

CHAPTER 6

ANALYSIS OF PATENT PRODUCTION IN BRAZIL: A PERSPECTIVE FROM THE LATTES PLATFORM

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ABSTRACT

CONTEXT. From the perspective of a nation's technological, economic, and social advancement, the assessment of technical yield was as crucial as the evaluation of scientific yield, with a particular emphasis on patents that safeguarded innovations and disseminated knowledge. Patents, therefore, represented a significant repository of technological information for various societal sectors, serving as a catalyst for innovation. In Brazil, a curriculum management platform known as Currículo Lattes enabled researchers to document their professional, scientific, and technical trajectories.

OBJECTIVE. Based on Currículo Lattes, this study provided an overview of the patent output of researchers working in Brazil by

analyzing the relationship between education level and the number of patents.

METHOD. The research was descriptive in nature and quantitative in its approach, employing statistical techniques to support its findings. The collection and analysis of data were facilitated by the development and execution of a set of algorithms within a computational framework.

RESULTS. The primary findings indicated that patent output increased over time, particularly in the past 25 years, and that researchers with doctoral degrees constituted the predominant proportion of inventors, thereby substantiating the study's hypotheses. Furthermore, by leveraging the mapping of patent output and the aggregation of open data on academic personnel from higher education and research institutions nationwide, it became feasible to conduct a comprehensive analysis of patent production and the collaborative dynamics that were inherent in each institutional context.

CONCLUSIONS. The study enabled the comprehension of the evolution of patent output by researchers in Brazil and the potential influence of education level on inventive activity in an unprecedented manner. The result achieved served as an important step toward the development of strategies and policies in the fields of science and technology, paving the way for new studies.

KEYWORDS: patents, Brazilian inventors, technical output, education level, Lattes platform

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1 INTRODUCTION

The technological, economic, and social development of a nation and the world is directly related to the innovation capacity of organizations, governments, and various other productive and social arrangements (Schumpeter, 1980). Indeed, innovation is the prevailing term in contemporary discourse; it is situated at the intersection of research and industry, contingent on a dynamic process that integrates external and internal factors (Alvares & Itaborahy, 2021). A variety of external factors must be considered, including but not limited to: competitive pressure, technology transfer, the necessity of network cooperation, and compliance with regulations. The internal factors relevant to this discussion are typically associated with organizational culture, resource management, qualified human capital, investments in research and development, and other relevant factors. Furthermore, it is imperative to prioritize the quality achieved at all levels of the organization, in conjunction with sustainable development. Innovation encompasses a range of changes, including those in products, processes, or services. These changes are contingent upon the knowledge possessed by the economic and governmental sectors concerning the market, current technologies, social context, and their own internal structure (Bessant & Tidd, 2009). This knowledge pertains to technological information, also referred to as information for industry, and has been the focus of recent research in various academic disciplines (Braga & Simeão, 2018). The concept of “technological information” can be interpreted from multiple perspectives; therefore, there is a degree of variability in the literature regarding the scope of this concept. A definition that has been cited in numerous studies is provided by the International Federation for Information and Documentation (FID), a perspective that is further elaborated upon by Kariem (1990). According to FID, technological information is defined as “all knowledge of a technical, economic, market, managerial, social nature, etc., which, through its application, promotes progress in the form of improvement and innovation.”

This definition is adequate for the objective of this study because, first, it emphasizes the multifaceted nature of technological information by establishing a connection with economic and social development, and second, it emphasizes its central role in promoting innovation. Consequently, patent documents

are considered a primary source of technological information on a global scale (Barroso et al., 2009; França, 1997; Mazieri et al., 2016; Quoniam et al., 2014). According to the World Intellectual Property Organization (WIPO) (2025a), a patent is defined as a legal instrument that is granted by the state with the purpose of protecting inventions within a given territory and over a given period. In addition, the patent system plays a significant role in innovation and, ultimately, in the economic and social development of a region or country from two main perspectives, according to Idris (2003), Pereira and Quoniam (2017), the WIPO Guide (WIPO, 2021), WIPO (2025a), and several other authors. On the one hand, the patent establishes a protection regime for the invention, thereby conferring upon the inventor the right to prevent others from commercially exploiting the patented object. On the other hand, a framework is established to facilitate the recovery of investments made in research and development by inventors and organizations. Conversely, the grant of a patent necessitates a comprehensive and detailed disclosure of its technical content, thereby establishing a foundation for the development of novel products, processes, or services. The optimal equilibrium between these two spheres of rights—the public and private—can serve as a catalyst for innovation, while concurrently ensuring economic viability.

Given the significance of technological information, particularly that derived from patent documents, as presented, it is imperative for any nation to devise methods to monitor and assess technical production, as indicated by patent filings. To accomplish this objective, it is imperative to determine the most suitable data source for extracting information concerning patent production within the country. In Brazil, a curriculum information system known as Currículo Lattes was developed and is currently administered by the National Council for Scientific and Technological Development (CNPq, 2023). This system is specifically designed for researchers operating within the Brazilian context. Currículo Lattes is a database that compiles information regarding the professional, scientific, and technical activities of researchers in Brazil. Consequently, this platform can function as a repository for patent production data, facilitating the identification of inventor researchers and enabling cross-references with other recorded data according to the researcher's informational requirements. The information declared in Currículo

Lattes is fundamental for the management of scientific and technological information and for the formulation of policies that foster the country's development in the fields of science, technology, and innovation (Silva & Smit, 2009). The Lattes curriculum database is also regarded as a reference for the approval of funding in research projects and activities (Oliveira et al., 2023).

However, as will be described below, studies in the literature analyzing data extracted from the Currículo Lattes database focus essentially on scientific production and collaboration. It is important to acknowledge that the analysis of patent data and inventor researchers through the Lattes platform and other databases is still an emerging research area, especially in Brazil. In light of the aforementioned context, the objective of this study is to provide a descriptive portrait of patent production in the country, the types of patents filed, the evolution in the number of filings over time, the education level of the inventors, and the collaborations involved in inventive activity. This portrait is based on data extracted from Currículo Lattes. Another contribution of the study, derived from the results achieved, is to enable the analysis of patent production and collaborations among responsible inventors within the context of each higher education and research institution through the implementation of a script. To this end, it is imperative to acquire a comprehensive list of the institution's personnel, adhering to specific guidelines, to facilitate the creation of an institutional inventor database for any higher education and research institution within the nation. The subsequent sections delineate the fundamental principles of patents and Currículo Lattes, which are indispensable for comprehending the investigative findings and scholarly discourse presented in this study.

1.1 Patents and inventions

As previously stated, the primary functions of a patent can be categorized as follows: first, it serves to protect the patented object, and second, it serves to publish the technical information that constitutes the invention (WIPO, 2021). In Brazil, the National Institute of Industrial Property (INPI, in Portuguese, 2021) recognizes two forms of invention protection within the context of industrial property: invention patents and utility model patents.

Invention patents, as in many other countries, allow for the protection of new products or processes, that is, novel creations, and have a validity of 20 years counted from the patent filing date. Utility models are utilized to safeguard functional advancements or enhancements in the utilization or fabrication of particular practical objects, with a validity period spanning 15 years from the filing date. As is already known, both types of patents represent the legal instrument for protecting inventions. However, it is essential to distinguish the concept of patent from the concept of invention. A one-to-many relationship exists between the concepts of patent and invention. A patent is a legal document that grants its proprietor the exclusive right to practice the patented invention for a limited time. However, an invention may be covered by more than one patent, as the same invention can be patented in different regions and countries. In this particular instance, the invention is safeguarded by a patent family, as granted by the European Patent Office (EPO, 2017).

The concept of patent family will not be explored in depth here, but it is important to highlight that in Currículo Lattes, it is not possible to provide data on all members of a family when a given invention has been filed in different countries (CNPQ, 2025). Consequently, even in instances where a family exists, typically only a single patent is documented in the inventor's curriculum. Conversely, patent documents that cite or are cited by a given patent declared on the Lattes platform are also not reportable in the system. In other words, there is a valuable patent ecosystem that cannot be identified solely through analysis of Currículo Lattes. This represents a notable limitation of the platform, and a methodology for identifying information on families, given and received citations, and other patent data involves the utilization of services furnished by international patent database platforms, such as the Espacenet database (Pereira & Quoniam, 2017). Espacenet, an online platform maintained by the EPO, is widely recognized as the world's most extensive patent database. It has been reported to aggregate patent data from over 100 countries (EPO, 2025). Currently, there are more than 150 million patent documents that are freely accessible through the interface or via the Web ops (Open Patent Services) provided by the Espacenet system. This Application Programming Interface (API) is robust and is available in a free version, which enables the automation of data extraction and analysis processes (EPO, 2025). Information

of a technical, bibliographic, and legal nature can be extracted from patent documents maintained by Espacenet.

1.2 Currículo Lattes (*Lattes curriculum platform*)

As previously stated, the Lattes curriculum platform, also known as Currículo Lattes, is an information system that is maintained by CNPq (2025) for the purpose of registering and consulting academic, scientific, and technological data of students, faculty, and researchers working in Brazil (Oliveira et al., 2023). The Currículo Lattes system was developed in 1999 (CNPq, 2023) and has been adopted as a standard consultation and analysis tool by the majority of funding agencies and institutions of education, research, and technology in the country (Mena-Chalco & César Júnior, 2009). To comprehend the life cycle of the Lattes platform, one must consider the three fundamental aspects outlined by Lane (2010): (1) the necessity to register and measure the nation's scientific activity was acknowledged, prompting the establishment of a collaborative community of federal agencies to design and develop the platform's infrastructure; (2) incentives were devised to motivate researchers and institutions to utilize the curriculum database effectively; and (3) a persistent identifier system, the Lattes ID, was implemented for researchers, thereby resolving conflicts caused by individuals with homonymous names. Currículo Lattes is an online system that is available free of charge to any individual who wishes to register their curriculum. To register, the user must first create an account (CNPq, 2025). In numerous academic and scientific contexts, researchers are obligated to register their data and maintain updated curricula (Bassoli, 2017). Consequently, in addition to its function as a curriculum database, Currículo Lattes serves as a substantial repository of scientific and technological information (Oliveira et al., 2023).

Given its importance to the scientific community, recent studies have investigated different categories of information declared in the curricula, such as activities, productions, projects, research lines, and fields of knowledge (Estácio et al., 2019). A comprehensive literature review was conducted to gather studies related to the platform's curriculum database over the past 20 years (from 2005 to 2025). The studies were subsequently

organized into three categories based on the object investigated in the Lattes platform: (1) the role of scientific networks and collaboration in the context of research, (2) the investigation of diseases and related phenomena, and (3) the analysis of data as a foundation for competitive and academic intelligence. The following studies were identified for Category 1: As indicated in the works of Balancieri et al. (2005), Dias et al. (2016), Dias and Moita (2018), Dias and Dias (2019), Dias et al. (2019), and Maruyama and Digiampietri (2021), the subject has been thoroughly researched. For Category 2, three studies have been identified: Magalhães et al. (2014), Sampaio et al. (2020), and Sobral et al. (2020) provide further insights into this phenomenon. Two studies are included in Category 3: Amaral et al. (2016) and Sarvo et al. (2023) provide further insights into this phenomenon. A substantial body of research has been dedicated to the evaluation of scientific production and collaboration in Brazil. This evaluation encompasses not only studies classified under Category 1, which prioritize the analysis of scientific data, but also those classified under Categories 2 and 3. These latter studies demonstrate a connection with the analysis of scientific production in Brazil, primarily through the utilization of Lattes curriculum as a data source.

Another study related to the Lattes platform, which is widely cited in the literature and serves as a basis for conducting different research, is the work by Mena-Chalco and Cesar Junior (2009). This study delineated the developmental process of the scriptLattes instrument, which facilitates the automated extraction and compilation of bibliographic, technical, artistic productions, advisories, and other pertinent information from researchers who have registered in the Currículo Lattes database. Specifically in the context of evaluating the technical production of researchers in Brazil through Currículo Lattes, only one study was found (Silva & Dias, 2023). This study offers the results of an analysis of patent production using the Lattes curriculum database, as well as the INPI (2021) and Espacenet (EPO, 2025) databases. However, the study considers only Brazilian patents (prefix BR), precluding the evaluation of the technical production declared by researchers registered in the Lattes platform in its entirety. Furthermore, the study by Silva and Dias (2023) does not demonstrate a correlation between patent production and the researchers' education level. These two aspects are fundamental to the proposal presented herein. The Lattes platform is a system

that enables researchers to freely provide their data, thereby ensuring the consistency and reliability of the data. Ensuring the consistency and reliability of the data is a challenge to be overcome. This discrepancy is further substantiated in the study by Brito et al. (2016), which examines the organizational shortcomings of information and the ambiguity surrounding guidelines for data filling or recovery. These problems, in general, have the potential to affect the accuracy, completeness, and credibility of data retrieval, thereby influencing the quality of the resulting information. Silva and Smit (2009) also emphasize that the platform has undergone significant advancements in recent years. To ensure the efficacy of this role, it is imperative to enhance the control and validation mechanisms of the declared information. This enhancement is necessary to prevent any compromise in information retrieval processes through the platform.

2 METHODOLOGY

This research employs a descriptive approach, as its objective is to characterize the scenario of patent production in Brazil by relating different variables in this context (Gil, 2010). To achieve this objective, a quantitative method was adopted, utilizing univariate and multivariate statistical techniques (Creswell, 2009). This study pertains to the domain of patentometrics (Hammarfelt, 2021), which aims to methodically analyze patent document data to discern various types of information, including technical, market-related, statistical, and others. As Nascimento and Speziali (2020) have demonstrated, this can contribute to research, development, and innovation. The methodology can be organized into five steps, as illustrated in Figure 1. Steps 1–4 were supported by the implementation of a set of algorithms, adhering to established software engineering practices (Pressman & Maxim, 2019). In Step 1, a comprehensive data extraction was conducted from the Lattes curriculum database through an API furnished by CNPq (2025), within the purview of an institutional agreement. The collection was conducted from late February to early March of 2025. The dataset encompasses approximately 9 million curricula from the Lattes platform, along with 115,258 patent records declared by researchers. In Step 2, an algorithm was implemented for the purposes of data cleansing, validation,

and deduplication, with a particular focus on the field designated for the storage of patent numbers, filing or publication numbers, as stipulated by the researcher in the curriculum. It is imperative to underscore the significance of this step, as it facilitates the reduction of inconsistencies and noise, thereby enhancing the quality of the data and, in turn, ensuring greater reliability in the analysis and interpretation of results.

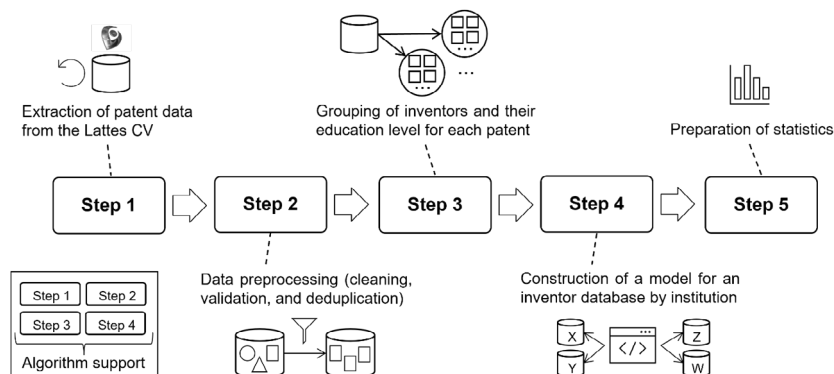


Figure 1. Research methodology steps. **Note.** Prepared by the authors.

The patent number underwent the following modifications for the purpose of cleaning: The stopwords were removed. These are special characters, spaces, and certain terms that frequently appear and are not part of the numbering; the invalid prefixes were removed. These are prefixes that do not correspond to a country prefix, and the kind codes were removed. The value of a kind code changes according to the patent status during its life cycle (published patent, granted patent, etc.). Consequently, the elimination of kind codes enhances the probability of identifying the same patent cited in the curricula of other researchers and locating this patent in additional databases, such as Espacenet. The subsequent data cleansing procedure entailed the classification of patent numbers as either valid or invalid. A valid patent number is one that contains at least four sequential digits (minimally, from the perspective of increasing the chance of finding that patent in other databases). The deduplication of patent records was conducted on the basis of cleaning and validation, with

the patent number serving as the criterion. Consequently, the number of unique patents declared throughout Currículo Lattes reached 65,173 (from a total of 115,258 patent declarations). The Lattes IDs of researchers were also deduplicated, revealing that 45,031 different curricula (researchers) declare at least one patent.

Subsequent to the deduplication of patent records, in Step 3, the inventor researchers were mapped and their educational attainment was ascertained for each unique patent. The categories of degrees and credentials include the following: PhD, master's degree, specialist, university graduate, and other (i.e., those who have not received a high school diploma or whose educational background is not specified). Consequently, it was feasible to obtain the count corresponding to each education level for each patent. In certain curricula, the same patent was declared multiple times. Consequently, the algorithm identified and disregarded these redundant declarations to ensure that the analysis of education levels was as faithful as possible to the Brazilian reality. Step 4 entailed the execution of a script that facilitated the generation of a database comprising inventors and their collaborative relationships for a specified education and research institution. To that end, it is imperative to obtain a list of institution staff members in csv format, containing at least their full names. A cross-reference of the data from both datasets was conducted. The datasets in question consist of patent records (115,258) and the institution staff list. The name was designated as the pivot attribute in the cross-reference. For the purpose of comparison, the names are subjected to a series of processing steps. This processing involves the removal of stopwords, as well as the normalization of case sensitivity and diacritics. Finally, in Step 5, the data resulting from the preceding steps were synthesized according to each type of statistical analysis necessary to fulfill the study's objectives. In this study, only general statistics from the Lattes curriculum data are presented; however, given the results of Step 4, as described, it is possible to reproduce these statistics in specific contexts.

3 RESULTS AND DISCUSSION

The initial phenomenon investigated pertained to the temporal distribution of patent filings, extending from the inaugural filing

year documented in the Lattes curriculum (1900) to the present year (2025). This investigation was predicated on data from 65,173 patents declared within 45,031 curricula. The result of this investigation is presented in Figure 2. A notable aspect of the findings is that only one patent filing was identified for the years 1900, 1902, and 1923. There is also a significant 40-year gap with no patent records between 1923 and 1963. At this juncture, it is imperative to underscore that the Lattes curriculum is subject to perpetual refinement by researchers. Consequently, the analysis presented in this study is only a mere “snapshot” of the prevailing curricula during the data collection period. To supplement this analysis, a search was conducted in the Espacenet database (EPO, 2025) to attempt to find patents filed in Brazil (prefix BR) between 1900 and 1963. The system returned no records. The oldest Brazilian patent registered in Espacenet was published in 1965. It is imperative to acknowledge that the Lattes curriculum comprises records of patents filed in Brazil and numerous other countries. In an initial analysis, it is estimated that 80% of the patents declared in the curricula were filed in Brazil. From 2000 to 2020, the number of patent filings exhibited a consistent growth pattern. A decline was observed in 2021 and 2022 (e.g., from 2020 to 2021, the reduction was 16%), which may be attributable to the impact of the Coronavirus disease 2019 (COVID-19) pandemic. In 2023 and 2024, the number of filings exhibited an uptick, yet it remained below the quantity recorded in 2020, suggesting a partial recovery. The figure for 2025 is notably low, as it pertains exclusively to the months of January and February.

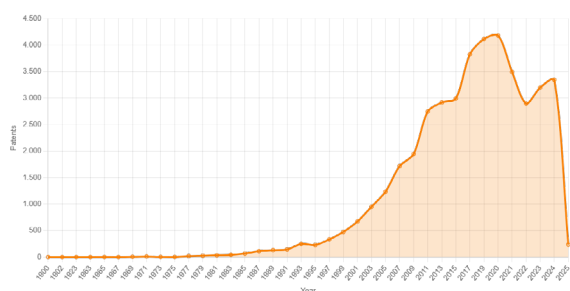


Figure 2. Number of patent applications over time.
Note. Prepared by the authors.

The ensuing analysis, as depicted in Figure 3, delves into the temporal progression of patent filings across the past three decades, distinguishing between various patent categories, including invention patents, utility models, and other types. This time frame was selected because the number of patents filed during this period corresponds to approximately 97% of the total patents filed and declared in the Lattes curriculum. Historically, the number of invention patents has consistently exceeded that of utility models, aligning with the trend observed in other countries that are among the 20 offices worldwide with the most patent filings (WIPO, 2025b). Examples of such nations include Japan, South Korea, India, and several European countries that have both forms of invention protection. From 1995 to 2020, the number of invention patents increased by more than 24-fold, while the number of utility models increased by 12-fold, approximately half of the aforementioned increase. The category designated as “Other” began to decrease in 2010 and was no longer reported in 2013, a development that may be attributable to a modification in the manner in which the patent type is documented on the Lattes platform.

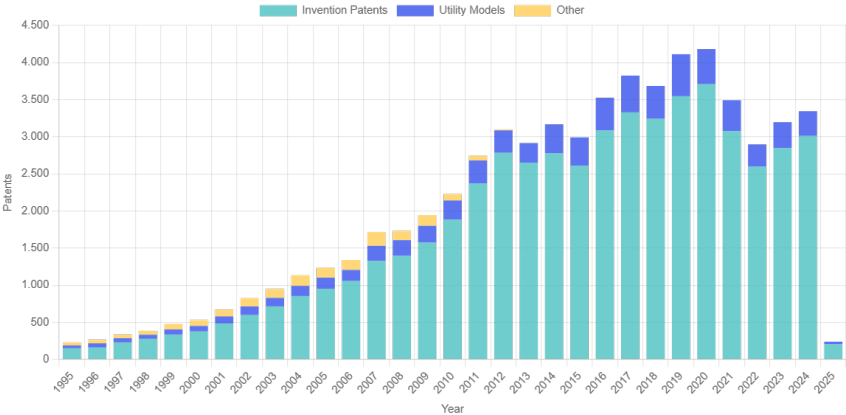


Figure 3. Patent applications by year and type over the past three decades. **Note.** Prepared by the authors.

Figure 4 presents the results of the investigation regarding patent production according to the inventors’ education level, also over

the past three decades. A close examination of the data reveals that PhD holders constitute the predominant proportion of individuals filing patents on the Lattes platform. In addition to the data presented in Figure 4, it was determined that approximately 81% of the total patents declared in the Lattes curriculum have at least one PhD researcher listed as the inventor.

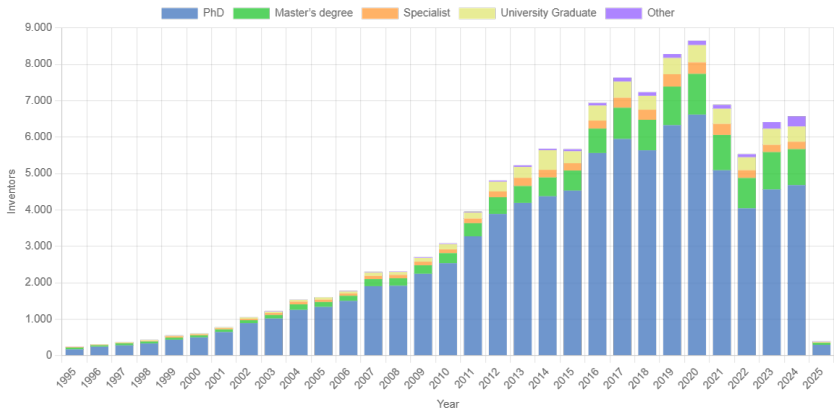


Figure 4. Patent applications by education level over the past three decades. **Note.** Prepared by the authors.

These figures indicate that the practice of patenting remains predominantly associated with postgraduate courses in Brazil, thereby substantiating the notion, as evidenced by several literature studies, that a significant proportion of patentable inventions emerge from scientific endeavors. To strengthen this hypothesis, please refer to Table 1, which shows the quantity of patents that involved collaborations between researchers with the same and different academic backgrounds. As demonstrated in Table 1, in 18,467 patents, there is collaboration of at least two PhD researchers; in 5,633 patents, collaboration between at least one PhD and one master’s degree researcher occurs; and in 1,210 patents, collaboration between at least two master’s researchers is present. Consequently, collaborations involving PhDs and master’s degrees constitute 78% of all collaborations, and collectively,

researchers with doctoral and master’s degrees are responsible for 90% of all patents.

Table 1. Collaborations among patent inventors by education level. **Note.** Prepared by the authors.

	PhD	Master's degree	Specialist	Undergraduate	Other
PhD	18,467	5,633	1,113	2,271	720
Master's degree	5,633	1,210	421	903	315
Specialist	1,113	421	149	293	93
Undergraduate	2,271	903	293	376	199
Other	720	315	93	199	98

While these figures are indicative of a potential causal relationship between education level and inventive capacity, it is imperative to carefully consider the implications of this result, given that an individual’s education level is cumulative. Consequently, a researcher who currently holds a PhD may have filed patents prior to obtaining that degree. Consequently, further research is necessary to comprehensively investigate this association. Another potential analysis, based on the Lattes curriculum, involved a survey of educational institutions with the most patent filings, according to data reported by researchers. Table 2 presents the top 10 educational institutions with the highest number of filings, their respective states, and the number of patents filed by each institution. A total of 10 institutions were considered in the study. All of these institutions are public and predominantly federal. Furthermore, it was determined that 50% of the institutions are located in the Southeast region of Brazil. This region is notable for its large economy, which is the largest in the country. The aggregate number of patents filed by these 10 institutions constitutes nearly 20% of all patents declared in the Lattes curriculum. Consequently, the interplay between technological, scientific, and economic development is once again evident.

Table 2. The 10 universities with the most patents declared in the Lattes platform. **Note.** Prepared by the authors.

University	State	Total of patents
Universidade Federal de Minas Gerais	Minas Gerais	2,140
Universidade Estadual de Campinas	São Paulo	1,713
Universidade de São Paulo	São Paulo	1,512
Universidade Federal da Paraíba	Paraíba	1,185
Universidade Federal de Campina Grande	Paraíba	1,132
Universidade Federal de Pernambuco	Pernambuco	1,082
Universidade Federal do Rio de Janeiro	Rio de Janeiro	1,039
Universidade Federal do Rio Grande do Sul	Rio Grande do Sul	906
Universidade Federal do Paraná	Paraná	864
Universidade Estadual Paulista Júlio de Mesquita Filho	São Paulo	829

The data collection process revealed that, among a total of 27,083 patents, no applicant had been informed by the researcher. This finding offers a practical illustration of the challenges associated with data accuracy and completeness, as previously documented in various studies and further elaborated in this analysis. Consequently, alternative strategies must be implemented for precise data acquisition and analysis, typically involving queries to external databases. As previously delineated, an automated process was developed to generate a database of inventors for education and research institutions. This development was informed by data processing in the earlier stages of the study and the implementation of a script. The generation of the inventor database is contingent upon the procurement of a comprehensive roster of the institution's personnel, exemplified by the compendium furnished by the Brazilian Federal Government—Office of the Comptroller General (CGU, 2025). The process of data

matching between the patent records in the Lattes curriculum and the staff list is executed through a name comparison. Despite the inherent limitations of this approach, including the presence of homonymous names and divergent name specifications on the Lattes platform and the other source utilized, this component of the study can be regarded as an inaugural approach. Consequently, it is amenable to adjustments and enhancements, with the potential to facilitate a more comprehensive description of patent production and collaborative endeavors among inventors within diverse institutional contexts. Beyond enabling the measurement of its staff's technical production, the institutional inventor database has the capacity to facilitate the development of internal indicators, the identification of expertise in specific technological domains, and the mapping of partnerships. This contributes to the enhancement of technology transfer prospects. In the context of academic institutions, such as universities, the information extracted from the database can play a pivotal role in guiding various academic activities, including teaching, research, and outreach initiatives. This, in turn, can contribute to the cultivation of a robust intellectual property culture among faculty members, students, and other stakeholders within the institution.

4 CONCLUSION

The study provided a general overview of the patent production by researchers working in Brazil through the Currículo Lattes platform, revealing a relationship between education level and inventive activity, as well as how collaborations in the scientific context can be reflected in collaborations in the patent context. This patentometric study endeavors to facilitate a two-way street between scientific and technological information on one side and industry and government on the other. This movement is characterized by the dissemination of information stemming from technical production, particularly with regard to researchers' patents, which provides a foundation for decision-making processes at local, regional, and national levels. These decisions can subsequently result in funding and incentive policies aimed at transforming scientific and technological knowledge into innovation and development. Despite their close relationship, it is

crucial to draw distinctions between the terms “invention” and “innovation,” as outlined by Schumpeter (1980) and subsequent scholars such as Mazieri et al. (2016). Schumpeter was the first to establish a link between these concepts and distinguish between different processes. According to Schumpeter, an invention can only be considered an innovation if it is introduced into the market context and produces some kind of economic or social effect.

Innovation is acknowledged to be contingent on numerous factors; however, its fundamental raw material is information and the knowledge derived from it. As thoroughly examined in this study and in other literature reviews, technological information, particularly that derived from patents, has emerged as a critical strategic asset for both organizations and nations. This strategic importance is particularly evident in the context of scientific, technological, and economic advancement. Despite this, there is a paucity of research in the literature proposing models or strategies for the effective conception, structuring, articulation, and utilization of technological information in its multiple dimensions and affecting different actors in the face of industrial, social, scientific, and sustainable demands. In this process, it is imperative to address the advancement of information and communication technologies, competitiveness, large volumes of data, green technologies, and other factors that influence and are influenced by technological information. This study unveils data and hypotheses that warrant investigation in subsequent studies, thereby facilitating not only diverse interpretations of the results but also the formulation of novel hypotheses concerning patent production, technological information, and its nexus with research, development, and innovation. As demonstrated in a variety of studies and as presented here, the Lattes platform occupies a central role in a research and innovation management system that facilitates connections between governments, educational and research institutions, funding agencies, and researchers. Consequently, it serves as a substantial repository of information for diverse research studies.

Conversely, as previously discussed, the Currículo Lattes is a self-declaratory system, thereby rendering the consistency and completeness of data contingent upon the manner in which researchers complete their curricula and the platform’s inherent structure. In the context of patented inventions that pertain to families and involve citations, as illustrated in this study, a

substantial proportion of patent data cannot be disclosed exclusively through data extraction from the Lattes platform. In this context, this study constitutes a component of a broader project that involves the modeling of technological information as a complex whole. The objective of this endeavor is to serve as a foundation for establishing a connection between scientific research data, inventive processes, and industrial sectors. With regard to the patent dimension, there is ongoing work that represents the continuation of this study. This work is aimed at three major objectives. To accomplish these objectives, the work is grounded in an automated process of invention certification, consulting the Espacenet database services.

The initial objective is to generate a patent database from Currículo Lattes with accurate, precise, and consistent data, addressing the observed gaps in the platform and human errors in data entry. This result will also serve as a strategy to certify all patent declarations in each curriculum. This objective is consistent with specific objectives in Brazilian research related to open science, transparency, and higher credibility and quality of data. The second objective is to map all patent families to discover and systematize the countries and regions where each invention was filed, the complete set of International Patent Classification (IPC, 2025c) codes that allow identification of the technological fields of patents regardless of language, the languages in which the invention was written, as well as other information and analyses. At this stage, the study will transcend the patent concept toward a complete mapping of the inventions behind the patents declared in Currículo Lattes. The third objective is to map all patent citations given and received by the inventions declared in Currículo Lattes. From this objective, related technology information can be traced, thereby providing a broad technological basis for evaluating the impact and reach of inventions in various other studies. The culmination of this unparalleled endeavor is anticipated to represent a substantial advancement in the establishment of a technological information ecosystem that will foster research, development, and innovation in Brazil.

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Conflict of interest

The authors declare that there is no conflict of interest related to this study.

Contribution statement

Dênis Leonardo Zaniro: Data Curation, Investigation, Methodology, Software, Writing – Original Draft.

Luc Quoniam: Conceptualization, Methodology, Supervision, Validation, Writing – Review & Editing.

Statement of data consent

The data generated during the development of this study are accessible at <https://tinyurl.com/zaniro>, under the terms of the CC BY-SA 4.0 license.

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