

Academic entrepreneurship in Brazil: an analysis of recent changes in conditioning factors

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Abstract: This paper aims to analyze the conditioning factors of academic entrepreneurship in Brazil over the last decades. Academic entrepreneurship is strongly related to the transformation of academic research results in innovations, thus contributing to the long-term economic growth of countries. The research was built based on the descriptive research methodology. Initially, a literature review was performed that allowed the characterization of knowledge-intensive entrepreneurship and, more particularly, of academic entrepreneurship and, in a second moment, data analysis was performed, using data from different institutions, including ANPROTEC, INPI, ANPEI, among others. Among the data presented and analyzed are data on business incubators, technology parks, accelerators, technology innovation centers, numbers of masters and doctors trained, graduate programs, published papers, and patents. Along with the data analysis process, was addressed the issue of public policies capable of impacting academic entrepreneurship. In terms of results, in general, conditions for academic entrepreneurship have significantly improved over the past two decades, both in infrastructure conditions such as the presence of incubators, technology parks and accelerators, as well as in conditions associated with the availability of private and public capital, professional qualification level and generation of new scientific knowledge. However, significant changes in university culture are still needed, as it is the necessary condition for greater and better articulation between universities and companies.

Keywords: Academic Entrepreneurship, Incubators, Technology Parks, Accelerators, Patents.

O empreendedorismo acadêmico no Brasil: uma análise das mudanças recentes nos fatores condicionantes

Resumo: O objetivo do artigo é fazer uma análise dos fatores condicionantes do empreendedorismo acadêmico no Brasil ao longo das últimas décadas. O empreendedorismo acadêmico está fortemente relacionado com a transformação dos resultados da pesquisa acadêmica em inovações, contribuindo assim para o crescimento econômico de longo prazo dos países. O artigo foi construído com base na metodologia de pesquisa descritiva, sendo realizada em um primeiro momento uma revisão da literatura que possibilitou a caracterização do empreendedorismo intensivo em conhecimento e, mais particularmente, do empreendedorismo acadêmico e, em um segundo momento, foi realizada a análise de dados disponibilizados por diferentes instituições, entre elas ANPROTEC, INPI, ANPEI, entre outras. Entre os dados apresentados e analisados estão os dados sobre incubadoras de empresas, parques tecnológicos, aceleradoras, núcleos de inovação tecnológica, números de mestres e doutores formados, de programas de pós-graduação stricto sensu, de artigos publicados, de patentes, entre outros. Junto ao processo de análise dos dados foi trabalhada a questão das políticas públicas capazes de impactar o empreendedorismo acadêmico. Como principais resultados o artigo mostra que, de modo geral, as condições para o empreendedorismo acadêmico tiveram melhoras significativas nas últimas duas décadas, tanto nas condições de infraestrutura, como a presença de

incubadoras, parques tecnológicos e aceleradoras, como em condições associadas a disponibilidade de capital privado e público, nível de qualificação dos profissionais e geração de novos conhecimentos científicos. Entretanto, ainda são necessárias mudanças significativas na cultura universitária, pois a mesma é a condição necessária para maior e melhor articulação entre as universidades e empresas.

Palavras chave: Empreendedorismo acadêmico, Incubadoras, Parques Tecnológicos, Aceleradoras, Patentes.

1. Introduction

Not every kind of entrepreneurship has a positive relationship with economic growth. According to Acs (2006), when the distinction between necessity entrepreneurship (economic agent has no other option of income to ensure their survival other than the entrepreneurial activity) and opportunity entrepreneurship (economic agent systematically seeks business opportunities) is made, the contribution of entrepreneurship to growth can be better understood. There is evidence that opportunity entrepreneurship has a positive impact on the development process of nations, whereas such a relationship is not present when necessity entrepreneurship is considered. A similar result is found by Wong et al. (2005) analysing a sample of 37 countries. The authors find evidence that only what they call entrepreneurship with high growth potential has a positive impact on economic growth.

Such evidence helps to understand why several authors in the area of entrepreneurship defend the importance of focusing attention when thinking and elaborating public policies, in that type of entrepreneurship that really matters in terms of economic growth, which some call of innovative entrepreneurship, others call technological entrepreneurship or high-impact entrepreneurship. Malerba and McKelvey (2016) and Caloghirou et al. (2016) defend the adoption of the concept of knowledge-intensive entrepreneurship as the basic concept for the comprehension of modern entrepreneurship and for the discussion of public policies aimed at promoting growth by stimulating entrepreneurship.

Knowledge-intensive entrepreneurship would have, according to Malerba (2010), as the main characteristic the establishment of new companies that would be able to introduce innovations in the economic system and that would use knowledge intensively. In this sense, according to the author, knowledge-intensive entrepreneurship would be present in new firms that are established in sectors that are highly knowledge-intensive, in the development of new activities in large corporations, which characterizes corporate entrepreneurship, and in activities of some individuals in non-profit organizations, such as universities and public laboratories, in what is known as academic entrepreneurship.

Over the last two decades, Brazil has undergone significant economic transformations but has not yet been able to boost the country's economic development in terms of higher growth rates. Many of these transformations may be associated with the transition from an economy characterized by massive state intervention to an economy where private enterprise plays a more relevant role. In other words, as will be explained in more detail throughout the article, Brazil has made the transition from a managed economy towards a more entrepreneurial economy. The objective of this article is to present the main challenges associated with this transition to a more entrepreneurial economy, especially in the development of knowledge-intensive entrepreneurship.

With the aim to achieve the proposed goal, this article is divided into five parts. The first corresponds to this introduction, contextualizing and presenting the purpose of the research. The second part is directed to the presentation and characterization of the concept of entrepreneurial society. The third part focuses on the presentation and characterization of the concept of knowledge-intensive entrepreneurship, differentiating it from traditional entrepreneurship. The fourth part has as its function to present a variety of facts and data that allow characterizing the main conditions associated with the development of knowledge-intensive entrepreneurship in the context of the recent Brazilian economy. The last part is devoted to presenting the main findings of the study and suggestions for further research.

2. Literature review

Academic entrepreneurship has been seen as one of the most promising forms of linkage between academic research and commercial research conducted by firms of different industries. According to Haeussler and Colyvas (2011), several countries and regions have adopted public policies aimed at narrowing this link and, thus, obtaining better economic performance. This type of linkage between universities and enterprises involves transferring the results of scientific activity from one organization to another, with subsequent development and commercialization, occurring through several mechanisms, including intellectual property, consulting, training of companies.

Entrepreneurial activity in the university context has been conceptualized as academic entrepreneurship where, as shown by Wood (2011) the university is the source of critical ideas and technologies. According to the author, academic entrepreneurship can be seen as a set of efforts and activities that take place in the context of universities with the aim to commercialize the results of academic research. Such efforts and activities mainly involve technology licensing agreements, spin-offs, and are facilitated by technology transfer offices.

According to Wood (2011), the growth of academic entrepreneurship is strongly associated with institutional changes in intellectual property rights associated with academic research. In the case of the USA, the main institutional change that stimulated academic entrepreneurship was the establishment of the Bayh-Dole Act of 1980. In this new legal norm, publicly-developed intellectual property became the property of universities and researchers. With the possession of this intellectual property, universities began to act more effectively in the commercialization and transfer of technology from the university to the private sector, making use of technology transfer offices.

The relation between universities and companies, concerning the transfer of technology, seeks to reduce the structural differences between academic research and commercial research. According to Partha and David (1994), structural differences can be understood in terms of orientation, reward, and way of making research results public. While academic research is discovery-oriented, commercial research orientation is the gain of market share. In terms of reward, the research effort in the academic arena is rewarded by the increase in reputation, while in the commercial field the reward comes in the form of profit. Regarding how the research results are made public, academic research has as main vehicle the publication of articles, while commercial research has as its primary vehicle the use of the patent system.

The greater emphasis on academic entrepreneurship as a desirable way for universities to contribute to the development of society has led to the development and use of new metrics for university evaluation. In addition to the number of publications and their quality, basic forms of measuring the quality of university institutions, more recently the number of patents and number of start-ups created, two more adequate measures to measure the entrepreneurial effort in the academic context, began to be used more widely. However, as Nelson (2009) points out, the use of such measures can distort the real impact of academic research on the economy.

In the literature about academic entrepreneurship a strong emphasis has been placed on the characteristics of the entrepreneur. According to the study by Haeussler and Colyvas (2011), which focused on entrepreneurship in the context of British and German universities, those professionals with higher achievements in academic life, that is, professionals with a higher level of publication and reputation, are better positioned to take advantage of the opportunities engendered by the relationship between universities and companies. They are more likely to engage in activities associated with academic entrepreneurship since the increased safety associated with a well-established academic career has contributed to minimizing the risks associated with entrepreneurial activity.

As previously registered, academic entrepreneurship takes different forms. However, the formation of a company corresponds to the form of academic entrepreneurship that involves greater commitment and higher risk. Packer and Webster (1996) and Shane (2004) emphasize that entrepreneurial activity, unlike academic activity, involves more complex forms of action in terms of obtaining financing, selection and development of the work team and exercise of entirely new roles in business development, such as marketing management for example. Thus, the technical skills of the candidate for academic entrepreneurs need to be complemented by managerial competencies to minimize the risks associated with the entrepreneurial activity.

The dynamics of academic entrepreneurship is associated with the presence of adequate resources. Powers and McDougall (2005), using as theoretical basis the concepts of Resource-Based View, show that financial resources, human capital and organizational resources present in the context of universities are a significant predictor of the number of start-ups formed and the number of companies that have made the opening of capital and, previously, have licensed some technology to the university.

In terms of financial resources, Powers and McDougall (2005) show that the presence of agreements between universities and companies that allow universities to receive private resources for their research positively influences the number of start-ups and the number of IPOs. According to the authors, the presence of the resources of private companies in the financing of university research can stimulate an entrepreneurial culture within universities, as well as allows the sharing of experiences, strengthening the bonds between universities and companies and, consequently, academic entrepreneurship.

In terms of human capital, the study by Powers and McDougall (2005) presents pieces of evidence of the importance of the quality of the researchers present in the university as a predictor of good results concerning academic entrepreneurship. In this sense, it is the responsibility of the universities, in strategic terms, to build a highly qualified body of researchers with conditions to carry out their research, as well as guaranteeing the

conditions, when possible, to transform research results into commercially viable products using the different ways to carry out technology transfer.

In terms of organizational resources, Powers and McDougall (2005) emphasize the role that technology transfer offices play in the flourishing and expansion of academic entrepreneurship within universities. According to the authors, the age of technology transfer offices is a vital predictor of the number of start-ups created and the number of companies that have licensed technology from the university and subsequently made IPOs. In this way, offices with more experience and, consequently, more developed skills, can cope better with the complexity of the technology transfer process.

An important aspect is emphasized by Powers and McDougall (2005), which was also observed by Bray and Lee (2000) as well as by Feldman et al. (2002) is that the competences developed by the universities' technology transfer offices allow the adoption of different transfer mechanisms from the most habitual, that is, licensing. According to Powers and McDougall (2005), many of the licensing agreements established between transfer offices are made with large and often public companies. However, the authors' study shows that the development of a partnership agreement between universities and start-ups may be the best way to align university interests with those of start-ups.

In the case of entrepreneurs or business leaders, technology transfer offices can be seen as a catalog of innovations in the early stages that are looking for an entrepreneurial vision or commercial viability conditions. These innovations, according to Wood (2011), can be seen, based on the ideas of the Resource-Based View exposed, among others, in Barney (1991), as rare and difficult to be imitated and consequently as a source of advantage competitive. Thus, the innovations generated in the university can allow the development of differentiated products and thus guarantee a higher economic return for new companies or existing companies.

An essential aspect of venture capital's role in financing innovative entrepreneurship is the proximity of suppliers and capital recipients. In the study by Powers and McDougall (2005), evidence was found that those universities located in metropolitan areas, where there is a more significant presence of venture capital, formed a higher number of start-ups and had a greater number of companies that made a public offering and who previously made a technology transfer agreement with the university. In this way, the geographic dispersion of venture capital has the power to influence innovative entrepreneurship in its academic aspect.

The study of knowledge-intensive firms is associated with the new role of universities. According to Etzkowitz (1998), in addition to teaching and research functions, at the end of the twentieth century the university starts to play an important role, that of generating new businesses, thus increasing the contribution of the same with respect to the economic and social development, making in the words of the author an entrepreneurial university. In this sense, the university becomes a provider of social capital and a locus for incubation of new business, serving as an infrastructure for development in the context of the knowledge economy.

For Wood (2011) the benefits of academic entrepreneurship can be analyzed from three perspectives: universities, researchers and entrepreneurs or business leaders. In the case of the university, as well as an additional source of resources in a context of greater budgetary

constraint, academic entrepreneurship can have positive repercussions in terms of reputation and generation of social benefits. In the case of researchers, academic entrepreneurship can enable financial gain, strengthen collaboration with scientists and product development teams, and thereby enable the research program to be directed towards areas of greater relevance in terms of social impact.

The flowering of academic entrepreneurship, as a specific form of knowledge intensive entrepreneurship, is conditioned by legal, institutional and organizational context, as shown by different authors such as Isenberg (2010). Specifically, in the case of academic entrepreneurship, context should be divided into contexts internal to universities and context external to universities. Fini et al. (2011) and interaction between university context and external context to universities, more specifically, the role, complementary or substitute, that mechanisms to support the creation of academic spin-offs exercises in relation to support mechanisms existing in the regional contexts where such universities are located.

The study by Fini et al. (2011), involving spin-offs from 64 Italian universities, shows that the external context of universities has a substantial impact on the creation of spin-offs, but that mechanisms to support the creation of forged spins-offs within universities may in many cases, have the ability to substitute unsatisfactory conditions present in the external context. Even regions lacking local conditions to support academic entrepreneurship, such as social capital, financing, incubators, public spending on research and development, can achieve better performance in terms of creating spin-offs with the development of support mechanisms in the context of universities.

Academic entrepreneurship strongly influences institutional change regarding intellectual property within universities, as evidenced by the extensive literature on characteristics and impacts of the Bayh Dole Act. The positive effects of such legislation have found robust confirmations by researchers, as shown by Kenney and Patton (2009). Following Mowery et al. (2004), it can be said that such legislation allowed universities to pay more attention to the technology transfer process, leading to the development of internal organizational structures, such as technology transfer offices, and specific regulations aimed at creating academic spin-offs.

3. Methods

This paper is based on the descriptive research methodology, aiming to describe the recent behavior of the conditioning factors of academic entrepreneurship in Brazil. A literature review on academic entrepreneurship was performed to provide contextualization, clarification of definitions, and characterization of academic entrepreneurship, as well as the reflection on the conditioning variables of such type entrepreneurship. After reviewing the literature, the next step involved documentary research, carried out on websites, reports, and secondary databases of institutions such as ANPROTEC, INPI, and ANPEI. The variables whose behavior is described and analyzed are the number of incubators, technology parks, accelerators, masters and doctors, graduate programs, and patents.

4. Academic entrepreneurship in Brazil: evolution of conditioning factors

An essential piece in the gear that stimulates innovative entrepreneurship is business incubators. Among other roles, incubators provide support for the development of entrepreneurs' ideas, seeking a better alignment between the idea and the needs of the

market, as well as allowing entrepreneurs to overcome, at least in part, an inherent problem of new ventures, the so-called fragility of the new one. This fragility is a situation in which new company does not have enough revenue to cover initial costs, has no reputation for attracting customers, has no assets to offer as collateral in obtaining credit, and lacks the credibility required for a good relationship with suppliers. In most cases, this support consists of physical infrastructure, courses and mentoring for the development of entrepreneurial skills, support for the managerial development of the incubated company.

In the Brazilian case, the presence of business incubators is already somewhat consolidated in the entrepreneurial ecosystems present in different regions, thus contributing to the development of new businesses and the reduction of mortality that characterizes such enterprises. According to Anprotec figures, in the year 2016 369 incubators were active in Brazil, which supported 2310 incubated companies and had already been responsible for 2915 graduated companies. Anprotec data also allow a broader view of the evolution of incubators in Brazil, showing that in 1993 there were 13 of these organizations, reaching 150 in 2001, 234 in 2002, 377 in 2007, 400 in 2008, year from which the number of incubators reached the maximum value, suffering a small drop in subsequent years, reaching 384 units in 2012 and stabilizing at this level.

Another important aspect of the development of the support structure for innovative entrepreneurship concerns the presence of technology parks. These parks, according to the most accepted definition, correspond to an industrial complex area where companies that invest intensively in R&D have offices and laboratories and do activities involving science and technology. In this sense, technological parks are favorable environments for the development of a strong culture of innovation by companies, supporting business training and technology transfer, thus increasing the competitiveness of installed companies and contributing to the development of the regions where they are present.

In the case of Brazil, as occurred with incubators, there was a substantial increase in the presence of such support structures to innovative entrepreneurship. Also according to data from Anprotec, in 2000 there were 10 technology parks in the country, in 2004 there were already 34, in 2008 the number reached the figure of 74 and in 2013 were already 94, a part in full operation, such as Porto Digital in Recife and another part in the process of construction. As with incubators, there is a strong regional concentration of technology parks in Brazil. The south-east region was contemplated in 2013 with 41.5% of the parks, the south region with 37.2%, the central-west region with 8.5%, the northeast region with 7.5% and the northern region with 5.3 %.

A third important structure for the development of innovative entrepreneurship that is characterized by the steady growth of its presence in Brazil over the last few years are the accelerators. These organizations, as well as the incubators, are dedicated to supporting the initial development of new businesses focused on innovation through a structured process, often called a program, in which companies participate for a specific time. These programs are structured around entrepreneurs' training through courses and mentoring, support for better evaluation of market opportunities, infrastructure and support services focused on the development of products and services, as well as the provision of initial financial capital.

In an analysis presented by Abreu and Campos (2016), the authors point the presence of 41 accelerators acting in every Brazilian entrepreneurial ecosystem. From the quantitative

information of 31 of these accelerators, the authors show that until that moment the investment made by these organizations in new companies reached R \$ 51 million reais, as an investment ranging from R \$ 45 thousand to R \$ 255 thousand reais. However, the study also shows the concentration of accelerators in the Southeast region, which had 71% of accelerators in operation, with 53% only in the State of São Paulo. The Northeast region accounted for 16% of the accelerators, and the southern and northern regions accounted respectively for 10% and 6% of the total accelerators present in the country.

Within the universities, organizational changes aimed at facilitating academic entrepreneurship were realized. Among such moves is the structuring of the technological innovation offices, known in Portuguese as NITs. These were created in the context of legislation that sought to emulate, in part, the US Bayh-Dole Act and the French Innovation Act. In the case of Brazil, Law 10973/2004 supported the establishment of these technology transfer offices, that should be used by universities and research institutes to transfer technology to the private sector. It is worth noting, as presented by Torkomian (2009) that even before the law 10973/2004, there were in many universities structures that carried out the same activities that would be carried out by NITs, which were denominated as offices of transfer of technology, offices of technological management, among other denominations.

Over the last decade, the presence of NITs in public universities and institutes has shown numerical expansion as well a better consolidation of practices, contributing to the generation of promising results in at least some specific cases. According to data obtained with ANPEI's website, 95 technology transfer offices are currently operating in Brazil. The regional distribution, in this case, is also characterized by a high level of concentration, with the southern region counting with the presence of 31 of these offices, the southeast region appears in second place with 30 units, and the northeast region holds 21 offices. The north region, in turn, has 8 offices, and the last position belongs to the center-west region that has 5 of these organizations supporting the transfer of technology.

Knowledge-intensive entrepreneurship has a positive relationship with scientific production, especially in the case of academic entrepreneurship, whose role is, in simple terms, to transform scientific knowledge into innovations. Several indicators can be used to measure the scientific output of a particular country. In this article, we chose to work with three of these indicators: teacher and doctor training, publication of scientific articles and number of patents. While the former can be seen as the input variable of the scientific production system, informing about the process of human capital formation, the second and third variables can be seen as output variables, showing the results of the scientific activities carried out in the different research institutions.

Knowledge-intensive entrepreneurship strongly depends on access to skilled labor, particularly in the case of academic entrepreneurship. That is why the configuration of an active academic system concerning the training of masters and doctors is an essential condition for the emergence and development of entrepreneurial ecosystems where technological innovation is one of the main characteristics. In the Brazilian case, public policies aimed at the training of masters and doctors have produced positive results, such as the increase in the number of master's and doctoral programs, which in 1996 were 1187 and 630 respectively and in 2014 were 3620 and 1954, according to information from the Center for Management and Strategic Studies.

This increase in the number of programs allowed the growth in the number of annual degrees in the two postgraduate categories. While in 1996 the number of masters degrees awarded was 10482 and the number of doctoral degrees was 2854, in 2014 were 50206 new master degrees and 16726 new doctoral degrees awarded. An important aspect involved in the growth of the number of masters and doctors and that differentiates the behavior of this variable from others discussed in this text concerns regional concentration. While in 1996 the training of masters and doctors was concentrated in the southeast region, responsible at the time for 58.8% of the master's degrees and 83.4% of the doctoral degrees awarded, in 2014 there is a reduction of this concentration, being the southeast responsible for 36.6% and 49.5% of the master's and doctoral degrees awarded.

Concerning the number of published articles, a very favorable behavior is observed. This conclusion is what can be deduced when analyzing the behavior of the number of Brazilian articles published in international journals indexed by Scopus. These data, available on the website of the Ministry of Science, Technology, Innovation, and Communications show that in 1996 the total number of Brazilian articles published reached 8718 and in 2017 the number was 130142. These figures put Brazil as a reference in Latin America concerning scientific publications, making the country responsible for 52.8% of these publications in 2017, compared to 38.4% in 1996. In the overall context, the country accounted for 0.75% of publications in 1996 and accounted for 2.5% in 2017.

In terms of patent numbers, the data show a significant weakness that may represent difficulties for the development of knowledge-intensive entrepreneurship in Brazil. An initial set of data concerns the number of patents granted to residents. According to INPI's report published at the end of 2018, while in 1999 6137 patents were granted to residents in Brazil, in 2018 this indicator reached 7473, representing annual growth of 1.04%. In addition to this low evolution of the number of patents granted, another serious problem concerns the bottlenecks in the patenting process. In 2008 there were 175028 patents pending decision, which in 2018 was 208341, after reaching the highest value in the historical series in 2016, with 243820 patents waiting for a decision.

This high number of pending patents is associated with two other indicators that show organizational problems present in the system of intellectual protection existing in the country. The first is the number of professionals responsible for evaluating applications. In 2012 there were 225 professionals, by 2013 the number fell to 192 professionals, by 2016 the number was 263 professionals, and in 2018, according to WIPO report, the number of examiners was 201, a deficient number when compared to Japan, with 1702 examiners and USA with 8279 examiners. The lack of skilled labor has repercussions on the second indicator, which is related to the waiting time to obtain the patent. In 2003 the waiting time was 6.81 years, in 2008 it was 9.96 years, in 2013 it was 11,4 years, the same number for the year 2018.

The effort in the creation of favorable environments for innovative entrepreneurship in the country has been translated in terms of public policies at both federal and state levels, as well as at the municipal level. At the federal level, examples of such policies are behind the figures presented in the previous paragraphs. However, in recent years the government has adopted new approaches in terms of federal policies, such as InovAtiva, an acceleration program offered by the federal government in partnership with SEBRAE, StartOut, another

federal partnership program and SEBRAE, aimed at the insertion of some Brazilian companies in innovation ecosystems in other countries. Other policies were the Brazilian Startups Acceleration Program, whose primary initiative is StartUP Brazil, and FINEP Startup, which aims to support projects after the acceleration phase.

At the state level, various policies can be presented as examples of initiatives aimed at fostering innovative entrepreneurship. One such example is the Startups and Entrepreneurship Ecosystem Development (SEED), established by the government of Minas Gerais, constituting a state accelerator with a daring goal: to transform the State of Minas Gerais into the biggest pole of entrepreneurship and innovation in Latin America. Another example is the work of several state research promotion agencies, such as FAPESP, FAPEMIG, FAPES. They are developing and implementing programs ranging from the encouragement of female academic entrepreneurship (FAPEMIG's DELA program), through programs that stimulate the generation of innovative ideas (FAPESP's Synapse Innovation Program) to programs to support for the execution of scientific or technological research in micro, small and medium-sized enterprises (FAPESP's PIPE program).

However, it is important to point out that in the last years the implementation of municipal public policies favorable to innovative entrepreneurship has emerged more strongly. Examples are the TechSampa, Empreenda Fácil and Mobilab initiatives implemented by the City of São Paulo, the Incentive Programs for Innovation in Contagem (PRIIC), implemented in the city of Contagem, Minas Gerais. Many of these local initiatives take place under specific municipal laws to support innovation. Examples of such laws are law 9672/2011 of the municipality of Sorocaba, law 438/2012 of the municipality of Florianópolis, law 9183/2017 of the municipality of Rondonópolis. Such laws are evidence of government efforts to create an institutional environment more conducive to innovative entrepreneurship.

5. Conclusion

For many authors, as shown throughout the text, knowledge-intensive entrepreneurship can be the way to make positive transformations in the productive structures of the countries, helping to develop and diffuse innovations in high technology sectors as well as in the middle and low technological intensity sectors. Entrepreneurship in Brazil has undergone essential transformations over the last few years, but concerning the impact of entrepreneurial activity on Brazilian growth, it can be said that it is still more a desire than reality. One of the reasons is that there are still considerable obstacles that hinder entrepreneurship in the context of the Brazilian economy, especially about knowledge-intensive entrepreneurship.

The Brazilian economy in the last years was the scene of several favorable changes in the development of innovative entrepreneurship. These changes, coupled with others implemented since the beginning of the 1990s, can be seen as evidence of the transition of the Brazilian economy from a dirigiste model to a model with a greater emphasis on entrepreneurial activity. The rupture with the model of the managed economy, represented by the process of import substitution and its exaggerated emphasis on the State as an engine of economic growth, meant the reduction of the strong presence of state-owned enterprises and the economic regulations. The massive interference of the State on the national economy ended, on the one hand, making financially unfeasible the State and on

the other hand creating difficulties for the growth of productivity and, consequently, the competitiveness of Brazilian products in international trade.

Improvements favorable to entrepreneurial activity in general and more specifically to innovative entrepreneurship can be understood both in the macroeconomic environment and in the microeconomic environment. Concerning the macroeconomic environment, it is undeniable that the present greater stability, when compared to the one that characterized both the 1980s and the early 1990s, allowed the better development of productive activity, broadening the planning horizon of the agents and facilitating the modernization of critical productive sectors present in the national economy. However, it must be acknowledged that structural problems persist that limit both the process of capital accumulation and productivity gains, thus hindering more vigorous and continuous economic growth.

In the case of the microeconomic environment, the data presented throughout this article allow us to say that the country is taking a path that has the conditions to stimulate the development of knowledge-intensive entrepreneurship in the country. The numbers related to changes in academic activity, such as the number of articles published, the number of graduate programs and, consequently, the number of masters and doctorates, and the improvement in the institutional and organizational context with regard to favoring the transfer technology and innovation, such as technological innovation centers, incubators, accelerators and technology parks, show that, despite a long way to go, various inputs or factors necessary for the development of innovative entrepreneurship, in particular, academic entrepreneurship, are already present in the Brazilian context.

The idea of an entrepreneurial ecosystem involves the interrelationship of different pieces that, when well articulated, affect the economy through the generation, diffusion and absorption of new technologies, generating employment and income, increasing productivity and competitiveness. The assembly and operation of these ecosystems require time and effort deliberately both by public agents and by private agents, in order to create a favorable context for the emergence of opportunities and the development of personal skills and organizational capacities that allow perception and use of these opportunities. In Brazil, in an incipient way, the development of these ecosystems may be creating the conditions for a productive transformation that guarantees a better insertion of the Brazilian economy in the global context.

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