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PARQUES TECNOLÓGICOS BRASILEIROS FATORES DETERMINANTES DE ATRAÇÃO DE EMPRESAS

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ABSTRACT

This article aims to analyze the factors influencing the attraction of companies to Brazilian science parks. To this end, the annual number of companies entering science parks between 1990 and 2022 was used as the dependent variable. The methodology employed was based on a stacked data model, with structural and regulatory characteristics of the parks as explanatory variables. The results indicate that the presence of universities and accelerators has a strong positive impact on attracting companies, while regulatory elements, such as the existence of formal statutes, architectural design, and environmental licensing requirements, appear to act as barriers to entry. Furthermore, older parks and those located in the North and Northeast regions also showed a greater capacity for attraction. The model used explained 24% of the observed variation, suggesting that contextual factors not included in the specification may contribute to improving its level of adjustment.

Keywords: Science Parks; Innovation; Triple Helix.

RESUMO

Este artigo tem como objetivo analisar os fatores que influenciam a atração de empresas para parques científicos brasileiros. Para tanto, utilizou-se como variável dependente o número anual de empresas ingressantes em parques científicos entre 1990 e 2022. A metodologia empregada baseou-se em um modelo de dados empilhados, com características estruturais e regulatórias dos parques como variáveis explicativas. Os resultados indicam que a presença de universidades e aceleradoras tem um forte impacto positivo na atração de empresas, enquanto elementos regulatórios, como a existência de estatutos formais, projeto arquitetônico e exigências de licenciamento ambiental, parecem atuar como barreiras à entrada. Além disso, parques mais antigos e aqueles localizados nas regiões Norte e Nordeste também apresentaram maior capacidade de atração. O modelo utilizado explicou 24% da variação observada, sugerindo que fatores contextuais não incluídos na especificação podem contribuir para aprimorar seu nível de ajuste.

Palavras-chave: Parques Científicos; Inovação; Tripla Hélice.

1. INTRODUCTION

The dynamics of global development have been driven by the generation, use, and dissemination of information and knowledge. These parameters have guided companies' efforts to improve economic performance and thrive in global market chains (Sousa, Beuren, 2012). Thus, technological innovation has been considered a central factor in the knowledge-based economy and the key element of economic development.

Given the importance of innovation, economic agents such as government, educational, research and development institutions, and companies are involved in implementing actions that encourage research that leads to new innovative processes and products. Among the various initiatives is the creation of innovation environments that allow for greater interaction between these agents at the local level, known as science parks (Audy. 2017).

Science parks are innovation environments designed to foster cooperation among their resident companies, aiming at disseminating knowledge and facilitating technological development through interaction between companies, universities, and the government. This framework, aligns with the so-called Triple Helix model of innovation, in which the government promotes an institutional arrangement, universities generate and transfer knowledge and technology, and companies transform this intellectual capital into new products, processes, and economic value (Etzkowitz, Zhou, 2017).

In this context, science parks function as spaces for collective learning, promoting the flow of knowledge through interaction between companies, research institutions, and government agents, with the objective of generating economic and social value from knowledge. Thus, the analysis of their performance becomes fundamental for the improvement of public policies oriented towards innovation (Abreu et al., 2016, Kimberly, Evanisko, 1981).

However, evaluating the performance of a science park is a challenge. The literature does not present a consensus on which criteria should be used, although some indicators stand out, such as the number of companies entering the parks, the volume of investments received, the revenue generated by the installed companies, and the number of patents, these being the most recurrent. It is important to note, however, that many of these indicators are not publicly disclosed and generally remain restricted to the managing institutions themselves (Dabrowska, 2011, Faria, Ribeiro, 2020).

In the Brazilian case, there is the Inovadata-BR system, which annually collects specific information about the country's science parks (MCTI, 2025). Given this panorama, the present study adopts as the dependent variable the annual number of companies entering science parks, with data covering the period from 1990 to 2022. The objective of the article is to analyze the determining factors in attracting companies to these parks and to verify how structural, regulatory, regional aspects and links with universities influence the performance of these ventures.

Aware of the importance of science parks for local development, the article is structured into five sections: the first section provides an introduction, presenting the problem and the objectives proposed in this study. The second section provides a bibliographical reference on the topic. The third section discusses the methodology applied using panel data regression. The fourth section presents the results obtained, and the fifth section discusses the final considerations.

2. LITERATURE REVIEW

2.1. REGIONAL DEVELOPMENT AND INNOVATION SYSTEMS

Etzkowitz and Zhou (2007) define the Triple Helix as an innovation model in which university, industry, and government, as primary institutional spheres, interact to promote development through innovation and entrepreneurship. In this context, a dynamic of processes is established that results in the formation of an innovation ecosystem, contributing to local development. However, the authors emphasize that innovation requires the accumulation of prior knowledge to achieve positive results and form an innovation system.

In this sense, the dynamics of a Triple Helix system require "regional innovation organizers," established on the basis of a collaborative and entrepreneurial civil society, fostering interactions between university, industry, and government as independent institutional spheres. Therefore, although an innovation ecosystem may emerge as a result of a specific Triple Helix configuration, it is essential to understand and value the process to ensure its effectiveness.

According to North (1990), social institutions play a central role in determining regional economic performance by directly influencing incentives for innovation and investment. In this context, an efficient institutional structure, combined with a collaborative civil society, is capable of fostering interactions between the agents of the Triple Helix, generating chain effects that can promote both the diffusion of knowledge and local economic growth (Hirschman, 1958; Etzkowitz; Zhou, 2017).

Thus, economic development follows a logic of circular and cumulative causation, in which more dynamic regions tend to attract investments, skilled labor, and innovative activities, reinforcing their initial advantages (Myrdal, 1957). In this way, regional development depends on the coordination capacity of local actors and the existence of effective mechanisms for generating and disseminating knowledge, forming a Regional Innovation System (Cooke, 1992; Asheim; Gertler, 2005).

From this perspective, regions with higher institutional density tend to exhibit greater innovative dynamism. This occurs because proximity facilitates the exchange of tacit knowledge and the formation of collaborative networks, fundamental elements for collective learning processes (Storper, 1997). Forming Regional Innovation Systems, characterized by the presence of scientific and technological infrastructure, qualified human capital, cooperation networks, and institutions that promote continuous learning, contributing to sustained trajectories of regional development.

Science parks, in turn, are components of Regional Innovation Systems, acting to strengthen interactions between economic agents and serving as policy instruments aimed at promoting regional development through innovation, reducing market failures. These environments seek to articulate companies, universities, and government, creating conditions for the emergence of innovation ecosystems (Link; Scott, 2003; Audy; Piqué, 2016).

However, the effectiveness of these instruments depends on the territorial conditions in which they are inserted. In regions with high institutional density and consolidated infrastructure, science parks tend to reinforce existing innovation dynamics. On the other hand, in less developed regions, these environments can play an inductive role, contributing to the formation of local capacities and the attraction of investments (OECD, 2011).

In this way, science parks should not be understood only as physical spaces for interaction between companies and universities, but as catalysts for regional economic development. By facilitating the creation of innovative companies and the transfer of knowledge between academia and the productive sector, these environments contribute to the formation of collaborative networks and to the promotion of technological and sustainable regional development (European Commission, 2007).

2.2. SCIENCE PARKS AS INSTRUMENTS OF DEVELOPMENT

Innovation environments are considered important instruments for regional development, transforming knowledge into economic value and providing local competitive advantages by fostering the creation of new technologies. These environments function as dynamic ecosystems that create the necessary conditions for innovation-based companies by offering infrastructure and promoting technology transfer between academia and the productive sector (Steiner; Cassim; Robazzi, 2008).

Science parks are innovation environments whose main objective is to promote interaction between the scientific community and the business sector, aiming at the integration of specific knowledge and capabilities. This collaborative model seeks to achieve strategic results, especially with regard to strengthening a culture of innovation and competitiveness among associated companies and institutions (Spolidoro; Audy, 2008).

Thus, science parks play an important role in the creation of regional innovation systems, in which the synergy between universities, research centers, companies and other institutions enables the development of new products and technologies. In this sense, they are characterized by their ability to create an ecosystem favorable to the development of advanced technologies, with strong interaction between research and production (Audy; Piqué, 2018; Cavalcante; Negri, 2020).

As a result, these environments facilitate the transfer of technology and entrepreneurial skills between academia and industry; stimulate the creation and development of technology-based companies through incubators and spin-offs; promote scientific and technological research; and encourage sustainable development in the regions where they are located (Spolidoro; Audy, 2008).

However, according to the UK Science Park Association (UKSPA), several factors influence the success of these parks, including: (1) rigorous management of the activities of the companies installed, (2) adequate infrastructure and efficient use of space, (3) professional and effective management, (4) partnerships with research-intensive universities, (5) availability of financial and technical support services, and (6) the existence of appropriate facilities for business incubation (Vila; Pagés, 2008).

Despite this, the success and impacts of science parks vary according to the economic and social context of the regions in which they are located. Each park has specific characteristics regarding its internal organization, partnership networks, and the role of the government in its implementation. Therefore, stimulating innovation, supporting the creation of companies, and strengthening regional competitiveness depend on the alignment between these factors and the structural conditions of each territory.

2.3. CONDITIONS FOR SETTING UP COMPANIES IN SCIENCE PARKS

The definition and measurement of success vary across regions, and there is no consensus in the literature regarding the most appropriate criteria, although indicators such as the number of firms, investment volume, revenue, and patents are commonly used (Faria & Ribeiro, 2020). In this context, Amoroso et al. (2019) propose firm attraction as a more comprehensive metric, as it captures investment inflows, job creation, and local economic expansion.

The decision of firms to locate in science parks is influenced by a broad set of factors involving coordinated efforts from governments, universities, research institutions, and the private sector. These interactions generate synergies consistent with the Triple Helix framework, fostering local and regional development. Therefore, understanding the determinants that shape location decisions is essential for improving the planning, management, and performance of these environments (Faria, Ribeiro, 2020).

Science parks have different important aspects for the development of the enterprises located within them: management of the environment; services that stimulate technology transfer among actors; effective relationships with universities; provision of value-added services; support facilities, social spaces, residential areas, leisure facilities; mechanisms for the creation of technology-based companies; development of networks and networking (Bellavista, Sanz, 2009).

However, the motivations that lead companies to settle in science parks may go beyond the aspects presented above. Considering the recent literature on the topic, Table 1 was prepared, with factors that contribute to the decision of companies to locate in a Science Park.

Table 1 | Factors for the Installation of Companies in University Science Parks

Factors	Reason	Reference
Fiscal	Laws to encourage innovation and R&D and tax incentives such as subsidies have the potential to attract companies to establish themselves in science parks	Closs et al. (2012)
Financial	Credit and financing lines focused on R&D demands and innovation processes are increasing the number of companies seeking to establish themselves in science parks.	Figlioli (2007)
Infrastructure	The size, age, and physical infrastructure of the park influence companies' decisions, as larger, more established parks tend to offer greater credibility and support structure.	Zouian e Plonski (2006)
Networking	Links with research institutes or the establishment of research centers within large companies are attractive to innovative companies that, through cooperation, seek to develop new and more efficient solutions for the market.	Oliveira et al. (2017)
Services	The presence of incubators, accelerators, and other support mechanisms provides technical, managerial, and infrastructure resources, strengthening the innovation environment and the growth of startups.	Amoroso et al (2019)
Regulatory	Rules and policies related to intellectual property, certifications, and registration of innovations can facilitate or hinder the establishment of companies in science parks.	Closs et al. (2012)
Geographical	The strategic location of parks can have a decisive influence, given the proximity of factors that contribute to lower company expenditures, such as proximity to customers or suppliers.	Costella et al. (2017)

Source: Prepared by the author based on research (2025).

According to Closs et al. (2012), the government plays a central role in creating tax benefits for companies located in science parks. In this sense, two federal laws subsidize innovative production: the Innovation Law and the "Lei do Bem." These laws establish the basis for partnerships between companies and scientific institutes, offering tax exemptions such as IPI and ICMS for research, development, and innovation activities.

Federal initiatives apply to all companies incubated in parks, provided they meet the requirements related to the productive sector, their connection to research activities, and the annual revenue limit, regardless of whether they have formal links to academic centers (Ribeiro et al., 2018). Thus, tax incentives tend to be applied uniformly, affecting all innovative companies similarly, without significant differences that might influence the decision to enter science parks (Porter, 1990).

According to Figlioli (2007), another factor influencing company attraction is the availability of credit lines and the ease of financing R&D and innovative processes. However, the differentiated nature of financing for technology-based companies varies according to the objectives of research and development (R&D) and the market potential of each company (Hall, Lerner, 2010).

According to Zouain and Plonski (2006), science parks should be built in locations with sufficient infrastructure to attract the companies that will settle there. Another relevant point is the presence of research centers and universities associated with science parks. These elements offer qualified technical support, reducing costs for companies seeking to establish themselves in these environments (Oliveira et al., 2017).

Ribeiro et al. (2018) state that companies may choose to establish bases in university-affiliated science parks, rather than non-university ones, due to direct access to academic talent and the intellectual capital of universities. These environments encourage collaboration with students, who often participate in research and development projects, promoting solutions aligned with market demands.

According to Amoroso et al. (2019), the services offered by science parks—such as incubation and acceleration programs, research laboratories, and co-working spaces—are attractiveness factors for companies. However, regulatory aspects such as bureaucracy, rigid regulations, and inflexibility act as barriers to entry in this process, generating dissatisfaction that discourages companies and leads them to seek other innovation environments (Closs et al., 2012).

The strategic location of the parks, generally in metropolitan regions or close to urban centers, may also exert a decisive influence. According to Costella et al. (2017), proximity to consumer markets and the availability of urban infrastructure make science parks more attractive environments for companies. In this manner, this research relies on the factors for the installation of companies in science parks to analyze the probability of entry of companies into Brazilian university science parks.

3. METHODOLOGY

Aiming at the appropriate analysis of the study, a multiple regression with pooled data was applied, using the Ordinary Least Squares (OLS) method. This choice is justified by the fact that the explanatory variables are time-invariant, which allows controlling for heterogeneity in the model without the need for a temporal structure. In addition, the short structure of the panel makes it impossible to adequately capture temporal variations and eliminates key variables in the fixed effects model.

The data were obtained through the InovaData-BR platform, which compiles and systematizes information about the main innovation environments in Brazil. Data were collected between the years 1990 and 2022, totaling 2,638 entering firms in the 59 Brazilian science parks in operation. These data cover institutional, sectoral, and temporal characteristics of the firms, enabling a comprehensive analysis of the profile of the organizations and their performance over time in the context of science parks.

It is noteworthy that fiscal and financial variables were not included in the methodological procedures. The exclusion of fiscal variables is justified by the fact that tax incentives tend to be applied uniformly, affecting all innovative firms similarly (Porter, 1990). Similarly, financial variables were also disregarded due to the differentiated nature of financing for technology-based firms (Hall, Lerner, 2010).

That said, aiming at the objective of analyzing the success rates of Brazilian science parks, the data were analyzed as presented in Equation (1):

$$Attraction_i = \beta_0 + \beta_1 AGE_i + \beta_2 AREA_i + \beta_3 UNI_i + \beta_4 INC_i + \beta_5 ACE_i + \beta_6 CORP_i + \beta_7 STT_i + \beta_8 AP_i + \beta_9 EL_i + \beta_{10} NO_i + \beta_{11} NE_i + \beta_{12} SU_i + \beta_{13} MW_i + \varepsilon_i \quad (1)$$

The dependent variable of the model, ATTRACTION, refers to the number of new firms entering the science park in a given year.

The independent variables of the model are: AGE refers to the age of the science parks; AREA refers to the size of the constructed area in square meters (m^2) of the science parks; UNI is the dummy variable used to capture the effect of the university on firms entering a given science park, taking the value 1 if the science park is linked to a higher education institution and 0 otherwise.

INC is a binary variable that takes the value 1 if there is an incubator in the science park and 0 otherwise; ACE is a binary variable that takes the value 1 if there is an accelerator in the science park and 0 otherwise; CORP is a binary variable that takes the value 1 if there is an installation of companies in the science park and 0 otherwise; STT is a binary variable that takes the value 1 if there is a statute in the science park and 0 otherwise; AP is a binary variable that takes the value 1 if there is an architectural project in the science park and 0 otherwise; EL is a binary variable that takes the value 1 if there is an environmental license in the science park and 0 otherwise.

In turn, NO is a binary variable that takes the value 1 if the science park is located in the North region and 0 otherwise; NE is a binary variable that takes the value 1 if the science park is located in the Northeast region and 0 otherwise; SU is a binary variable that takes the value 1 if the science park is located in the South region and 0 otherwise; MW is a binary variable that takes the value 1 if the science park is located in the Midwest region and 0 otherwise. The coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}, \beta_{13}$ are the parameters to be estimated, and ε_{it} represents the error term of the function.

After estimation, it is verified whether the residuals follow a normal distribution. OLS assumes as a premise that the errors follow a normal distribution. If the normality of the errors is violated, the estimates may become biased and inconsistent. Thus, the Jarque–Bera (JB) test is used, which tests whether the data follow a normal distribution, based on the skewness and kurtosis of the sample. If the p-value is low, the null hypothesis of normality is rejected.

If non-normality of the residuals is confirmed, the bootstrap method may be used. The technique involves resampling the residuals with replacement, adding them to the fitted predictions to create new dependent variables, and repeatedly estimating the coefficients. This generates empirical distributions of the coefficients, allowing the calculation of robust confidence intervals

(Gujarati, 2011). It is also necessary to pay attention to regression issues related to the presence of multicollinearity and heteroscedasticity.

According to Gujarati (2011), multicollinearity occurs when there is a perfect or near-perfect linear relationship between the explanatory variables. In the presence of near-perfect multicollinearity, the coefficients have high standard errors, compromising the precision of the estimates. To detect it, one observes wide confidence intervals, high correlation between regressors, and a high R^2 with insignificant t-ratios. To correct it, one may obtain a priori information, exclude or transform variables, add new variables, or reduce collinearity in polynomial regressions.

Heteroscedasticity, in turn, occurs when the variance of the error term is not constant, harming the efficiency of the estimators and invalidating tests such ast, F e X^2. To detect it, tests such as White and Breusch–Pagan–Godfrey (BPG) are used. The correction depends on knowledge of the error variance: if known, weighted least squares are used; otherwise, standard error corrections using the White method or generalized least squares are applied.

4. RESULTS AND DISCUSSION

4.1. ECONOMETRIC RESULTS

This work estimated the number of companies entering technology parks in southeastern Brazil. Thus, firstly, the descriptive statistics of the variables used were analyzed, and subsequently, the regression was estimated using stacked data. The choice of the model was motivated by the characteristic of the explanatory variables remaining constant over time, which allows controlling for unobserved heterogeneity without requiring a temporal structure. Table 1 presents the descriptive statistics of the variables.

Table 1 | Descriptive statistics of the variables used to estimate the relationship between the determinants of success of science parks.

VARIABLE	OBS.	MEAN	STD.-DEV.	MIN.	MAX.
ATTRACTION	450	5.862	7.593	1	57
AGE	450	11.998	7.547	0	39
AREA	450	22,507.400	59,495.550	0	254,902
UNI	450	0.882	0.323	0	1
INC	450	0.780	0.415	0	1
ACE	450	0.109	0.312	0	1
CORP	450	0.651	0.477	0	1
STT	450	0.702	0.458	0	1
AP	450	0.947	0.225	0	1
EL	450	0.104	0.306	0	1
NO	450	0.016	0.124	0	1
NE	450	0.120	0.325	0	1
SU	450	0.444	0.497	0	1
MW	450	0.020	0.140	0	1

Source: Prepared by the author based on research results (2025)

As shown in Table 1, the average number of companies entering university science parks per year is 5.862. The average age of the science parks is approximately 12 years, and the average total-built area is 22,507.4 m². The remaining variables are dummies, so their averages represent the percentage composition of the sample. Thus, 88.2% of the science parks are linked to universities, and approximately 78% have incubators. Regarding accelerators, 10% of the parks have this structure. Sixty-five percent have companies located within the parks' lots, 70% have formal statutes in force, approximately 94% have an architectural project, and 10% hold an environmental license. In terms of location, 1.6% of the sample are in the North region, 12% in the Northeast, 44.4% in the South, 2% in the Midwest, and 40% in the Southeast.

After analyzing the descriptive statistics, the model was estimated using Ordinary Least Squares. The presence of heteroscedasticity was examined using the White test, which returned a p-value of 0.00, leading to the rejection of homoscedasticity and confirming heteroscedasticity. The LM test for autocorrelation yielded a p-value greater than 10%, so the null hypothesis is not rejected, indicating no autocorrelation. The Variance Inflation Factor (VIF) indicated no multicollinearity problems, as no variable had a VIF greater than 10. Nevertheless, due to the presence of heteroscedasticity, the model was estimated with robust standard errors.

Finally, the normality of residuals was tested using the Jarque–Bera test, which returned a p-value of 0.00, rejecting the null hypothesis of normal distribution. Therefore, the bootstrap method was applied with 1,000 replications, resampling the residuals with replacement and adding them to the fitted predictions. This procedure generated empirical distributions of the coefficients, allowing the calculation of more robust confidence intervals and assessment of coefficient variability, as shown in Table 2.

Table 2 | Results of the coefficients estimated by bootstrap for the relationship of the determinants of success of science parks.

VARIABLE	COEFFICIENT	STD. ERROR	P>|Z|
CONSTANT	3.803	1.876	0.043
AGE	0.278	0.052	0.000
AREA	-7.83e-07	0.000	0.906
UNI	6.840	1.013	0.000
INC	-1.169	0.867	0.177
ACE	9.206	2.259	0.000
CORP	-1.843	0.847	0.030
STT	-2.764	0.917	0.003
AP	-5.625	1.660	0.001
EL	-2.522	1.431	0.078
NO	6.239	2.524	0.013
NE	5.361	1.412	0.000
SU	1.492	0.788	0.058
MW	-2.951	1.089	0.007
Wald Test 95.58***		R^2 24.19	

Source: Prepared by the author based on research results (2025)

Regarding the estimates presented in Table 2, the number of entrant companies in science parks in the Southeast is 3.803, holding all else constant, and statistically significant at 5%. This means that, on average, approximately 4 new companies enter each science park in the Brazilian Southeast.With respect to AGE, each additional year of the science park's existence increases the number of entrant companies by 0.2, holding all else constant, and statistically significant at 1%. As for AREA, an increase of 10,000 m² implies a reduction of 0.007 in the number of entrant companies, but it is not statistically significant. Thus, this variable does not impact the decision of new companies to enter science parks.

Regarding UNI, if the science park is linked to a higher education institution, there is an increase of 6.8 in the number of entrant companies, holding all else constant, and statistically significant at 1%. For INC, if the science park has an incubator, there is a reduction of 1.17 in the number of entrant companies, but it is not statistically significant. Therefore, this variable does not impact entry decisions. When considering ACE, if the science park has an accelerator, there is an increase of 9.2 in the number of entrant companies, holding all else constant, and statistically significant at 1%. Regarding CORP, if there are companies already installed on the park's land, there is a reduction of 1.84 in the number of entrant companies, statistically significant at 5%.

For STT, if the science park has a formal statute, there is a reduction of 2.76 in the number of entrant companies, statistically significant at 1%. For AP, if the science park has an architectural project, there is a reduction of 5.62 in the number of entrant companies, statistically significant at 1%. In other words, parks with an architectural project attract approximately 6 fewer new companies. About EL, if the science park has an environmental license, there is a reduction of 2.52 in the number of entrant companies, statistically significant at 10%. Thus, parks with an environmental license attract approximately 3 fewer new companies.

Regarding location, if the science park is in the North region (NO), there is an increase of 6.23 in the number of entrant companies, statistically significant at 5%, meaning approximately 6 more new companies. In the Northeast (NE), the increase is 5.36, significant at 1%, approximately 5 more companies. In the South (SU), the increase is 1.49, significant at 10%, approximately 1 more company. For the Midwest (MW), there is a reduction of 2.95, significant at 10%, meaning approximately 3 fewer new companies.

Therefore, according to the results in Table 2, the following characteristics are observed: i) AREA and INC were not statistically significant at the 10% level; ii) the signs of AREA, INC, UNI, STT, AP, EL, NO, NE, and SU were not consistent with expected discussions. The R^2 coefficient indicates that the model explains 24% of the variation in the number of entrant companies in Brazilian science parks.

4.2. DISCUSSION OF RESULTS

The analysis of the regression results on the factors influencing the number of firms entering science parks in Brazil reveals, from a regional perspective, that firm attraction is embedded in heterogeneous regional contexts, marked by structural inequalities, distinct institutional capacities, and unequal access to knowledge infrastructures.

From a regional perspective, it is observed that, on average, each science park in Southeast Brazil receives approximately four new firms per year. This value suggests a strong demand for science parks in the region, with the main hypothesis being that the innovation environment created within these parks provides greater competitive advantages to participating firms.

In contrast, science parks located in the North, Northeast, and South regions of Brazil attract more firms than those in the Southeast. Parks in the North and Northeast show an increase of approximately 6 and 5 firms, respectively, suggesting that these regions are becoming more competitive and attractive to entrepreneurs. One possible explanation is that, given the less dynamic business environment in the North and Northeast compared to the Center-South, science parks may act as support hubs.

In this context, science parks become attractive to entrepreneurs seeking strategic advantages, infrastructure, financing, mentorship, and networks, creating an entrepreneurial environment that is generally scarcer in other areas of these regions, while also benefiting from local incentives such as tax exemptions and partnerships with universities. This finding is consistent with OECD (2011), which highlights that in less developed regions, science parks tend to play an inducing role in fostering innovation.

In contrast, the Center-South regions (Southeast, South, and Midwest), despite concentrating the country's economic and scientific resources, exhibit a smaller marginal effect in terms of firm attraction. This result may be explained by the economic and innovative maturity of these regions. In this perspective, science parks in more developed regions play a different role in regional development compared to those in the North and Northeast, focusing more on the consolidation and scaling of innovation by reinforcing existing dynamics.

The strong positive effect associated with the presence of universities reinforces the central role of knowledge institutions in regional innovation systems. This result is consistent with the Triple Helix theory, in which universities act as key agents in the generation and diffusion of knowledge, promoting interactions with firms and government. From a regional perspective, this finding highlights the importance of localized knowledge spillovers and the role of universities in structuring innovation ecosystems.

Similarly, the presence of accelerators and the age of the park intensify firm attraction, suggesting that accumulated experience, more consolidated infrastructure, and stronger networks, along with support mechanisms, help accelerate the growth of innovative firms, reduce uncertainty, facilitate market entry, and provide a more favorable environment for innovation and collaboration.

On the other hand, the negative effects associated with regulatory variables, such as statutes, architectural projects, and environmental licensing, indicate that excessive formalization and bureaucratic rigidity may act as barriers to entry, especially for startups. From a regional development perspective, this raises important questions about the balance between institutional structure and flexibility in contexts where firm attraction depends on reducing transaction costs and uncertainty.

Overall, the results indicate that science parks may play a dual role in the Brazilian context. On the one hand, they may contribute to reducing regional inequalities by promoting innovation in less developed regions and fostering the spatial diffusion of economic activities. On the other hand, in more developed regions, their effectiveness is conditioned by pre-existing regional factors, which may lead to the consolidation and scaling of innovation aligned with local capabilities.

Regarding the model, the coefficient of determination indicates that approximately 24% of the variation in the number of entering firms is explained by the variables included in the specification. This result suggests the presence of unobserved factors that also influence the process of firm entry into science parks. Thus, the findings reinforce the need to consider additional dimensions, particularly institutional and territorial factors, for a more comprehensive understanding of the determinants of firm attraction to science parks.

5. FINAL CONSIDERATIONS

This study indicate that the attraction of firms to science parks in Brazil is strongly influenced by regionality, with parks in the North, Northeast, and South regions attracting a higher number of firms compared to those located in the Southeast. These results suggest that the reduction of operational costs, in addition to specific regional characteristics, may be making these regions more attractive. Another point is that science parks can create business-supporting environments, stimulating greater firm attraction in regions with lower economic dynamism, such as the North and Northeast.

OECD (2011) explains this difference by arguing that in regions with high institutional density and consolidated infrastructure, science parks tend to reinforce existing innovation dynamics. In less developed regions, however, these environments may play an inducing developmental role, contributing to the formation of local capabilities and the attraction of investments. Thus, science parks may perform a dual role in local development, depending on their characteristics.

In addition, three other factors favor firm attraction: the accumulated experience of the parks, the presence of universities, and the presence of accelerators. The experience of the parks, associated with more consolidated infrastructure, suggests that older parks with a longer operational history provide a more favorable environment for the emergence of innovation-oriented firms.

The presence of universities also showed a significant positive impact on firm attraction, with a considerable increase in the number of entering firms. This result corroborates the Triple Helix theory, which emphasizes the importance of interaction between universities, firms, and government for fostering innovation. Universities, as centers of research and training, provide access to cutting-edge research, contributing to the formation of a solid knowledge and innovation base within the park ecosystem.

Another relevant factor was the presence of accelerators, which proved to be positive and significant, contributing to a substantial increase in the number of incoming companies. By providing strategic, financial, and infrastructural support, accelerators play an essential role in fostering competitiveness and the growth of new ventures, reinforcing the need for more dynamic and structured environments to support the development of startups.

However, not all variables showed positive effects. The analysis of factors such as regulatory statutes, architectural designs, and environmental licensing requirements indicates that bureaucracy and regulatory barriers can hinder the attractiveness of science parks. Parks with more rigid structures or more complex bureaucratic processes appear to be less attractive. This suggests that excessive regulation or overly detailed planning can act as a constraint, limiting the flexibility needed for the entry of new companies.

Regarding incubators, although they play a relevant support role, their effects on attracting companies were not as significant as those of accelerators. This suggests that, although incubators are essential for initial support for startups, they do not offer the same level of strategic and financial support as accelerators, which may explain the difference in impact between these two structures.

Finally, the coefficient of determination indicated that the developed model is able to explain a significant portion of the variation in the number of companies that join science parks. However, the results suggest that many other unobserved factors, such as public policies for innovation, the quality of the local business environment, the availability of funding, and institutional support, also play an important role in attracting companies to science parks. It is necessary to evaluate including these variables in future studies.

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