Technological innovation territories and networks: experiences in Buenos Aires and Seville

Territorios y redes de innovación tecnológica: experiencias en Buenos Aires y Sevilla

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Abstract

The article analyzes policies for the formation of technology districts and parks, understood as innovation means or networks. It compares two cases located in disparate geographical contexts and temporalities, but with complementary purposes: on the one hand, the Cartuja Science and Technology Park in Seville, Spain; on the other, the Technology District in Buenos Aires, Argentina. The methodological proposal includes a systematization of regulations and official documents, along with visits to the territory, photographic records, and interviews with key informants from each district. The results subsidize an analysis of territorial registration and effective conformation of these means of innovation, their articulation with the social and economic needs of the immediate environment, and the purposes of internationalization.

Keywords: means of innovation; technology districts; public policies; production networks; urban renewal.

Resumen

El artículo aborda las políticas de formación de distritos y parques tecnológicos, entendidos como medios o redes de innovación. Analiza comparativamente dos casos impulsados en contextos geográficos y temporalidades dispares, pero con propósitos complementarios: por un lado, el Parque Científico y Tecnológico Cartuja de Sevilla, España; por el otro, el Distrito Tecnológico de Buenos Aires, Argentina. La propuesta metodológica contempla la sistematización de normativas y documentos oficiales, junto con visitas al territorio, registros fotográficos y entrevistas a informantes clave de cada distrito. Los resultados alcanzados aportan a pensar en torno a la inscripción territorial y efectiva conformación de estos medios de innovación, su articulación con las necesidades sociales y económicas del entorno inmediato y los propósitos de internacionalización.

Palabras clave: *medios de innovación; distritos tecnológicos; políticas públicas; entramados productivos; renovación urbana.*

Introduction

Encompassed in an economic context governed by the international demands and global influx of information and exchange, the policies of promotion of technological development have been key for the positioning of local economies within the global market. Accordingly, after the Second World War, several initiatives for the creation of technology districts, technology parks and technopoles have thrived, which have different characteristics and intensity, and represent new geographical patterns. They are typically known as high-tech areas (Goicoechea, 2019); some of them are: the Iconic Silicon Valley set up in the mid-70s (Barbrook & Cameron, 1996) and the soviet answer and creation of Akademgorodok; thereafter, the European initiatives of Cambridge Science Park, Sophia Antípolis; later, Oxford Science Park (De Mattos, 1991); the most-well known experiences from the Asian Southeast, such as Shenzhen High-Tech Park, located in China, Bengaluru, a city in India (Dutt et al., 2016; Das & Lam, 2016); along with more recent projects such as the technology park One-North in Singapore or Multimedia Super Corridor (MSC) in Malaysia (Bunnell, 2002); reaching to the Latin American experiences of a smaller size, such as the Brazilian technology park Porto Digital in the city of Recife (Lacerda & Fernandes, 2015) or the Mexican initiatives in Monterrey and Santa Fe in the Federal District (Rodríguez-Pose, 2012). In these cases, beyond their peculiarities, they represent a particular form of territorial organization of the production related to the high-technology industry in line with the forms of international production (Castells 1996) and following new phases of the capitalist development.

The review of these experiences therefore allows to account for a variety of models spread globally, of different sizes and levels of consolidation, which take up specific forms; however, they can be classified into two trends:

On the one hand, there are models oriented to the production processes and systems that put emphasis on the dynamics of innovation and raise interest from the economies of agglomeration approach due to the positive externalities that produce, assigning value to the territory for its role in the productive process to set up legitimate innovative milieus (Aydalot, 1985).

On the other hand, there are initiatives where the creation of districts seems to be targeted to a strategy of real-estate promotion or positioning of a city or part of it. The interventions in the latter cases are mainly oriented to an improvement of the urban environment and allocation of necessary infrastructure to garner the attention of a qualified, consumer and creative community. They are generally located near or within core areas of the city; they exhibit some common ground on the policies of urban renewal and revival of historical centers fostered by creative activities (Florida, 2005). Research on these experiences has emphasized on the urban effects, mainly in the cases where these clusters have an open-air structure, such as clusters, districts or smart cities, which lead to a dynamics of urban renewal, real-estate valuation and changes in the identity of the territory.

Due to the creation of these new territorial configurations, it, thus, leaves the door open for a discussion regarding the most appropriate conditions for fostering technological innovation and its relationship with the closest environment in which it is implemented, bearing the consequences it may have. Postulates related to the creation of innovative milieus do not adopt a definite position about whether the aforementioned two models – one puts emphasis on the innovative processes and the other on business ecosystems – are compatible to each other or hold contrary positions about whether urban life hosts or triggers synergy. This is the reason why this article seeks to answer the following questions: What is an innovative milieu? Are all high-tech areas consolidated as such? How does the economic and urban policy influence them? Who are the main urban agents in the creation of these milieus? How are these innovative milieus related to the cities where they can be found? Besides, addressing the last question and bearing its consequences, the following questions can be asked: Do the urban dynamics empower or condition the development of innovative capability? Which role does the real-estate market hold in the public policy?

Within this framework, it is herein proposed to advance on a comparative analysis of two Ibero-American initiatives of different temporal contexts, background and consolidation status, which could be understood within the extreme poles of the typology of already identified geographical arrangements: on the one hand, within the first group, we posit the Cartuja Science Technology Park, Cartuja STP (*Parque Científico Tecnológico Cartuja*, PCTC, in Spanish) founded in 1993 in Seville, Spain. On the other hand, within the second group, we posit Buenos Aires Technology District (*Distrito Tecnológico Buenos Aires*, DTBA, in Spanish) founded in 2008 in the city of Buenos Aires, Argentina.

Hereinafter, this article is organized in the following way: the first section is devoted to explain key theoretical concepts to shed light on the characteristics of how these productive environments work, the urban effects that are produced and the conditions for the evolution of innovative milieus. In the next section, the purpose of study is formulated while its scope and the chosen methodological design are established. Regarding the results, salient characteristics about the design of the Cartuja STP and DTBA are slightly revised; the presence (or not) of innovative components are identified and characterized; finally, in an exploratory way, the main interventions oriented to the promotion of the interaction dynamics between units and collective learning are described. Concluding the article, the final section summarizes the findings and explains the conclusions.

Theoretical framework

From the economic perspective, theoretical foundations about these geographical arrangements are linked to existing contributions about agglomeration economies and the benefits that territory management generates within the production systems (Marshall, 1890). In the context of economic deregulation and flexibility of

Ford's production criteria, these geographic spaces represented an appropriate place to take forward business strategies for the outsourcing of less competitive activities. Following this line, according to Becattini (1989) the approach of industrial districts took into account the local community where they were developed, its values, knowledge and abilities to think about the role of these spaces in the Italian economic geography in the '70s. Towards the '90s, clusters (Krugman, 1997; Porter, 1990) became relevant as they stressed the articulation between economic units and global integration, eventually losing importance whenever in contact with the local community and the end market (Sánchez Slater, 2008). Finally, recent literature also argues for critical positions; according to which, these networks are understood within the current context of neoliberal and post-industrial restructuring that operates in the capitalist forms of production and political-institutional arrangements as well as in the construction of subjectivity. Under the framework of economic deregulation, the creation of these spaces coincides with the idea of exaltation of the image of an individual entrepreneur (sole responsible for his success) or start-ups as business models par excellence (Das y Lam, 2016).

There exist differences between the models of high tech areas; nevertheless, all of them share the foundations of agglomeration economies. They are valued not only for the positive externalities or spillovers that produce, but also for the cooperation and trade mechanisms, specialization, productive linkage and integration. Nonetheless, not all these initiatives consolidate themselves as true "innovation ecosystems" or "innovative milieu" (Aydalot, 1986; Maillat, 1998; De Mattos, 1991).

Technological innovation not only implies machinery (imported or acquired through transference processes), but also processes. The latter results fundamental for acquiring true autonomy and ability to demonstrate the necessary knowledge for the selection, adaptation and adequate use of certain technologies, taking into account the specific characteristics of a certain territory. It refers to the interaction of elements that represent the innovation factors (human, business, social and natural-physical) as well as the dynamics of learning among them. In this regard, innovative milieus are those spaces which have favorable conditions for interaction and collective learning, taking advantage of their own goods and contributing to encourage processes of territorial development (Camagni, 1995). However, which characteristics should territories have to become innovative milieus?

Innovation requires localization, near and adjacent, of many elements that jointly contribute to create a suitable environment for the promotion of research and development (R&D): highly qualified human resource, educational and research institutions, companies and access to capital aimed at investing in high-risk operations (Ondategui, 2001).

In these clusters that bring research and productive development together, incubators take up a fundamental role in fostering innovation, in accessing to high-risk capital

investments aimed at financing research, and in conducting research based on academic fields together with the private sector. Nonetheless, the promotion of interaction and articulation dynamics, that is to say the creation of innovation networks, implies more than the sum or physical gathering of elements. Analyzed from a complex geographic perspective, and not only from a business-economic perspective, they must not be thought of as permanent geographic environments, but as collaborative environments where factors like social mood or collective identities of economic agents are key (Méndez, 2002). Innovation resources arise from the innovation process *per se* and the relationship with the context in which it is set. (Amendola & Gaffard, 1988).

But, from the urban point of view, the promotion of such spaces requires huge fixed capital investments in order to promote suitable productive environments and urban life conditions (including leisure, relaxation and recreation activities). According to some previous research studies (Bunnell, 2002, Das y Lam, 2016; Barbrook y Cameron, 1996), they typically involve the articulation of public and private strategies for the development and financing of urban projects, which -excluding legal steps- spark speculative reasoning of urban planning that encourages real-estate valuation.

Furthermore, due to its immaterial nature, activities related to high-technology are considered to be "soft industries" that, different from traditional industries (associated to negative environmental consequences and incompatibility with urban life), foster the interplay between productive, business and residential uses, which encourages an urban interaction and land valuation. This generates challenges for the territorial arrangement because it modifies the relationship between the deployment of productive activities and the business activation of the real-estate market.

During the last decades, there have been improvements on the dynamics of globalization, economic deregulation and re-escalation of the National State competences over local bodies, which, in turn, have assumed business roles (Harvey, 1989; Brenner, 2003). Under this scheme, the innovation capability has become essential for allowing local territories to achieve a better position in the global economy. Also, it has become an instrument for urban branding and city positioning, following a plan dominated by the strategic planning oriented to the market (Vainer, 2000). Consequently, these new configurations pose questions from the point of view of production, mainly related to the way these clusters work together with the territories where they are set; leaving the door open for new challenges from the urban planning point of view.

Purposes, scopes and methodology

It is herein proposed to allow a comparative analysis of two cases (Neiman & Quaranta, 2006), mainly on two Ibero-American initiatives of different temporal contexts, background

and consolidation status, which are key to reflect upon the creation of innovative milieus and their concrete possibilities of actual establishment in a territory.

On the one hand, the Cartuja Science Technology Park, Cartuja STP (*PCTC*, in Spanish) in Seville was created in 1993 in a premise belonging to Isla de la Cartuja, after the Universal Exhibition in Seville in 1992. It is close to the center of Seville and detached, though (firstly, due to the urban barrier imposed by the Guadalquivir river); it hosts urban facilities, government departments, universities and business centers which occupy 50 ha out of 200 ha, which is the park's total surface. In October, 2019, it was home to 459 technology companies and it generated employment for 17,000 workers that commuted daily (Guzmán, 2019). It was firstly designed to be a "closed" technology park (Castells & Hall, 1994). Currently, it faces some challenges regarding its location and its integration to the urban life in Seville.

On the other hand, the Buenos Aires Technology District (*DTBA*, in Spanish) was established in 2008 in the city of Buenos Aires, on the other side of the Atlantic Ocean. It is an open district; it is located in the pericentral area, including Parque de los Patricios neighborhood and parts of Pompeya and Boedo neighborhoods. It has 328 ha and by October, 2019, it was home to 286 established companies (according to *Agencia Gubernamental de Ingresos Públicos, AGIP*, in Spanish, 2019). It was an initiative on the part of the government of Ciudad Autónoma de Buenos Aires (*GCBA*, in Spanish) in an attempt to arrange the urban and economic development of the South part of the city, under a program to attract and support IT companies (Goicoechea, 2017). The design of this policy was inspired on the Catalan model of 22@Barcelona (Marcús, 2012; Gonzales Redondo, 2020).

Leaving aside their differences, an important feature of these centers is that both arose from government initiatives, as the physical and urban characteristics of the territories made them perfect for their establishment; that is to say, they did not emerge from productive interactions in those environments. Regarding the case in Seville, Isla de la Cartuja has been chosen because as soon as the Universal Exposition 92 in Seville finished, all the huge equipment and infrastructure could be re-used. The Expo '92 was commemorating the fifth centenary of Cristobal Colon's landfall in the Americas. Regarding the case in Buenos Aires, after studying different areas of the city and confirming that Parque de los Patricios neighborhood offered a great urban location: closeness to the city center, good accessibility and potential for real-estate development. Now, it is herein proposed to have a deep insight into these experiences in order to comparatively analyze the design, implementation and scope stages of the creation of these genuine innovative milieus, probing how these geographic areas have been built from the "bottom-up" and how they eventually become (or not) suitable places for the development and promotion of technological innovation.

Regarding the scopes of this study, the study is concentrated on the design stage of the districts, taking into account the different temporal contexts when they were implemented. Nevertheless, there are also some considerations included that account for some effects derived from the initial planning. The demarcation of time encompasses the context of the 90s in the European case and the context of the new millennium in the Latin-American case; both cases have been analyzed until pre-pandemic times. Even though there are some secondary sources published after the pandemic, it is noted that Covid-19 breakout at the beginning of the year 2020 greatly impacted on the urban life of these centers, conditioning some findings previously identified.

Questions and possible analysis axes are many and varied. Now, and from a perspective related to economic geography, attention is drawn to several innovation factors (companies – research and education centers – public institutions), their main characteristics and joint articulation together with some urban impacts of these changes. The methodology employed includes visits, photographic records of the territory, interviews to key informants such as officials and businesspeople of the IT sector, and analysis of secondary sources (newspaper articles, regulations and official documents). Regarding DTBA, findings published on the doctoral research of the author finished in 2016, updated in 2019, are reported. Regarding Cartuja STP, results obtained from a postdoctoral research carried out in 2019 in the University of Seville, sponsored by the Ibero-American Association of Postgraduate Universities (*Asociación Universitaria Iberoamericana de Posgrado*, in Spanish) and the Ministry of Economy and Knowledge of the Autonomous Region of Andalusia (*Consejería de Economía y Conocimiento de la Junta de Andalucía*, in Spanish) are presented.

Lastly, a proposal of comparative analysis of different cases set up in different geographical contexts implies paying attention, in the same way, to the institutional and economic frameworks where these innovative spaces are located. It is mandatory to bear national and regional policies that frame local initiatives as well as the characteristics of integration and participation into the global economic circuit.

Results

Design and creation of territories of technological innovation

Cartuja Science Technology Park, Cartuja STP (PCTC, in Spanish) – Seville, Spain

Cartuja STP began to develop in the year 1993 as a strategy to take advantage of an obsolete urban structure left behind by the Universal Exposition 92 in Seville (Figure 1). It was originally a large rural area, occupied by Monasterio de La Cartuja (later transformed into a ceramics manufacturing facility) that by '70s was recognized as an *ACTUR* area (Urgent Urban Development) carried out by the National Institute of Urbanization (*Instituto Nacional de Urbanización*) pursuant

Figure 1 – Landscape of Cartuja STP with pavilions construed for the Exposition ‘92 in Seville

Source: own photographic records, 2019.

to Decree-Law 734/1971 of Spain. Therefore, the administration of the premise belonging to Isla de la Cartuja is taken over by the Autonomous Region of Andalusia (*Junta de Andalucía*), which, in turn, moves forward the control and mitigation interventions related to the overflow of water from the Guadalquivir river that by 1982 was considered as an urban land. Once the Universal Exposition was over, the Administration of Urban Planning of the City Council of Seville wrote the “Special Plan of Cartuja and its Surrounding” in 1993 that establishes plots of land, areas and uses, and modifies the urban road system. Furthermore, this plan paves the way for Detailed Studies with the purpose of rearranging every plot of land regarding volumetry, height, buildable area, boundaries, etc. in detail (Sierra Muñoz, 2017).

The territory where the new Science Technology Park was established constitutes a privileged area due to its proximity to the city; it is a public territory (unoccupied, but already urbanized); it presents a territorial, zonal and block planning. Besides, the fact that the park would be set up in the city of Seville

was, similarly to the Universal Exposition, mainly because of the priority of regional policy conferred on Andalusia by the Socialist Spanish government during the '80s. Between 1985 and 1992, around 10 million USD were invested on several public works programs in Andalusia, among them: the construction of Madrid-Seville high-speed rail line, in 3 hours (...); the construction of Madrid-Seville motorways, and with the Mediterranean coast (...); the expansion of the Seville and Malaga airports; an important improvement of the telecommunications system, including the construction of a teleport near Seville, connected to the Exposition '92 teleport through three fiber optic rings (Castells & Hall, 1992, p. 278).

Nevertheless, apart from the immediate antecedent of the Exposition '92 in Seville, Cartuja Science Technology Park had been thought beforehand, in the year 1990, without a park nature, but as an innovative milieu. The idea can be traced back from an initiative by a group of researchers under the Research Project on New Technologies in Andalusia (*Proyecto de Investigación de Nuevas Tecnologías, Pinta*, in Spanish), in charge of Peter Hall and Manuel Castells, research directors, who put forward an strategy of regional scope for the promotion of technological development, stressing on the specific conditions of Andalusia.

Junta de Andalucía has been a key political agent in the design (as it financed the aforementioned research activities through *Instituto de Fomento Andalucía*), and later implementation, through different dependent entities. The final report written by the Pinta group highlights the regional outlook of technological development. Researchers acknowledged two innovative milieus and described the Technology Park of Andalusia (*Parque Tecnológico de Andalucía, PTA*, in Spanish) in Malaga as a second productive network with intrinsic potential for innovation (Ferraro, Castells & Hall, 1990, p. 6.1-1) and stressed on the importance of guaranteeing the functional cross-relations between both parks. Furthermore, the project in Isla de la Cartuja was also targeted to generate good open-air spaces and equipments at a metropolitan scale that would grant a physical dimension to the new condition of Autonomous Government of Andalusia (*Comunidad Autónoma de Andalucía*), pursuant to "*Esquema de Ordenación del Área de Actuación de la Cartuja*" passed by *Gabinete de Estudios Metropolitanos de la Consejería de Obras Públicas y Transporte* (Sociedad Pública Cartuja93, S.A., 1995).

However, the establishment of technology parks in Andalusia was also aimed at a broader scope, thinking about Spain as an important country in the relationship between the European Economic Community and Latin America. It is worth recalling that these experiences have been set up during a context characterized by heated discussions and negotiations about the economic and political integration of Europe, which gave birth to the European Union in 1993.

The original plan outlined by the PINTA group described the creation of an exclusive area for the scientific community, housing centers, technological institutes and research & development departments. Some excluded activities were the university teaching of first and second cycle – degrees and licentiates- but being highly dreamt for the presence of university institutes, as they integrate

research projects and teaching of third cycle, involving advanced students. The commercial and office sectors[1] were also excluded, as it was thought that the diversification of activities in a limited space would undermine the importance of the innovative environment. According to the report:

> *It is clear that Cartuja could be a successful block of offices and department stores in Seville and that the selling of its land for such purposes could become a great financial operation. In addition, we are certain that such operation is incompatible to the creation of an innovative milieu that can foster technological modernization and regional development of Andalusia. What could not be unacceptable, from the point of view of professional ethics and in relation to the public opinion, would be selling as an innovative milieu what, in fact, could be a block of business offices. It is mandatory to choose. Both projects (innovative milieu and business hub) are not compatible in such a small space as the premises of Cartuja Project '93.* (Ferraro, Castells & Hall, 1990, p. 6.3-11)

Despite the fact that Pinta group's guidelines were respected in general, by the end of the Exposition '92, the real-estate market pressures, political negotiations and the need to recover part of the invested funds in this territory led to the effective establishment of the project with some changes. Firstly, companies and office blocks were allowed to establish, but they did not

Figure 2 – Technical drawing of Cartuja STP

Source: Cartuja STP, 2019.

have great significance for the park. Secondly, part of the premises was targeted to cultural and recreational activities (as thematic parks and theaters). Thirdly, even though some specific research fields which had been outlined (information and communication technologies, biotechnology, food technology, water technologies, among others) were developed, other types of companies related to communication (like television and the press) were established too (González Romero, 2006, pp. 162-165) (Figure 2).

Buenos Aires Technological District (DTBA, in Spanish) – Buenos Aires, Argentina

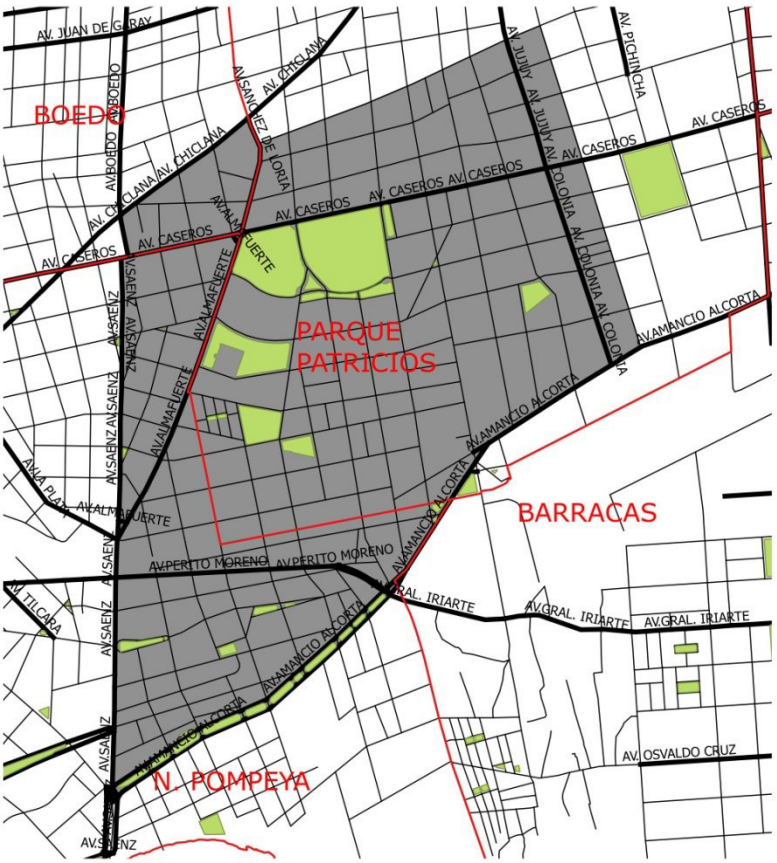
Regarding the DTBA project, it was created under a policy of urban development that began in 2008 when a liberal political party won the elections in the city of Buenos Aires. It places importance on the physical dimension of the territory as a way to encourage economic and social development of the most unprivileged parts of the city.

In the same way as the model in Seville, the urban characteristics of Parque Patricios neighborhood imposed the district boundaries: great physical environment (trees, squares and parks around Parque de los Patricios, the main park), transport system that connects the city center to the rest of CABA neighborhoods by subway and public transport, highways leading to the international airport (Figure 3). Unlike the Spanish case, here, there was not previous special planning of the area or any other kind of urban planning, apart from the legal regulations that supported and regulated the project.[2] DTBA does not have any broader scope outside the city of Buenos Aires, as it does not maintain any relationship with the metropolitan surrounding nor with the existing industrial parks.

The design of the district can be retrieved from the Catalan model of 22@Bna (Marcús, 2012). Taking into account the territorial model in Barcelona and the Catalan urban participation to think and define urban plans of the city (González Redondo, 2020) forces were joined to set out a city brand ("marca Ciudad") (Puig, 2008). Therefore, the Technological District project is part of a wider policy of "placing Buenos Aires as the Latin-American center of technology and promoting the district as the headquarters of quality, knowledge and entrepreneurship" as stated by the Minister of Economic Development of the Government of the City of Buenos Aires (MDE – GCBA, 2012, p. 7). From this perspective, it represents an attraction for foreign investors to the city. After having talked to the main representatives that designed DTBA, they highlighted the human resource found in the city of Buenos Aires as a strategic element for economic development, as it allows for a competitive positioning against other cities – specially against Latin-American cities. According to their statements in some interviews:

> [In reference to the Software sector and Information services]... *There exists a natural opportunity in relation to that. Due to the existence of a qualified human resource; it is a sector that exports; it generates currency;*

Figure 3 – Technical drawing of the Technological District of Buenos Aires and established companies



Source: own preparation based on data provided by the Government of the City of Buenos Aires, 2021.

it has a trickle-down effect on other sectors; there isn't unemployment... It strikes gold. (Personal interview to the Subsecretary of Creative Economy – MDE – GCBA, 2015)

To choose those strategic industries, we thought that Buenos Aires has human resources... and it is basically the HUB of services for the whole country (...) *Buenos Aires has experienced a technology boom in 2001, brought about by the communications breakthroughs* (...) *There is a commodity, up in the air, which grants importance*... (Personal interview to the Head of Investor Service Center [Centro de Atención al Inversor], Subsecretariat of Investment – MDE – GCBA, 2015)

Nevertheless, DTBA is also inscribed under an urban development policy, which conceives the creation of economic districts as instruments for the promotion of urban innovation in the south part, triggered by the business activation of real-estate market, the growth of buildings constructions and land densification (Goicoechea, 2017) pursuant to the policies of heritage or tourist attractions (González Bracco, 2019; Gómez Schettini & Zunino Singh, 2008). This is the reason why this technology district represents the first one of many more economic districts built in the city with the purpose of promoting the establishment of certain activities, adopting different economic profiles in different territories.[3]

Regarding the technological profile fostered inside the district, there is not any specific sector. Pursuant to the laws of creation and their amendments, a general list of possible IT activities was established,[4] including teaching and updating, specialization and training to users, teachers and students from all types of teaching institutions oriented to IT.

Whenever it is understood that a part of the city is consolidated under a private sector who owns the land, it is acknowledged that the strategy for attracting companies to the district was based on tax benefits and exemptions to IT companies and workers that would be established in DTBA. According to the law of creation of the technological district (Law n. 2972/08), foreign companies (where more than 50% of the capital is foreign) would profit from more than 10 years of tax benefits once they installed themselves in the district. Regarding the case of companies with national capital, that benefit would be valid for 15 years at different times. In 2014, a new amendment was passed which extended the benefit time until 2029 to the foreign companies and until 2034 to the national companies. Finally, the most recent amendment Law n. 6392/21, does not make differences between companies based on their capital origins and extends the term of the benefits until 2035. This time extension of the economic benefits reveals the low level of success of the district in terms of creation of innovative environments, being scarcely appreciated for their spillovers.

Furthermore, Banco de la Ciudad offered four different financing lines for companies established in DTBA (pursuant to Law n. 2972/08) whether to be used for: investing projects, relocation and purchase of equipment & facilities, acquisition of capital (through the granting of loans under a French amortization and other loan of discount of post-dated checks). Regarding the promotion of residential areas, Banco de la Ciudad established a preferential rate for mortgage loans in the south part of the city. Besides, workers of IT companies that lived near the District premises would be exempted from paying municipal services for lightning, sweeping and cleaning services.

This last aspect represents a great different in relation to the model in Andalusia, as the urban planning is supported and promoted by the interplay of uses that guarantee urban life during the day and evening. DTBA project is based on the pre-existence of a sub-centrality, as the one offered by the business center around La Rioja street

and Caseros Avenue, which seeks to promote the architectural revival, the refunctioning and real-estate investments. The evolution of socio-territorial transformations in this sector set the course regarding the characteristics of new buildings with a mixed orientation -business buildings and residential buildings- (Figure 4). Even in the last amendment (Law n. 6392/21), GCBA intended to accompany this measure by including "urban developers of mixed architecture projects" into this trend, allowing them to pay 25% less of their gross income tax(which was the result of doing their jobs in the whole city).

Figure 4 – Type of building construed at DTBA

Source: own photographic records, 2019.

An approach to the synergy dynamics

Innovative components

Having different history, temporal contexts and macro-economic contexts, this article shows that both technological centers can be compared in an exploratory way. This proposal makes emphasis on the presence (or absence) of some characteristics and formal elements that define innovative environments from the static point of view, but could not enable the creation of dynamic environments by themselves (Chart 1).

An important characteristic that is relevant to mention is that Cartuja STP was born to reply to an initiative that was aimed at the public sector, which was designed and planned before; interests and efforts of a national and regional level are articulated to the ones of the government of Seville. Consequently, key institutions and actions are identified (many of them have a public-private administration), which indirectly contribute to an intervention and regulation framework of the activity. The administration company *Parque Científico y Tecnológico Cartuja S.A* (before known as, Cartuja93 S.A.) is crucial. It is composed by members of different departments of Junta de Andalucía, the City Council of Seville, deputies and the University of Seville, among others (Chart 1). But there exist institutions from the private sector, like *Círculo de Empresarios de Cartuja* (CEC) created in 2001 and promoted by companies and entities that develop their activities at Cartuja STP.

On the contrary, DTBA answers to an exclusive initiative of the Government of the City of Buenos Aires (GCBA). It recovers the national regulatory frameworks of promotion of the sector (National Laws n. 25.856/2003, 25.922/2004, 26.692/2011 and 27.570/2020) and it recognizes tax benefits, but there are not any inter-jurisdictional agents that work over that socio-productive networks. In this case, there is not any administration figure and it is the GCBA (through the Ministry of Economic Development and Production) that takes up the role of administrator. The temporal contexts of these milieus are different as well as their maturity periods. Regarding the Argentinean case, on the last amendment, the local government assigns to the administrator some clustering functions aimed at promoting the gathering of people or companies that share interests for the knowledge transfer. It grants competences to define the activities and to fix the standards for accreditation of compliance on the part of the companies as long as they continue to lawfully hold the tax benefit (Law n. 6392/21). Lastly, the possible creation of synergy does not seem to be, for the moment, an intrinsic motivation for the establishment of IT companies and facilities in the District, and as it was mentioned before, on the subsequent amendments, the tax benefit period was extended, as it was realized that they are the truly attractive factors.

Regarding the size of the territories and the socio-territorial scope of the projects, they constitute different models of local development. Cartuja STP, was precisely implemented under the concept of (closed) park and was especially thought to be an

Chart 1 – Comparative analysis between Cartuja STP and DTBA

	Cartuja Technology Park (PCTC, in Spanish)	Technological District of Buenos Aires (DTBA, in Spanish)
Area	200 ha. (Including the cultural, sports, leisure, university and business scientific areas)	200 ha.
Created in	1993	2008
Managed by	Cartuja 93 S.A.	–
Urban planning	Plan especial de Ordenación del espacio de la Cartuja (1992)	
Amount of established companies	459 (Cartuja STP, 2019)	248 (*AGIP*, in Spanish, 2019)
Employees	16,430 (8,356 in High Tech)	20,000 (en 2019)
Entities that generate new knowledge	National Center of Accelerators, CNA (University of Seville, Junta de Andalucía); Doñana Biological Station; Centro de Investigaciones Científicas Isla de La Cartuja	Buenos Aires Institute of Techology, ITBA (2016)
Incubators	Marie Curie Tech Incubator	IncubaTICs; Hoteles de Industrias Tecnológicas (HIT) 1, 2 and 3
Facilitating Institutions	Agencia Andaluza de Conocimiento; Technological Corporation of Andalusia (CTA); Fundación para la investigación y el Desarrollo de las Tecnologías de la Información en Andalucía; Agencia de innovación y desarrollo de Andalucía; Cámara de la Industria y Comercio de Sevilla; Red Tecnológica Andaluza	Authority in charge of the District: Ministry of Economic Development and Production of the Government of the Autonomous City of Buenos Aires (Decree n. 107/2021 - GCBA)
Local business networks	Círculo de Empresarios de Cartuja (CEC)	GIGA Buenos Aires (until 2017); Buenos Aires Tech Cluster (from 2019 up to now)

Source: (Cartuja STP) González-Romero, 2006; Brinkhoff, 2017; (DTBA) own preparation based on official sources.

infrastructure premise. The total amount of surface is organized into plots of land assigned to productive, scientific development, culture and leisure activities. As evidenced by the photography (Figure 5), there is not any urban vigor in the environment and for the moment, it is not clear whether that is an objective. There are opposite views regarding the use and significance of the area that continue since the beginning of the project. On the one hand, the construction of a residential network is rejected as it is conceived as an area for the promotion of innovation, but, on the flip side, the absence of passers-by in public places, its daytime use and the presence of grilles surrounding the premises are questioned.[5]

Figure 5 – Public space of Cartuja STP

Source: own photographic records, 2019.

On the contrary, DTBA is, firstly, a neighborhood. It has workers' traditions, mixed uses (residential and productive) and business sub-centrality; the area is frequently and daily walked by neighbors and around 20,000 new workers, according to the local government figures for the 2020 (Cieri, 22/8/2021). These urban features have an impact on the creation of an innovative milieu as it tailors a diversified and complex productive network that, even though it does not encourage the opportunity of exchange between highly qualified human resources, it actually contributes wealth and turns it into an attractive place to visit and consume, eventually, promoting its use. Before the outbreak of the Covid-19 pandemic, it was frequent to find employees of IT companies having lunch in the surrounding area of Parque de los Patricios, talking to each other in bars and cafés of the area. Criticism to these technology environments from the urban perspective makes emphasis on the challenges for urban integration because the establishment of these new economic activities in the neighborhood ends up shaping separate circuits that exclude the traditional inhabitant (Goicoechea, 2017).

Interaction between companies and potential for internalization

The strategy of attracting companies has been different in both cases, consistent with the planning and design paths which were equally different. In Cartuja STP, the legacy of Exposition '92 is key: firstly, regarding the infrastructure and construction because of the pavilions construed for such event (and the subsequent construction of new buildings that complement the real-estate offer); secondly, due to the symbolism that the territory linked to technology and innovation acquired and the establishment of scientific and academic facilities that carry out research.

According to some previous studies, it is noticeable that, among the reasons to establish Cartuja STP, managers of IT companies expressed that the urban characteristics of the premises are more valuable than the benefits that proximity to the agglomeration economy would yield (González Romero, 2006). Nonetheless, apart from these specific characteristics of the companies, the model in Seville encompasses entities of different governmental levels and programs aimed at promoting the link between companies and between the international sphere (evidenced in Chart 1): There are also business cooperation programs and initiatives. Cartuja STP belonging to the Association of Science and Technology Parks of Spain (APTE, in Spanish) offers information about technology supply and demand to the companies as well as the possibility of participating in twinning programs with other technology parks. Furthermore, it takes part in the initiative Enterprise Eurolodging coordinated and supported by International Association of Science Parks and Areas of Innovation (IASP) to foster the exchange between companies around the world.

Nevertheless, despite all the efforts, according to some previous research, synergy dynamics arising from the park are developing, but they are not rooted in the relationships between companies and centers located there. The physical proximity results an outstanding aspect in the articulation between research companies and centers, as it emerges from cooperation agreements developed in the national or European sphere (González Romero, 2006, p. 192). During the fieldwork in 2019, coincidental interviews at the Cartuja STP were conducted, among which it is important to highlight what workers of *Pabellón de Italia* stated as they argued being linked to Cartuja '93 only because of being the tenant of the offices they occupied, but whose exchange instances were null and they even did not know the kind of activities that other companies ran within the same pavilion.

Regarding the companies established at DTBA, according the interviews conducted and previous research (Goicoechea, 2017; Poore, 2018), it is worthwhile mentioning all the tax benefits and exemptions that companies could get as soon as the move to the area. In the interviews, managers and representatives regret the absence of interaction between companies, which constitutes a necessary aspect for the activation of the "cross--pollination" process that feeds hubs installed in other cities.

In addition, it is crucial to recognize the recent temporal context of the project, as the district in Buenos Aires was set up around 10 years ago and the promotion of business synergy requires maturity. This fact has also been acknowledged by the representatives of the project in GCBA, who stated that:

> *The stage of 'making people go to the district' would have finished by 2018, and the next step is making companies see how attractive the district is because of its potential for joining business and talent together.* (General Director of Production Development, Ministry of Economy and Finance – quoted in Poore, 2018)

Attempts made by the local government to intervene in the IT business network took two different paths. On the one hand, with a view on placing the sector within the international economy, from the beginning of the project, it promoted actions to attract and "sell" the project, which is ongoing now. One of the main steps to start and promote DTBA was looking for business partners and foreign investors. Most of the advertisement of the project was focused on trips overseas, meetings with CEOs of the technology sector, signing of agreements with other cities, statements of interest by companies, etc. These trips required the Ministry of Economic Development and the City Governor to travel to China, India, the USA (Washington, Silicon Valley, California) and England, motivated by three purposes: getting funds to invest in the project, getting to know relevant experiences carried out in other cities and promoting the district among foreign technology companies. These internalization strategies, nonetheless, were not complemented by the creation of a specific area or institution to accomplish them; neither were they framed by an international policy at a national or provincial level (Goicoechea, 2017).

On the other hand, the local government understood the importance of promoting the self-organization of IT companies to create a political agent that has an influence on local aspects of the urban life in the district. Consequently, GIGA Buenos Aires was an initiative by the Subsecretariat of Investments of GCBA to create a "Consorcio de Industrias del Distrito Tecnológico" (Joint Venture of the Technology District) that worked from 2009 to 2015. The government official said:

> ... [about GigaBA] it is a joint venture... *a place where people gather in common areas and interact among them to agree on rules of coexistence... Are there safety problems? Well, how we can work out these safety problems... And,* [sic] *how about schools? How we can work with schools, all together... How can we get closer to neighborhood facilities, all together*. (Subsecretary of Investment – MDE – GCBA, 2015)

The GigaBA experience was limited to the challenges that for companies implied moving their headquarters to a new neighborhood; but it did not thrive in its role of facilitator. Recently, in 2019 Buenos Aires Tech Cluster was created. It gathers 50 members of companies and institutions mainly located at the DTBA. Among their main objectives, it is important to mention actions to link companies and

start-ups with investment funds, venture capital, incubators, etc. and coordination of export actions at an international level (Buenos Aires Tech Cluster, 2019).

University – business engagement

Regarding the model in Buenos Aires, research centers and university institutes, located now and in the future, belong to the private sector. In 2016, *Instituto Tecnológico Buenos Aires* (*ITBA*) opened a branch. There are prospects for the opening of two private universities in the future: *Universidad de Belgrano* and Caece. GCBA has identified some measures of economic incentive targeted to attract more educational entities and IT entities, but it has not moved forward in linking the innovative capability of them to the business activity. On the one hand, Innovation Scholarships (*Becas de la Innovación*) are granted to students that graduate from secondary school and would like to study an IT career. On the other hand, since 2021, the program *Beneficiatech* GCBA operates. It is oriented to promote the implementation of teaching educational programs and training sessions, targeted to employees of the companies established under the promotion scheme of *Distrito Tecnológico del Registro Único de Distritos Económicos* (Section n. 52/MDEPGC/21). The entity that is deeply involved in the processes of technological transference is ITBA pursuant to the program *Centro de Emprendedores* (Entrepreneurs' center) created in 2001. Nonetheless, it appeared before the DTBA and is part of an exclusive academic initiative. In 2017, it was established in the premises of DTBA and since then, it has generated agreements and links to some companies of the area. Similarly, *IncubaTics* is the first private incubator of IT companies at DTBA, but it is not engaged in significant activities at the moment. Secondly, there are co-working buildings, known as *Hoteles de Industrias Tecnológicas* (HIT).

On the contrary, Cartuja STP holds a strong tradition regarding the promotion of collective knowledge. Network planning, since the design of the park, assigns a university campus. In this campus, there can be found the Higher Technical School of Engineering and the Faculty of Communications of the University of Seville, private university schools (Ceade and *Centro Universitario San Isidoro*) and the International University of Andalusia. Among the scientific knowledge transfer programs, Andalusia Tech stands out, supported by the University of Seville and the University of Malaga. Lastly, Marie Curie Tech Incubator stands out. It was opened in 2010 as the first one in Andalusia and currently, it hosts 39 IT companies.

However, as it was pointed out by an interviewed expert that apart from the initiatives and developed programs, there were people who played and play key roles in this university-business engagement:

> *There are professors that have played key roles in spin offs* (...) *companies like Inerco emerged from Engineering professors, are located there and have contributed a lot to the park, even more*

> *than other policies. Besides, that is the reason why the School of Engineering -and not any other school- is located there. It is true that the presence of students can deviate from the concept of technology park, but it is also important that the student is familiar with the business reality and they can see how their own professors are the ones who work in that companies... There, the physical proximity results crucial* (...) *I remember José María Benjumea, a professor of architecture of the University of Seville, who was the Technical Director at Cartuja '93 and he stated the importance of direct contact, apart from the existence of business partnerships. The so-called "business breakfasts" or informal encounters among researchers, professors and managers are bottom-line for the success of the park, for the creation of synergy, as before any valuable contact, there must be trust... trust is built face--to-face, when you look at somebody... and that is only achieved by close human relationships*. (Personal interview Professor Gema González Romero, 2019)

Finally, according to what the expert said, during the last years (before the outbreak of Covid-19 pandemic) the relationship in the local network has been further developed and it is coherent to the most frequent type of development of these spaces built bottom-up. This consideration is valid for the Spanish and Argentinean case because the creation of dynamics of productive and innovative technology synergy requires some time to mature in a territory.

Conclusions

This article has attempted to introduce the most salient aspects regarding the creation of innovative milieus and their relationship with the urban environment where they are established. This relationship implies a challenge and generates some controversial aspects. First, the creation of the innovative capability in the territories implies the creation of a certain social mood, cooperation networks and exchanges – formal or informal – with dynamics of learning and transfer... elements which are part of the social life that would not be possible in spaces without urban life. Secondly, the establishment of business activities and other business, recreational and residential purposes weakens the possibility of interaction between qualified workers and collective learning of new forms of arrangements, which are key factors of the intrinsic innovative capability.

At the beginning of the analysis, by having knowledge about some previous experiences of more relevant technology spaces, it has been clear that the relationship between the promotion of productive innovation and urban development (based on urban marketing, urban renewal and real-estate validation) is not always solved equally, allowing for the identification of some differences between these spaces. Therefore, it has been herein analyzed the cases of Cartuja Science Technology Park in Spain and the Technological District in Buenos Aires, Argentina, in depth.

Leaving aside the differences in geographic contexts, local economic conditions and unequal international integration, they can still be compared.

Cartuja STP unveils a strategy centrally planned at a national level and "bottom-up", proposed by Junta de Andalusía together with the City Council of Seville, adopting an urban design carefully planned that outlines specific guidelines and interventions in the territory. Its objectives imply purposes of economic positioning for the technological development of the region of Andalusia within the country and of the country within the European Union. Located at Isla de la Cartuja, it was aimed to profit from the experience of the international cooperation of Universal Exposition '92 as a support for the technological project. On the contrary, DTBA was a strictly local initiative, triggered exclusively by the GCBA and disarticulated from the system of existing industrial parks in the Province of Buenos Aires. Besides, they have different temporal contexts and maturity periods. Regarding Cartuja STP, there is a gap between the design stage and its actual establishment, a 30-year gap. Regarding DTBA, it has been working for 13 years, and it represents a smaller initiative that has been designed and redesigned according to the interests of the involved parties, the economic aspects and business strategies.

Regarding the design of these models and their main interventions, firstly, it is necessary to acknowledge that these urban environments are completely different. Isla de la Cartuja was an unoccupied urban area, with big premises and obsolete equipment, most importantly, without urban life. Once Cartuja STP was established, restrictions to the residential uses or establishment of other economic activities apart from the established ones – measures that set boundaries to the real-estate market – condition the development of dynamics of use of public spaces and the creation of exchange interplays. Regarding DTBA, it was implemented in a consolidated part of the city, with a territorial history associated to the residential urban life at a neighborhood level that began to show a new urban landscape with business dynamics.

Some challenges of DTBA are promoting the internal articulation between parties and enhancing innovation dynamics, which for the moment, stands out more due to their urban impacts and business activation of the real-estate market than due to its technology characteristic. On the contrary, Cartuja STP, with a much longer history, institutional frameworks of business articulation and a consolidated integration from a national and regional (from Andalusia) productive policy evidences some challenges for the promotion of urban life in the streets, enabling the informal and on the spot interaction between agents (highly important for innovation dynamics). Finally, it can be argued, from an economic geography approach,

that both experiences illustrate certain dissociation between the policies of economic development, technological innovation and the ones that conceive the territory as an innovative milieu.

Further comparative analysis of these cases would deserve to be complemented by the analysis of the macroeconomic conditions of the regional and national policy and of the level of integration and participation of the sector within the global economy. Such matters, as well as the characteristics related to human resources that integrate such socio-productive networks and the available financial capital, require to be discussed in subsequent studies. That would be the only possible way to understand and consider the levels of "success" of each case of study.

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Notes

(1) Based on the background knowledge acquired by the international experience, experts considered economic units whose management activities are unrelated to the R&D center and employ more than 25% of their staff as "commercial offices hidden behind the label of R&D center" (Hall & Castells, 1992, p. 6.3-11)

(2) In 2008, the Government of the City of Buenos Aires (GCBA) passed the first law on creation of the DTBA (Law No. 2972/08) that set boundaries to the development action area; new urban criteria and conditions for the establishment of IT companies were laid down. Later, original regulations were redefined and modified, changing design characteristics and expanding the initiatives of economic promotion (Laws No. 3516/10; 4115/12; 5234/14; 5927/18 and 6392/21).

(3) Nowadays, there exist seven economic districts, which since 2008 have been implemented systematically and subsequently in different areas of the city of Buenos Aires that have a certain level of sub-development or urban decay: Technological District in Parque Patricios (2008), Audiovisual District in Chacarita (2011), Arts District in La Boca (2013), Design District around Barracas neighborhood (2014), Sports District in most parts of Comuna 8 (2014), the recent "Distrito Joven" in Costanera norte (2018) and Wine District (2021). To analyze the cases in depth and comparatively, see Arqueros & Gonzalez, 2017 and Goicoechea & Arqueros, 2021.

(4) These are: development, maintenance or updating, software guarantee or consulting, etc.; technology outsourcing services; information services for equipment and networks safety; hardware manufacturing; services of software, hardware, infrastructure, platforms and cloud computing; services of biotechnology, robotics and home automation; nanotechnology services, 3D printing service, accelerators, incubators and providers of incipient technology companies.

(5) There is an ongoing project from Urban Lab of Europe – UE, known as *Cartuja Qanat* (2019-2021), whose main objective is the promotion of street life as a social stimulator through the integration of actions that provide answers to the climate change problem.

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