offer. Lately, new actors have emerged, incorporating the private sector in the dual role in the institutional dynamics, as incubators/ accelerators and investors. Also, open innovation initiatives can be found in large companies. New foreign businesses have landed in Chile. Therefore, the current ecosystem is much more diverse, nourished and sophisticated. However, the Government's leading role is still vital to allocating resources.

To sum up, from an evolutionary perspective, we cannot argue for the existence of a sort of big bang after which the ecosystems emerged. Ecosystems are constructed and developed over time as a mix of emergent and strategic efforts. They result from the co-evolution of the different dimensions and dynamics. There are ecosystems with diverse drivers and ecosystems where the relevance of each driver changes over time. From this viewpoint, we can identify the first contrast between mature and developing ecosystems: the relative weight of the entrepreneurial, business and investing dimension versus the institutional, governmental and political dimension. In mature ecosystems, the private incentives are crucial in understanding the actors' behavior in the ecosystem. Even in Israel, private investors are levered by strong public incentives. On the contrary, in the developing ecosystems, the government's incentives are still more relevant as molding entrepreneurs' and institutions' behaviors.

This has not always been this way. In the history of Silicon Valley, the government's role has always been vital. First, the defense contracts and then through the Small Business Investment Companies program aimed at developing the entrepreneurial capital industry. In Israel, the State's role has been pivotal in granting subsidies to research, in incubators programs (with their different versions in time) and, in the early 1990's, in Yozma. And even through the Army, the public sector has helped develop entrepreneurial and technical skills for decades.

In these cases, a positive sign of the ecosystem behavior has been the gradual shift in the relative weight of the different dynamics and dimensions. For that reason, in the Latin American case, some recent 'entrepreneurial recycling' processes (Mason and Harrison,

2006) and the emergence of large companies supporting entrepreneurs through open innovation and acceleration processes can be seen as a promising sign contributing to the ecosystem development toward an advanced stage. These processes must undoubtedly be examined thoroughly to understand them in their proper dimension and nature. The Israeli experience reveals the importance of seeing the co-evolution of different dimensions as a phenomenon, especially when redirecting public strategies. This was the case of the change in the incubation model, which was a key factor for the new actors to take over the incubators. Still, public incentives have significantly levered private resources and actively enhanced the investment dynamics.

Therefore, the study of the different evolutionary paths conveys a dynamic view on Santiago de Chile and Buenos Aires ecosystems. On these grounds, it is possible to grasp some relevant contrasting features in the current service platforms of these ecosystems, evolving from the evolutionary view into the current dynamics, for instance in the following aspects:

a) IN MATURE ECOSYSTEMS, THE QUALITY AND SIZE OF THE DEAL FLOW PRODUCES STRONG INCENTIVES FOR A BOOMING PRIVATE DRIVE.

This is pivotal given the high attraction that new business ventures and technology have as a source of potential businesses, future return on investment at the exit and their impact on innovation in the high tech industry. For that reason, for example, incubators ownership in Israel is private whereas in Santiago and Buenos Aires, universities and the tertiary sector predominantly head these organizations.

In Latin American ecosystems –Santiago de Chile and Buenos Aires–, private dynamics is weak, even when the emergence of accelerators and large firms in the entrepreneurial world may be a sign of a leap forward. The role of the governments as an ecosystem catalyst is vital. Not only do they implement proper incentives for entrepreneurs and institutions but they also become a proactive factor for the development of actors and markets. Although Silicon Valley and Israel are non-replicable cases, it is crucial to fostering a dynamics that encompasses the private sector, the business and the investment framed in mixed ecosystems to bring maturity.

We do not overlook that in Israel profitability has been and still is actively levered, through public resource investments in incubators and the science and technology platform. We do not overlook that in Silicon Valley the State “invisible hand” has had a crucial role as generator of opportunities together with the defense expenditure or the Small Business

Investment Companies Act. The presence of Entrepreneurial States is relevant in the private sector and ecosystem development in their early stages.

b) DEAL FLOW AND SOCIAL CAPITAL QUALITY AND VOLUME IMPACT ON THE SERVICE MODEL

Silicon Valley accelerators work in a context of abundance, not only regarding the deal flow but also the social capital. Therefore, its service model can be “on demand”, reacting to its more proactive and stronger entrepreneurs’ requirements. Even if the Israeli case shows this abundance, its incubators follow a different work model, much more proactive. The scientific entrepreneurs’ profiles who need a CEO and some aid to develop their projects, and the impact of the State resources leveraging them account for this model. In the Chilean and Argentinean cases, the lack of deal flow abundance demands significant efforts in the search and selection processes. It also requires hard work to help entrepreneurs and their projects. The latter is particularly necessary because of the lack of social capital, which negatively impacts on the emergence of valuable networks and other actors, such as mentors and sophisticated specialized services and investors.

However, deal flow quality has not always been the same. A sort of “start-ups manufacturer” has gradually developed over time. It began with the first entrepreneurial cases, through the following entrepreneurial breeds and spin-offs, until nourishing an extremely fluid dynamic while the other ecosystem conditions and dynamics co-evolved. Virtuous ecosystems are those in which the different ecosystem dynamics and its balance around the “core” dimension of “entrepreneurship” co-evolve.

c) THE DEGREE OF SPECIALIZATION OR SEGMENTATION OF THE ECOSYSTEM ORGANIZATIONS AFFECTS THE DEPTH OF THEIR SERVICES

Another consequence of this abundance, also known as ‘the scale’, is the degree of specialization per vertical on the platform of services to entrepreneurs. While this is the rule in mature ecosystems, organizations working with innovative projects and even more generical ones prevail in Latin America. This situation results from the market scale that allows for specialization (as Adam Smith would say). Some advances can be seen, however, as accelerators seem to have concentrated in segments like fintech or agritech, and incubators start to include specific segments of particular interest in their portfolios.

Again, in mature ecosystems, the ecosystem’s own development dynamics has evolved from a platform of existing knowledge to technologies that are more specialized. Over time, it has encompassed activities to be able to overcome the challenges.

d) STAFF'S BACKGROUND IN THE ECOSYSTEM ORGANIZATIONS CORRELATES WITH THE DEGREE OF DEVELOPMENT.

In mature ecosystems, it is easier to find former entrepreneurs running incubators and accelerators or even entrepreneurial capital funds. This is crucial because they have gone through the same situations that the entrepreneurs they support have to face. In this context, it is not surprising that the organizations' value proposal profile fits better with their staff's.

As it was analyzed, this results from the 'entrepreneurial recycling', which, in turn, stems from a strongly vigorous exit dynamics and companies failures, too. In Latin American ecosystems, these phenomena started to develop to a lesser extent than in the mature ones. Extra efforts are required to generate the skills and resources as well as to strengthen the institutions.

e) THE DEGREE OF ARTICULATION WITH MENTORS (AND THEIR PROFILES) DEPENDS ON THE ECOSYSTEM MATURITY

Another contrast has to do with the role of mentors and their profiles, for instance, their sophistication and added value. In mature ecosystems, most mentoring usually take place in informal settings, 'outside' the institutions. This happens in the context of sufficient skills and resources, for example, people with entrepreneurial experience in technology and business sectors. This can be seen as a sign of the ecosystem maturity in the entrepreneurial and business dimensions, but it can also be seen as an indicator of a more open culture, with larger bases of trust (social capital) which help to build bridges.

In Latin America, it is easier to find institutionally organized mentoring in the ecosystem. Mentors often focus on technical challenges instead of entrepreneurial experiences, and so being more similar to specialist consultants. It is complicated to find mentors because the culture is less open and there are less skilled mentors and resources. For this reason, Chile has implemented a program fostering a network of mentors.

f) GREATER DIFFERENCES CAN BE FOUND IN THE INVESTMENT DYNAMICS AND FINANCING IN ECOSYSTEMS WITH DIFFERENT LEVELS OF DEVELOPMENT.

One of the virtuous aspects of mature ecosystems like Silicon Valley and Tel Aviv is the presence and leadership of venture capitalist as well as their articulation with the ecosystem.

In Silicon Valley, there is an environment of funds and networks of experienced private investors, making the ecosystem more sophisticated but this is not the rule in Latin America. In the latter, the lack of or little development of venture capital influences the development of innovative entrepreneurs. The operating logic in Silicon Valley is purely private whereas in Israel, it is enhanced by public contributions to incubated projects. In the Israeli ecosystem, the vertical integration between the incubators and the entrepreneurial capital industries is greater.

In both cases, the State has played a pivotal role in the rise and development of the private industry with entrepreneurial capital. In Chile, the past and present efforts materialized into policies have only achieved partial results. Crossing the Andes, the national government has recently decided to offer incentives through a Fund of Funds and tax privileges for investors and funds. In tandem with these efforts, it is necessary to develop other tools that meet the working capital and investment needs for those segments of new and young enterprises, which, do not 'appeal' investors for several reasons and vice versa. Ecosystems development cannot be deprived of the diversity hidden in a different entrepreneurship dynamic (Kantis, Federico and Ibarra García, 2016).

g) IN MATURE ECOSYSTEMS, THE EXPECTATIONS OF GENERATING BUSINESSES HELP ALIGN ORGANIZATIONAL BEHAVIOR.

Another consequence of powerful private incentives in mature ecosystems is that 'the imaginary value chain' can be easily aligned. This does not mean that cooperation prevails because competition among actors within the same industry is a potent driver. Besides, value orchestration is more feasible and powerful when there are greater differences in actors' specialization. Some actors help entrepreneurs go along this "imaginary value chain" and foster networking among the members in the ecosystem organizations (such as the universities with incubators, incubators with investors, but even the latter in investment rounds) (Napier and Hansen, 2011; Brown and Mason, 2014, 2017). These are known as 'dealmakers', people wearing different 'hats' as they belong to the steering committees of different businesses. Either they are chief executives in big technology firms and professors or they participate in the selection or investment committees for different organizations.

This situation differs from the traditional problems stemming from the lack of articulation between the actors in the Latin American ecosystems organizations. They seem to go through difficulties 'to allocate roles' and complement each other. It seems like the 'ego game' prevails, leading to the concept of 'ego systems'. In this framework, articulation is not due to the rainforest but the attempt to overcome these shortfalls, through building trust, socializing information and entrepreneurs circulating among the actors. There are

organizations with this purpose, such as ecosystems working groups and associations, among others, which attempt to strategically and deliberately recreate what takes place more spontaneously in mature ecosystems.

All in all, in this paper, the findings have revealed the presence of important differences between mature and developing ecosystems which deserve further studies. What will happen next? At Prodem we are moving forward to study and follow these issues and we invite you to discuss ideas about it. This is a key factor to effectively promote dynamic entrepreneurship and innovation in the region.

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