desenvolvimento em questão

ARTIGO

Analysis of the Brazilian Entrepreneurial Ecosystem

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Abstract

The objective of this study was to analyze the Brazilian entrepreneurial ecosystem in the light of the National System of Entrepreneurship – NSE theory, through the implementation of the Global Entrepreneurship Index methodology – GEI. The study indicates that Brazil has low quality average institutional interaction. However, social context is the main bottleneck in the national entrepreneurial ecosystem. Differences between the performance quality of the institutional framework and social factors promote entrepreneurship low socioeconomic impact. The results of the article show that the Brazilian entrepreneurial ecosystem presents low internationalization of companies, innovation in products and processes, formation of human capital and high-growth enterprises. The results of the article provide insights for decision makers on the factors that determine the opening of new businesses.

Keywords: Entrepreneurship. Ecosystem. Indicators. Evaluation.

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ANÁLISE DO ECOSSISTEMA EMPREENDEDOR DO BRASIL

Resumo

O presente trabalho teve como escopo analisar o ecossistema empreendedor brasileiro à luz da teoria National Systems of Entrepreneurship – NSE, por meio da aplicação da metodologia Global Entrepreneurship Index – GEI. O estudo indica que o Brasil apresenta interação institucional de qualidade média baixa. No entanto, o contexto social é o principal gargalo do ecossistema empreendedor nacional. As diferenças entre a qualidade do desempenho do quadro institucional e dos fatores sociais promovem o empreendedorismo de baixo impacto socioeconômico. Os resultados do artigo evidenciam que o ecossistema empreendedor brasileiro apresenta baixa internacionalização de empresas, inovação em produtos e processos, formação de capital humano e de empresas de alto crescimento. Os resultados do artigo fornecem insights para os tomadores de decisão sobre os fatores que determinam a abertura de novas empresas.

Palavras-chave: Empreendedorismo. Ecossistema. Indicadores. Avaliação.

Public policies have different approaches according to the development´s degree of a nation (ÁCS; SZERB; AUTIO, 2015). While developed economies face the dilemma of ensuring the current state of economic prosperity, through production expansion, developing countries tend to cope with population growth and the increasing creation of new jobs. One way to meet the increasing needs of productivity and job creation is through entrepreneurship support policies, especially those related to creating products and higher value-added services originated from technological innovation, from micro, small and medium start-ups.

Therefore, entrepreneurship is closely related to innovation that is increasingly seen as the key factor for competitiveness of a country, both nationally and internationally, and thus it needs to be part of the competitive strategy of companies. Among the arguments, those related to resilience can be mentioned, as innovative companies recover more quickly from economic downturns (WYMENGA et al., 2011) and related to the results of entrepreneurial action which, among others, creating companies that generate value is expected; the value measured, for example, by generating a higher organizational performance, by the creation of new skilled job posts and well paid, or by the introduction of new production processes less aggressive to the environment (KURATKO; HODGETTS, 2001; SCHUMPETER, 2011 [1934]). In this scenario, in which entrepreneurship is acquiring greater importance (ORGANISATION..., 2011), due to its role as a vector of development and recovery from economic shocks and generating jobs, the need for analytical assessment tools development and monitoring has also increased, with the aim of creating a set of information (indicators) that can support decision-makers in developing more efficient and effective policies in the future and deliver accountability of the effects of policies implemented in the past (SHANE, 2009).

When it comes to initiatives to evaluate and monitor entrepreneurship at the level of nations, the Global Entrepreneurship Monitor – GEM (REYNOLDS; HAY; CAMP, 1999) is highlighted, which since 1999 has

been analyzing the complex relationships between economic growth and entrepreneurship. In its first version, the report dealt with the G-7 countries and in its last 2014 survey, there were 73 countries, which together account for 72.4% of the world population and 90% of world GDP (SINGER; AMORÓS; MOSKA, 2015).The research concluded that the main action of a government to promote economic growth is to stimulate and support entrepreneurship, which should be a top priority of public policies, making the big difference to economic prosperity, since a country with low rates of business creation is at risk of economic stagnation.

More recently, researchers (ÁCS; AUTIO; SZERB, 2014), who also belong to the GEM founding team, developed a new conceptual framework named National System of Entrepreneurship – NSE, and attached to it a new monitoring and evaluation methodology called Global Entrepreneurship Index – GEI, based on data from GEM and other sources such as the Global Competitiveness Report (SCHWAB; SALA-I-MARTÍN, 2014).This conceptual model and methodology compares the performance of entrepreneurial ecosystems through a set of indicators along three dimensions: attitudes, skills and entrepreneurial aspirations (ÁCS; AUTIO; SZERB, 2014; ÁCS; SZERB; AUTIO, 2015, 2014). This study aims to analyze the Brazilian entrepreneurial ecosystem in the light of the NSE theory and GEI methodology. This is a new and exploratory effort in order to provide answers to three key research questions in this study: i) reviewing the adequacy of theory/methodology as a tool to measure entrepreneurship; ii) identifying the main strengths and bottlenecks of the Brazilian entrepreneurial ecosystem; ii) providing insights that give subsidies for the development of public policies on high-impact entrepreneurship.

For the scope of this paper, the definition of entrepreneurship ecosystem should be explained even briefly. They were the names of regions or nations, whose growth is driven by entrepreneurial activity, in particular

high-tech. Its development is associated with the existence of a set of institutions and organizations, specialized in supporting the growth of start-ups (ÁCS; SZERB; AUTIO, 2015; ISENBERG, 2010).

To achieve this objective, the study is divided into six sections, excluding this introduction. Section 2 presents the justification of the study by addressing the relevance of the subject and investigated problem. Section 3 provides a brief overview of the national systems and entrepreneurship theory, and then Section 4 discusses the assumptions and indicators used to assess entrepreneurial ecosystems in the light of this theory. Section 5 comments on the methodological steps taken, while Section 6 contains the investigation results. Finally, Section 7 concludes with the final remarks, limitations and suggestions for further work.

Entrepreneurship and Economic Development

In order to understand how entrepreneurs contribute to economic development, it is important to note several features of entrepreneurial action. As already mentioned, one of the characteristics attributed to the entrepreneur refers to innovative results generated by their action. According to Sarfati (2013), while the entrepreneur seeks rapid expansion, generation of jobs and aggregating value and differentiated proposal, small business owners or as Filion (1999) classifies, the SMEs owner-managers start a business to meet their needs.

According to Ács, Szerb and Autio (2014), this entrepreneurial process is initiated by individuals, covered by benefits and return expectations regarding the exploitation of market opportunities, surrounded by risks and, their results are conditioned by conjunctural and institutional determinants such as provision of capital and support entities, support and promotion of entrepreneurial activity. Above all, entrepreneurial action is essential to stimulate competition and business performance in terms of innovation and competitiveness (AMORÓS; FERNÁNDEZ; TAPIA, 2012).

According to Llisterri (2004), small and medium enterprises (SMEs) are associated with entrepreneurship due to their ability to create jobs, innovation and export opportunities. One of the pioneers in research to emphasize this point was David Birch, in 1981 (cited in OECD, 2002), which showed that over 80% of new jobs created came from small rather than large companies in the US. In addition to this research, other studies emphasize the importance of establishing cooperation and partnerships between SMEs and large companies as a way so the first can integrate global supply chains and thereby improve their organizational learning (RAYNARD; FORSTATER, 2002; STEL; CARREE; THURIK, 2005).

The effects of establishing partnership and cooperation relations have become evident. In a study involving 36 countries, Stel, Carree and Thurik (2005) showed that the lack of large companies with partnership and cooperation relations with SMEs and the shortage of skilled human capital generate negative effects on entrepreneurial activity in developing economies, contributing to the marginalization of entrepreneurs and emergence of micro-enterprises and, therefore, to entrepreneurship failure when stimulating economic growth in developing countries.

Therefore, not every entrepreneurial action or sponsoring political activity will generate positive externalities in the economy. In this sense, research such as that developed by Henrekson and Johansson (2010) and Henrekson and Stenkula (2010) refers to high-impact entrepreneurship, that is, the one that produces significant changes in socio-economic terms and is characterized by innovation and international expansion of productive operations. The authors named this type of enterprise as high-growth companies or gazelles.

High-growth enterprises (ORGANISATION..., 2011) are those considered the organizations with annual growth of 20% in terms of number of employed persons or turnover (some subjects measure it by net sales,

others, by gross income). "Gazelles" companies are those under five years of activity and, as well as high-growth companies, have growth superior to 20% in the number of employed persons or turnover.

These same authors (HENREKSON; STENKULA, 2010) make a distinction between public policies aimed at SMEs, in general, and public policies for promoting high-impact entrepreneurship. According to the authors, the policies aimed at SMEs have scope to stimulate job opportunities or minimize the competitive disadvantages of these companies; while the public policies of high-impact entrepreneurship aim to create conditions for the emergence of innovative initiatives that significantly influence the socio-economic context, through the creation of skilled jobs and higher value-added innovations.

These public policies for promoting entrepreneurship have been understood and applied under the economic development stages concept proposed by Porter et al. (2002) in their seminal work for the World Economic Forum in 2002. The authors proposed, after extensive data analysis and use of statistics tools, three stages of economic development, which have different priorities and policies. They are:

1. *Factor-driven stage*: this phase is characterized by the predominance of commodities production, semi-manufactured goods and intensive use of unskilled labor. The organizations present in economies targeted for production factors have limited participation in global value chains. At that stage, countries are dependent on the global economy due to market influence on the prices of agricultural products and fluctuations in exchange rates. Thus, the role of government authorities is to avoid instability in macroeconomic terms, reduce tariff barriers to increase integration into global supply chains and create conditions for foreign direct investment (FDI).

2. *Efficiency/investment-driven stage*: this phase is characterized by the intensification of activities of the goods and services industries, increased FDI rates, partnerships with foreign companies,

and production outsourcing. Although the efficiency-driven economies exhibit complex production processes, most of the technology is imported from developed countries. At this stage, the government authorities' role is to promote infrastructure improvements in order to facilitate trade flows and integration in global value chains.

3. *Innovation-driven stage*: this stage is characterized by intense activity in the high-tech sector, emergence of innovative companies and conglomerate business. This stage results from the change from an economy driven by efficiency, which is dependent on imported technology, for an economy capable of generating its own technology. In the stage oriented to innovation, public policies should encourage the innovative capacity through public-private partnerships, development of human capital and encouraging entrepreneurship.

The authors of the theory of National System of Entrepreneurship (ÁCS; AUTIO; SZERB, 2014) appropriated this methodological tool to explain the relationship between national entrepreneurial ecosystems and their respective economic developments. As a national economy transitions from the stage driven by production factors to the efficiency stage, and stabilizes, a higher incidence of entrepreneurial activity with superior results can be seen, as measured by the *Global Entrepreneurship Index* methodology. The next section deals with this theme and brings the main components of the theory.

National System of Entrepreneurship

In the innovation field, many studies use a theoretical framework, dating from the 90s, known as National Systems of Innovation – NSI. This theory was consolidated and included the first efforts in the search for understanding which factors affect the emergence and diffusion of inno-

vations and how to manage this process. Researchers linked to this theory (EDQUIST, 1997; FREEMAN, 1995; LUNDVALL, 1992; NELSON, 1993) emphasize that innovation is the result of interaction between companies and institutional agents, that is, "*... institutions network in both the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies*." (FREEMAN, 1995, p. 8). According to those authors the creation of innovation systems at national level was the basis of policies adopted by decision makers for the economic recovery of countries such as Germany and Japan.

The merits of the NSI theory are undeniable, when instrumentalizing the NSI agents in order to develop, implement and evaluate science, technology and innovation policies, which partly accounted for the economic recovery of major post World War II countries (DOSI, 1982; KLINE; ROSENBERG, 1986)there appear to be \u201ctechnological paradigms\ u201d (or research programmes. However, some researchers (ÁCS; SZERB; AUTIO, 2015; RADOSEVIC, 2007) argue that the NSI theory neglects the entrepreneurial action (individual's role) as a central element for generating innovations, and emphasizes too much the enterprise (firm) as a central agent of the phenomenon.

The authors state that for a long time the pioneering insights of Schumpeter on his model entitled "Schumpeter Model of Entrepreneurial Innovation – Mark I" (SCHUMPETER, 1949, 2011 [1934]) described the process of innovation as a process of *creative destruction* were forgotten and abandoned. In this model, Schumpeter made it clear that whoever fired the innovation trigger were not the same people who control the production process to be displaced by the new, but the entrepreneurs who, when realizing the potential of such inventions, took the development risk – of the transformation of inventions into innovations for an extraordinary profit. For Schumpeter, the entrepreneur is the one who educates consumers to want new products.

Given this hiatus in the NSI theory, Ács, Szerb and Autio (2014) proposed the NSE theory, which emphasizes the interaction between entrepreneurial action and the institutional context. They argue that in the absence of individual initiative, the institutional context would not be able to influence the creation of high-impact SMEs. In contrast, in the existence of an inadequate institutional context, individual actions would not be able to influence the opening of new SMEs (ÁCS; CORREA, 2014).

In short, the NSE theory incorporates elements of NSI approach and traditional literature on entrepreneurship, considering the importance of integration between the institutional elements and the individual actions for generating innovation and creating high-impact SMEs (ÁCS; AUTIO; SZERB, 2014; AUTIO et al., 2014).

This interaction is encapsulated within the ecosystem concept emerged in the field of biological sciences, where external factors influence the internal elements and the interaction between them affects the existence and performance of the entire ecosystem (FUERLINGER; FANDL; FUNKE, 2015). This concept was adopted by the field of business to explain the successful experience of various regions characterized by the activity of start-ups that significantly impacted the region and socioeconomic trends such as Silicon Valley, Massachusetts and Israel (ISENBERG, 2010).

Some researchers (ÁCS; SZERB; AUTIO, 2016; ISENBERG, 2010; NECK; MEYER; COHEN; CORBETT, 2004; ROBERTS; EESLEY, 2011; WEST; BAMFORD, 2005) agree that entrepreneurship ecosystems resemble a network of specialized services, in which cooperation between agents and actors determines the success and performance of the entire network. In this sense, entrepreneurs and start-ups get public-private support, ie, universities, R&D laboratories, venture capitalists, government agencies and policies, as well as specialized services such as advisory marketing, legal and suppliers. Thus, the creation of high-impact companies depends on cooperation and interaction between the institutional context and individuals willing to start a business or nascent entrepreneurs.

It is worth noting that in Brazil, according to Schwartzman (2008) and Suzigan and Albuquerque (2011), R&D activities take place mostly in the public sector (universities), which play a role of importance in scientific production and cooperation with the private sector, in order to foster innovation. His role goes beyond the main teaching and scientific dissemination functions, responsible for most of the R&D activities and in conjunction with the State, with the main articulators of university-business interaction policies.

However, as some researchers pointed (BUAINAIN; CORDER; PACHECO, 2014; SCHWARTZMAN, 2008; SUZIGAN; ALBUQUERQUE, 2011; VIOTTI, 2008) the university-enterprise relationships still need to grow and cooperation between educational and research institutions is in a timely manner and in a few mature sectors such as health science, mining, agriculture and resource extraction, with the exception of the aeronautical technology sector. Nonetheless, NSE theory considers the relation between universities and individuals/start-ups as a key to regional development in terms of economic growth and creation of new jobs (ÁCS; SZERB; AUTIO, 2015; AUTIO et al, 2014.)

The first efforts to estimate entrepreneurship considering the individual and institutional context through the methodology currently known as GEI are from 2009, when the researchers Ács and Szerb released a 94-page report named The Global Entrepreneurship Index (GEINDEX) in the magazine Foundations and Trends in Entrepreneurship (ÁCS; SZERB, 2009). They measured entrepreneurship in 32 countries.

Later, Ács, Autio and Szerb (2014) published the article that coined the scientific term National Systems of Entrepreneurship. In that article, the authors present NSE as a theory opposed to the NSI theory, emphasizing the role of individual action as economic growth vector. In that study the authors presented an analysis of 88 national entrepreneurial ecosystems using a set of 15 indicators, aggregated into three dimensions, and a methodology called Global Entrepreneurship & Development Index. Currently, the ter-

minology is entitled Global Entrepreneurship Index (GEI), a foundation was established to disseminate the methodology (*The Global Entrepreneurship and Development Institute* – <http://www.thegedi.org/>), where data from 130 countries can be accessed. The next section provides an overview of this methodology.

Global Entrepreneurship Index (GEI) Methodology

GEI methodology has been formulated to understand individual and institutional factors that induce individuals' choice, when it comes to setting up a business (HAFER; JONES, 2014). GEI measures the quality of national entrepreneurship systems, considering the role of individual action and the institutional framework relevance. In this sense, the method is appropriate to estimate the interdependence relationship between individuals and their context (ÁCS; CORREA, 2014; AUTIO, 2014).

GEI captures the essence of the NSI and NSE theories, in order to identify the social and institutional aspects that promote and inhibit the ability to create high socioeconomic impact enterprises. The methodology allows decision makers to identify the barriers to entrepreneurial activity and develop policies to improve the performance of national entrepreneurship systems (ÁCS; AUTIO; SZERBE, 2014; ÁCS; SZERB; AUTIO 2015; ÁCS, SZERB, AUTIO, 2014).

GEI is composed of a systemic view of the entrepreneurial process, in which three dimensions interact with each other in order to generate results in an entrepreneurial ecosystem. They are: i) entrepreneurial attitudes sub-index – ATT; ii) entrepreneurial ability sub-index – ABT; iii) entrepreneurial aspiration sub-index – ASP. These dimensions keep a parallel with the reference model and research of Global Entrepreneurship Monitor

(Singer *et al*., 2015). These dimensions give rise to 14 pillars or indicators, with variables that represent the micro levels (called individual variables) and macro levels (called institutional variables of entrepreneurship) (ÁCS; SZERB; AUTIO, 2015).

Table 1 shows the division of entrepreneurship pillars in institutional and individual variables. Institutional variables are obtained from various sources, publicly available, such as Global Competitiveness Report, the Index of Economic Freedom, the World Bank's Ease of Doing Business Index, the United Nations, the United Nations educational, scientific, and cultural organization (Unesco), and the KOF Index of Globalization (ÁCS; SZERB; AUTIO, 2015).

The individual variables are obtained from the Global Entrepreneurship Monitor survey (SINGER; AMORÓS; MOSKA, 2015). We present above, a short description of each pillar and the name of the individual and institutional variables that formed it. A detailed description thereof is available in the book Global Entrepreneurship Index 2015 (ÁCS; SZERB; AUTIO, 2015).

- The *entrepreneurial attitudes* dimension refers to the share of the population working for the development of new businesses and social groups that foster entrepreneurship through financial and cultural support. The dimension consists by the pillars *Opportunity Perception*, *Start-Up Skills*, *Risk Acceptance*, *Networking* and *Cultural Support* (ÁCS; SZERB; AUTIO, 2015).

Table 1 – Pillar, institutional and individual variables description of the GEI

Sub index	Pillar	Institutional variable	Individual variable
Entrepreneurial attitudes sub-index ATT	1: *Opportunity perception*	Market agglomeration	Opportunity recognition
	It represents the portion of the population that can start an enterprise through the perception of marketing possibilities.		
	2: *Start-Up skills*	Tertiary education	Skill recognition
	It refers to the population percentage that claims to have the skills needed to start an enterprise.		
	3: *Risk acceptance*	Business risk	Risk perception
	It refers to the portion of society that does not consider risks as inhibitors to start a enterprise.		
	4: *Networking*	Internet usage	Know entrepreneur
	It refers to entrepreneurs who started a business within a period of two years using the internet as a platform.		
	5: *Cultural support*	Corruption	Career status
	A cultural environment that values entrepreneurs lays the foundation for the development of an entrepreneurial culture.		
Entrepreneurial ability sub-index ABT	6: *Opportunity start-Up*	Economic freedom	TEA opportunity
	It refers to the portion of society that identified an opportunity to start a business by motivation, own objectives, complement or to increase income.		
	7: *Technology absorption*	Tech absorption	Tech sector
	It represents companies in the technology industry and the ability to incorporate and disseminate new technologies		
	8: *Human capital*	Staff training	High Education
	It reflects the value of education in the training of entrepreneurs and professionals capable of starting and running rapidly expanding companies. Human capital is still the benefits of professional training in the corporate environment and in the creation of new businesses.		
	9: *Competition*	Market dominance	Competition
	It refers to the percentage of inserted enterprises in markets with few competitors offering similar products or services		
Entrepreneurial aspiration sub-index ATT	10: *Product innovation*	Technology transfer	New product
	It represents the transfer of technology and innovation, in terms of applicability in the development of new products and/or services		
	11: *Process innovation*	GERD	New technology
	It refers to investments in research and development (R&D) and the participation of technological innovations in GDP		
	12: *High growth*	Business Strategy	Gazelle
	It represents the high-growth enterprises that aspire to grow more than 50% over a period of five years and increase their staff to approximately 10 people.		
	13: *Internationalization*	Globalization	Export
	It refers to the degree of internationalization of enterprises of a country in terms of exports		
	14: *Risk capital*	Depth of capital market	Informal investment
	It refers to the participation of financial support tools for enterprise development in terms of investments		

Source: Elaborated by the authors based on Ács, Szerb and Autio (2015).

- The *entrepreneurial abilities* dimension quantifies the opportunities to start a business by total early-stage entrepreneurial activity (TEA) and focuses on characterizing businesses and entrepreneurs through the attributes needed to start an enterprise. The scale consists of indicators *Opportunity Start-Up*, *Technology Absorption*, *Human Capital* and *Competition* (ÁCS; SZERB; AUTIO, 2015).

- Finally, the *entrepreneurial aspirations* dimension is related to the reasons for a business creation. The dimension consists of *Product Innovation*, *Process Innovation*, *High Growth*, *Internationalization* and *Risk Capital* (ÁCS; SZERB; AUTIO, 2015).

Methodology

This section first presents the main methodological steps that the authors (ÁCS; SZERB; AUTIO, 2015) used to construct indicators that make up the GEI. Subsequently, the methodological procedures we adopted in the research are presented.

The GEI method is structured into variables (individual and institutional), pillars, dimensions and GEI aggregate index. The related index is obtained through eight stages (ÁCS; SZERB; AUTIO, 2015) that follow the OECD manual of recommendations for the preparation of aggregate indicators (NARDO et al., 2008). The stages are:

1. Selection of variables: the variables represent the entrepreneurship micro and macro levels. As mentioned in section 4, the individual variables are obtained through GEM and institutional research obtained from various reports made available by internationally recognized institutions;

2. Construction of indicators: the variables give rise to the pillars through multiplying individual variables by their respective institutional variables;
3. Standardization: the values assigned to the pillars are normalized on a scale between 0 and 1.
4. Treatment of *outliers*: at this stage, the higher/lower values to percentile 95/5 are excluded.
5. Pillar average adjustment: GEI is based on a comparative analysis. However, not all analyzed countries have the same data in the same period. To solve this problem, GEI uses data from 2006 to 2013 or from the latest available year, in order to estimate an average for the pillar.
6. *Penalty for bottleneck*: GEI considers entrepreneurship as a multi-faceted phenomenon. To measure systemic conditions that result in entrepreneurship and opening of high-impact companies, GEI uses the penalty for bottleneck (PFB) method, which is based on the assumption that an ecosystem performance is dependent on the bottleneck, that is, its overall performance is determined by its weakest connection.
7. Construction of sub-indices: GEI consists of ATT, ABT and ASP dimensions; each dimension value is obtained by averaging their respective pillars, which is then multiplied by 100.
8. GEI value: It is obtained by calculating the simple arithmetic average of the three sub-indices.

The present research is classified as quantitative and qualitative, from the approach point of view. According to Silva and Menezes (2005), the quantitative approach is characterized by the use of mathematical methods. While the qualitative approach gives the researcher the responsibility of analyzing the data logically. The research uses data-opinions in order to analyze them and assess inductively the Brazilian ecosystem. Data were collected in GEI report and kindly provided by the The Global Entrepreneurship and Development Institute, through Professor Erkko Autio.

As to the objectives, the work is classified as exploratory and descriptive (SILVA; MENEZES, 2005). In the literature review stage it is an exploratory work, while in the applied phase it is considered descriptive; a stage in which the objective is to analyze the Brazilian entrepreneurial ecosystem.

Regarding the study design, the work is based on bibliographical techniques and multiple case studies. According to Gil (1999), bibliographic method is based on analysis of existing literature on entrepreneurship, Global Entrepreneurship Index and National Systems of Entrepreneurship. The multiple case studies are based on research of the Brazilian entrepreneurial ecosystem and some selected countries, in order to analyze the indicators that promote and inhibit the ability to generate high-impact entrepreneurship (YIN, 2005).

To meet the objective of the work, the study adopted three steps: i) analysis of 14 pillars in the light of the GEI methodology of Brazil and some selected countries; ii) comparison of separated pillars in their institutional and individual variables of Brazil; and, iii) comparative analysis of 14 pillars as radar chart.

To perform a comparative analysis of pillars and variables, the averages of quartiles available in the GEI report were adopted. In order to facilitate the understanding of the pillars and individual and institutional variables, the original nomenclature was adopted.

Results

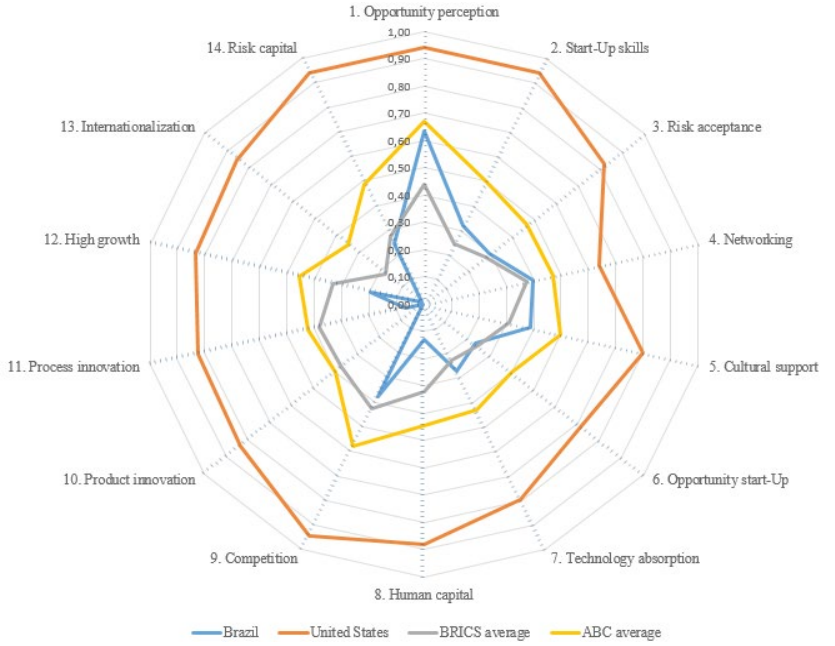
Brazil is a country of upper middle income, with per capita GDP of U$ 10,264. The Brazilian economy is characterized by being driven by efficiency. In the Global Entrepreneurship Index 2015 ranking, composed of 130 countries, Brazil occupies the one hundredth (100th) position. Regionally, the country occupies the nineteenth (19th) position when compared to other countries in South and Central America and the Caribbean.

Figure 1 shows Brazil performance (in blue) in the 14 pillars in a radar graph. The figure allows us to observe that the Brazilian entrepreneurial ecosystem has great potential in the pillar opportunity perception, while the weaknesses are in the pillars *internationalization*, *product innovation*, *human capital*, *high growth* and *process innovation*.

In addition, Figure 1 shows three more country results. It is possible to comparatively analyze the Brazilian entrepreneurial ecosystem in relation to the United States, Brics average (Brazil, Russia, India, China and South Africa) and average of ABC (Argentina, Brazil and Chile). Argentina and Chile occupy respectively the positions 56 and 19 of 130, respectively.

The Brazilian entrepreneurial ecosystem has superior performance compared to Brics average, in the pillars: *opportunity perception*, *start-up skills*, *risk acceptance*, *networking*, *cultural support* and *technology absorption*. Compared to the average ABC, the Brazilian ecosystem stands out only in the pillar opportunity perception.

Figure 1 – GEI of Brazil, countries and blocs selected, 2016



Source: Prepared by the authors with GEI data (2016).

Additionally, Table 2 presents the same 14 pillars values of Brazil, but now decomposed within its two components: the individual and institutional variables. The subsequent analysis took into account these two data.

Brazil scores in the top quartile in two institutional variables: *Market agglomeration* and *depth of capital market*. The same occurs for some individual variables: *opportunity recognition* and *career status*. In the medium high quartile, the country scores in nine institutional variables (*business risk*, *internet usage*, *corruption*, *tech absorption*, *staff training*, *market dominance*, *technology transfer*; Gerd and *business Strategy*) and in three individual variables (*skill recognition*, TEA *opportunity* and *know entrepreneur*). On medium lower quartile, Brazil scores in institutional variables: *economic freedom*, *tertiary education* and *globalization*; and in five individual variables: *risk perception*, *tech sector*, *competition*, *gazelle* and *informal investment*. In the lower quartile, the country scores only on the individual variables: *high education*, *new product*, *new technology* and *export*.

Table 2 – Brazilian GEI decomposition, 2016

Dimension	Pillars		Institutional variables		Individual variables	
ATT	*Opportunity perception*	1.00	*Market agglomeration*	1.00	*Opportunity*	0.82
	Start-Up skills	0.34	*Tertiary education*	0.50	*Skill recognition*	0.65
	Risk acceptance	0.34	*Business risk*	0.52	*Risk perception*	0.50
	Networking	0.55	*Internet usage*	0.72	*Know*	0.59
	Cultural support	0.50	*Corruption*	0.56	*Career status*	1.00
	Total ATT	41.9				
ABT	*Opportunity start-Up*	0.27	*Economic freedom*	0.40	*TEA opportunity*	0.57
	Technology absorption	0.27	*Tech absorption*	0.58	*Tech sector*	0.40
	Human capital	0.10	*Staff training*	0.66	*High Education*	0.17
	Competition	0.43	*Market dominance*	0.70	*Competition*	0.44
	Total ABT	23.7				
ASP	*Product innovation*	0.07	*Tecnology transfer*	0.58	*New product*	0.17
	Process innovation	0.14	GERD	0.73	*New technology*	0.07
	High growth	0.18	*Business Strategy*	0.63	*Gazelle*	0.32
	Internationalization	0.04	*Globalization*	0.50	*Export*	0.07
	Risk capital	0.23	*Depth of capital market*	0.86	*Informal*	0.31
	Total ASP	12.6				
	Total GEI	26.1	**Total institucional**	0.64	**Total individual**	0.43
Legend:	Lower quartile < 0.25		Medium low quartile 0.25 to 0.50		Medium high quartile 0.50 to 0.75	Top quartile > 0.75

Source: Elaborated by authors based on GEI 2016 data (ACS; SZERB; AUTIO, 2016).

During stage three (analysis of the 14 pillars in the light of the GEI methodology), it was found that the dimension of entrepreneurial activities (ATT) has as its biggest potential the pillar 1, opportunity perception. This pillar is driven by the institutional variable market agglomeration and by

the individual variable opportunity recognition, that is, the share of the population that considers possibilities of starting a business in the area where they reside. That pillar illustrates the institutional potential of the Brazilian entrepreneurial ecosystem in terms of domestic market size, urbanization and individuals' perception on regional opportunities to undertake.

The start-up skills pillar consists of abilities needed to start a high-impact enterprise. In the individual context, the country has individuals who claim to possess the skills to start a business. However, institutionally, the Brazilian entrepreneurial ecosystem has a bottleneck in terms of individuals with technical and/or higher education. Analysis in the light of the GEI points to low enrollment rates in universities and polytechnics.

The risk acceptance pillar analyzed in the light of the GEI has medium low performance, that is, the ecosystem shows median viability conditions for starting a business. The analysis considers that public and political institutions, laws and bureaucratic procedures for starting a business have better quality than the lower quartile. However, there is no performance close to ecosystems classified in the top quartile. At the individual level, a portion of the population states that fear of failure is an inhibitor to start a company.

The networking pillar is influenced by institutional context, that is, the number of internet users, the Brazilian entrepreneurial ecosystem has high rates of internet access, a fact that promotes e-commerce and distribution of new business.

The cultural support pillar presents medium low performance with respect to the influence of culture in opening new businesses and appreciation of entrepreneurs. The performance can be explained by the value assigned to institutional variable, that is, it presents score of 0.56, which impacts negatively on the development of an entrepreneurial culture of a country. In contrast, at the individual level (career status variable), the population considers becoming entrepreneurs as a great career option.

In the entrepreneurial skills (ABT) analysis, the dimension is the second bottleneck of the Brazilian entrepreneurial ecosystem. The pillars that make up the entrepreneurial skills are in the medium low, except for the human capital pillar, which is part of the lower quartile. The competition pillar features the best performance (0.43) in ABT dimension. The market dominance variable points to an institutional framework located among countries with high average, with a score of 0.70, which means that the domestic market sectors present opportunities for the entry of new companies. The individual variable points to opportunities of markets entry through differentiated products. The data illustrate companies that began operating in segments where there are not many companies offering the same product. From an economic point of view, the performance of the Brazilian entrepreneurial ecosystem in the competition pillar allows the entry of new companies and the exploitation of market segments, which encourages innovation and differentiation due to business need to attract customers by obtaining competitive advantages over other organizations.

The technology absorption pillar is negatively impacted by the poor performance of institutional and individual variables. The analysis in the light of the GEI, the Brazilian institutional framework has performance of 0.58 in terms of technology absorption. The individual variable of the tech sector points to low performance of companies in the medium and high technology sectors. The medium low performance of the Brazilian entrepreneurial ecosystem in the technology absorption pillar suggests that the institutional framework does not significantly promote cooperation between research, universities and industries institutions. This fact highlights the dependence on imported technology and on the low rate of start-ups creation.

The human capital pillar has lower performance. Although the institutional variable (staff training) is part of the medium high quartile (0.66), the ecosystem has low rates of business owners or managers with superior

training (0.17), which suggests that the institutional framework contributes little to the workforce specialization, resulting in low rates of human capital with superior training.

Analyzing the entrepreneurial aspirations (ASP) pillar in the light of the GEI methodology, this pillar is the main bottleneck in the Brazilian entrepreneurial ecosystem. The five pillars that make up the entrepreneurial aspirations score in the lower quartile, that is, between the countries with scores lower than 0.25.

The internationalization pillar is the main bottleneck of entrepreneurial aspirations. The institutional context (globalization variable) is rated as medium low (0.50) for the economic, social and political dimensions, considering trade flows, foreign direct investment rates, investment portfolio, balance of payments, tariff policies and non-tariff barriers. The individual context is a bottleneck for the internationalization pillar. The entrepreneurial ecosystem has low performance (0.07) in terms of exports, that is, a small portion of early-stage companies have at least one customer abroad. Institutionally, the country has favourable conditions for the internationalization of companies. However, few entrepreneurs assume aspirations to carry out operations in other markets.

The culture of stimulus for exports has not been well established in Brazil. Over the last twenty years the federal government has put in practice some initiatives to touch the entrepreneur in the sense for export. However, the exchange rate ups and downs, and the economic growth within Brazilian economy contribute to maintain the entrepreneur focused in the domestic market.

The product innovation pillar is the second bottleneck of the ASP dimension. At the institutional level, Brazil has medium high performance (0.58) in terms of investments in innovation, research and development, patent protection and collaboration between businesses and educational institutions. However, in the individual context, it provides low performance

in terms of launching new products, that is, only a small portion of entrepreneurs at an early stage offers new products. Thus, there is low interaction between institutional and individual actions.

The process innovation pillar shows low performance (0.14). At the institutional level the country has high medium performance in terms of investment of a GDP share aimed at research and development (Gerd). In the individual context (new technology), the entrepreneurial ecosystem has low indices of entrepreneurs in early stage that use technologies with less than five years since its launch, suggesting that, although the institutional context subsidizes research and development, it does not contribute to the application of new technologies in the processes of early-stage companies.

The analysis of high growth pillar points medium high performance (0.63) for the institutional context (business strategy variable), that is, companies have the ability to pursue differentiation strategies, involving positioning and innovation in terms of products and services. In contrast, at the individual level, the entrepreneurial ecosystem has low rates of early-stage companies classified as "gazelles". In short, institutionally, the country has companies seeking new strategies. However, the ecosystem has low creation of companies that significantly influence the economy.

The risk capital pillar has lower performance (0.23) due to the preferences of the population by investments (informal investment variable), that is, individually the ecosystem is weak in terms of population's action in holding informal investment within three years and providing capital for the creation of new businesses. At the institutional level, the country has stock market and debit and credit activities considered solid. Thus, the country has good institutional conditions for opening new companies through investments. However, the population has no culture of investments regarding high risk ventures.

Through the interpretation of the dimensions and their variables, in order to identify the factors that stimulate and inhibit entrepreneurial activity in Brazil, the study showed that low interaction between the institutional framework and the social context results in the inhibition of high-impact entrepreneurship. Since, according to the principles of NSE theory, entrepreneurship is the result of high impact performance and interaction between institutional and individual context (ÁCS; AUTIO; SZERB, 2014). Thus, the entrepreneurial activity in Brazil and the interaction with the institutional framework is inhibited by the lack of individual initiative, regarding the opening of business and the aspirations of growth and innovation.

Based on the assumptions of the approach of innovation systems to explain the current Brazilian situation, technological progress depends on cooperation between government, universities and companies. These last two do not have good interaction, either for lack of political articulations and/or lack of training programs and motivation of individuals when it comes to creating high--impact business. These assumptions are adopted by NSE theory. However, the core of this approach lies in the figure of individuals and entrepreneurs at an early stage, the success of these depends on the interaction with universities.

Thus, the analysis of the Brazilian entrepreneurial ecosystem in light of NSE theory and GEI methodology identified lack of interaction between the institutional and individual motivations, especially in terms of inadequate cooperation for innovation, low rates of entrepreneurs with superior training and few companies initiated by the perception of business opportunities.

In this sense, the main bottleneck in the Brazilian entrepreneurial ecosystem is the inadequate cooperation between universities and individuals/entrepreneurs. These are at the margins of entrepreneurial ecosystems, i.e., national educational and research institutions are not aimed at training and development of enterprising individuals capable of prospecting opportunities for innovation and create high-impact companies.

Thus, the Brazilian public policies should aim at implementing a national program to position the university in the centre of entrepreneurship ecosystems (regional approach), that is, to foster cooperation between universities and entrepreneurs, in order to meet the scientific demands of companies at an early stage and develop regional entrepreneurship centres providing radical innovations or solutions to local demands. In opposition to the creation of incubators policies, since these institutions (often positioned on the outskirts of the campus) are static and reactive, that is, its function is focused on entrepreneurial assistance.

The study presents initiatives that would foster cooperation between universities and entrepreneurs, besides motivating the creation of innovative companies, among which stand out: i) the creation of student activities focused on association of entrepreneurial students and presentations that highlight success cases; ii) entrepreneurship programs in universities with an horizontal approach, i.e. to ensure the exposure of a portion of students to entrepreneurship courses; iii) mentoring programs; iv) events similar to Slush in Helsinki, which brings together many entrepreneurs, students and inventors, aiming to transform ideas into businesses to create strategic partnerships to develop innovations; v) angel investor programs in order to make capital contribution to creating high-impact companies; vi) create spaces and laboratories for students and other interested people in developing and testing ideas and technologies.

Final Remarks

Considering the importance of the socioeconomic role of entrepreneurial action in terms of increased productivity through innovation, launching products, services and job creation, this paper proposed an analysis of the Brazilian entrepreneurial ecosystem in the light of the NSE theory and GEI method. Thus, the GEI pillars were separated in their institutional and individual variables. GEI was used since it allows describing the strengths

and weaknesses of entrepreneurial ecosystems, by observing the factors that influence the emergence of high-impact companies. This method is a tool to assist decision makers in designing and implementing incentive policies to startup entrepreneurship and SMEs.

The results showed that the dimension of entrepreneurial attitudes is the main strength of the Brazilian entrepreneurial ecosystem. However, when compared to other countries, the economy is in the medium low quartile. The dimension of entrepreneurial aspirations represents the weakest link in the national entrepreneurial ecosystem, followed by the dimension of entrepreneurial skills.

When analyzing the 14 pillars, the ecosystem showed low interaction between individual initiatives and the institutional context. Thus, the institutional framework has a medium high performance. However, individual initiatives represent the main Brazilian bottleneck, being *export*, *new technology*, *high education* and *new product* variables highlighted. This implies low rates of early-stage entrepreneurs who have customers in other markets, in using new technology in their processes, introducing innovative products in the market and the existence of entrepreneurs with superior training.

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Another aspect identified by the study was the lack of exchange between universities and the Brazilian entrepreneurial ecosystem, resulting in inadequate interaction between institutional context and entrepreneurs,

which implies the low rates of innovation, generation of jobs and regional development. Given the importance of individuals and educational/ research institutions for economic growth and creating high-impact companies, the research proposed some initiatives that could assist in the exchange between universities and potential entrepreneurs and start-ups.

The main contribution of this paper to the field of studies related to entrepreneurship lies in the multifaceted analysis of the Brazilian entrepreneurial ecosystem, i.e. the study progresses through the assessment of the interaction between the institutional framework and entrepreneurs. Since most of the studies on entrepreneurship makes use of qualitative or quantitative approaches, while GEI method, used to approach this study, evaluates the structural and qualitative nature of entrepreneurial activity in Brazil.

In the field of public policy, in addition to the initiatives proposed to improve the exchanges between universities and entrepreneurs, the study progresses, since it identified the main bottlenecks in Brazil related to high-impact entrepreneurship. Thus, public policies should not have focus on institutional improvement, on the contrary, should aim to improve the environment for businesses at an early stage with regard to the development of export capacity, management skills, development and use of new technologies and introduction of innovative products in the market. These policies are directly related to cooperation between universities and start-ups. In this sense, the interaction between these is critical to the development of high-impact entrepreneurial aspirations in students.

For future research, we propose to apply data envelopment analysis (DEA) to replace the comparative analysis of performance indicators used by GEI method, in order to evaluate the efficiency of the entrepreneurial ecosystems in relation to the capacity for developing high impact entrepreneurship.

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