Patent Profile of the Patent Deposits of FINEP Participants with CT-Petro Resources

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Abstract

This article presents the patent filing profile of the participants of CT-Petro edicts. The release of the notices and analysis of projects are in charge of FINEP, the period analyzed will be from 1998 to 2018. Since this is the oil and natural gas production chain, the general objective of the referred work is to verify if the IPC - International Patent Classification C10, was present in the deposits of the participants. As well as, among the CPI codes, the nomenclature with the highest frequency of presentation. For the robustness of the work, the historical contextualization and definition of patents, Patentiometry and the International Patent Classification - IPC, adopted by the National Institute of Industrial Property - INPI, were performed. The literature review highlights the importance given to patents for technological and economic development. The methodology applied has a qualitative and quantitative character, the sample studied are the institutions that had projects approved by FINEP. In short, the article seeks to outline the profile of patents developed in the participating institutions and whether this profile will reflect positive results for CT-Petro.

Keywords: Patents, Patentiometry, International Classification of Patents.

1. Introduction

After the creation of the CT-Petro Sectoral Fund in 1998, the program was structured and the normative structure for the release of financial resources was defined. FINEP made the first public call through a public notice to attract researchers, research institutions, universities and companies interested in strengthening the oil and natural gas production chain in the country.

Such public policy was created to minimize the performance of foreign institutions in this field in the country. To strengthen and stimulate R&D throughout the country. As well as, to stimulate regions of Brazil with a volume of research and technology developed smaller than the Southeast and South axis. Thus, the CT-Petro was divided into two macro-regions: region - Southeast and South; region - Northeast, North and Center-West. The publication of the edicts has an isonomic character allowing the participation of institutions from all regions of the country, aiming at changing the scenario of concentration in only one region (SENADO, 2016; FINEP, 2019).

In countries with good technological indicators, the relevance given the production of patents and their applicability is noted (SOUZA & ALMEIDA, 2019). The institutions participating in these edicts have the autonomy to create patents, as well as their deposit with the agency responsible for this protection in Brazil (FINEP, 2019). Based on this principle, the possibility of a patent profile for institutions participating in these public calls is investigated.

Several areas considered as national security require greater attention to their legal, economic, social and technological protection. It is notorious that even with the recent policies developed, a better perception of them is still necessary for the Brazilian society (SOUZA & ALMEIDA, 2019). Intellectual Property is included in these strategic areas.

The oil and natural gas industry includes several other industries, such as automation, transportation, steel, mechanical, naval, energy, information technology, among others (FINEP, 2019). As the objective of the work is to draw up a patent profile of the participants in the edicts and verify whether in any way the patents filed generated positive results for this economic chain, it was necessary to use the IPC to develop the research methodology (INPI, 2020).

Well, with all the development structure of the work put together, the importance of patents and Patentiometry for economic and technological development was highlighted. Following a brief explanation of the international classification of patents - IPC and analysis of the patent survey conducted in the INPI database.

2. Literature Review

2.1 Patents and Patentiometry

In Brazil, the first normative instruments referring to patent registrations date from 1809 that aimed to protect some new machine, for a period of 14 years. In 1923, the General Directorate of Industrial Property - DGPI was created, which served as a model for the creation of other structures to deal with the matter until the National Institute of Industrial Property - INPI, in 1970. In 1971, the first industrial property code was created. This code was revoked by Law no. 9,279/1996 (WIPO, 2016; SOUZA & ALMEIDA, 2019).

The first international treaty on the subject was the 1883 Convention of the Union of Paris - CUP, of which

Brazil was a signatory. This convention gave subsidies for the creation of the International Secretariat of the Union for the protection of IP - BIRPI. In 1967, it underwent restructuring that resulted in the World Intellectual Property Organization - WIPO.

WIPO defined as intellectual property everything that is the result of human creation that can be industrialized, can contribute to science and, also, has a literary and/or artistic stamp.

In Brazil, Law no. 9.279/1996 provides for patents and what can be protected with their registration with the INPI, envisaging the social interest, technological and economic development of the country (BRAZIL, 1996; WIPO, 2016). In the referred law that regulates rights and obligations related to industrial property, there are subdivisions of Intellectual Property in the country, in which patents fall under Industrial Property.

> *"...a patent protects an invention and grants the holder exclusive rights to use his invention for a limited period of time in a particular country" (WIPO, 2016,).*

The INPI maintains on its website the main information regarding the IP modalities that can be registered, as well as manuals that the depositors need to read to meet the main requirements. Among the patentability requirements, the application for filing must contain a descriptive report, claims and a very precise summary (INPI, 2020; WIPO, 2016).

> *"Patents are documents with a legal status to describe and claim technological inventions in which, similar to scientific publications, references are given. These references concern mainly earlier patents ('prior art') in order to prove novelty in view of the existing technological developments"* (VAN RAAN, 2017).

In academic articles from the most renowned scientific journals around the world it is evident that the evaluation of scientific and technological development takes place by means of intellectual property indicators, that is, the higher the volume of deposits and the faster the granting of patents, the better will be the results generated for the economy of a given country, as well as its performance in the international market (QUERIOZ, 2006; FABRIS, 2016).

In countries such as Japan, Taiwan, the United States and the European Union, the period for granting patents is very short if compared to Brazil. In the country, the average for the concession is around 10 years (SENADO, 2016).

The competitiveness between countries and companies can be measured from the patents developed, they can become parameters for economic sectors and competitive actions (LEYDEDORF, 2001). Because of this, policies to stimulate the importance of patents and the decrease in their grant term are necessary. Moura et. all. (2019) reinforce the importance of patents when they state that patenting symbolizes innovation and economic and technological development.

Cornell University, the French Business School Insead and WIPO publish annually a report called Global Innovation Index (GII) in which the innovation index of the countries stands out, the number of patent registrations compose part of the indicators used in the mentioned study (SOUZA & ALMEIDA, 2019; GII, 2020).

In recent years, within the academic environment, Patentiometry has been observed, which is a metric for evaluating technologies developed through patents with a focus on gathering data that solidify the benefits of a given technology (MENDES & MELO, 2017). However, there is also a duplication in the evaluation of Patentiometry, one up to patents and patent citations; another, to demonstrate innovation and technological production (OLIVEIRA et. all., 2019).

There is a concession that public and private organizations make use of methods that assess the degree of technological development, with Patentiometry being a cornerstone for such analysis. Through it, it is possible to verify the potential of knowledge transformation in products and services that may reach society (MENDES & MELO, 2017; OLIVEIRA et. all, 2019).

According to Oliveira et. all. (2019), Patentiometry is responsible for developing organizations and countries that can direct scientific, industrial and business policies, strengthening the relationship between University-Business-Government. The Patentiometry study highlights the main trends and possibilities of partners, being an analytical method of bibliometric, that is, a metric study of patent documents (MENDES & MELO, 2017).

The edicts of CT-Petro created by *Financiadora de Estudos e Projetos - Finep* (Studies and Projects Financing Agency) question whether those projects developed with public resources generated a patent and can be inferred as a stimulus to the creation of patents (FINEP, 2019).

Mendes and Melo (2017) state that an evaluation of technology - AT is extremely important because it can be verified if the technology acquired by the institution will contribute to solve the existing demands. This evaluation can be done through the patents created and granted.

In the next topic the Patent Classification adopted by INPI will be addressed, the agency seeks to follow the international parameters to perform the analysis of what can be patented and avoid future judicial and diplomatic problems. The guidance given by the BPTO to file a patent application is that a prior art search be performed. Such search must be performed in the BPTO's database and in the main international databases, such as USPTO, LATIPAT, PATENTSCOPE® and ESPACENET.

2.2 Patent Classification

The International Patent Classification - IPC was created from the Strasbourg Agreement in the 1970s,

> *"...has as its initial objective the establishment of an effective search tool for the retrieval of patent documents by intellectual property offices and other users in order to establish novelty and evaluate the inventive step or non-obviousness (including the evaluation of technical progress and useful results or utilities) of technical disclosures in patent applications" (WIPO, 2019, p. 1)*

The CPI is divided into main groups, being arranged into Section, Class, Subclass, Group and Complete Symbol of the classification.

The BPTO adopts the International Patent Classification (IPC) to classify its applications. Below is a table prepared with data from the IPC Classification used in Brazil.

Table 1 - Distribution of CPI Codes by Section

Section	Section Title
Section A	Human Needs
Section B	Processing Operations; Transportation
Section C	Chemistry; Metallurgy
Section D	Textiles; Paper
Section E	Fixed Constructions
Section F	Mechanical Engineering; Lighting; Heating; Weapons; Explosion
Section G	Physics
Section H	Electricity

Source: Prepared by the authors, 2020.

Within each section there are subsections with the respective codes used within CPI. The CT-Petro Sectoral Fund, as it deals with the oil and natural gas production chain, can be framed in Section C. This section is subdivided into: Chemistry, Metallurgy and Combination Technology. The distribution of the codes occurs as follows:

- Chemistry: 14 codes;
- Metallurgy: 5 codes;
- Combinatorial Technology: 2 codes.

For the present work, the analysis was carried out on the distribution of codes within the Chemical subdivision. Below in table 2 is the distribution of this subdivision.

Table 2 - Distribution of CPI Codes in Section C - Chemistry (Subsections)

Code	Classification
C01	Inorganic Chemistry
C02	Water, Wastewater, Sewage or Sludge Treatment
C03	Glass; Mineral Wool or Slag Wool
C04	Cement; Concrete; Artificial Stone; Ceramics; Refractory;
C05	Fertilizers; Its Manufacture
C06	Explosives; Matches
C07	Organic Chemistry
C08	Organic Macromolecular Compounds; Its Preparation or Chemical Processing; Same Based Compositions
C09	Dyes; Paints; Polishers; Natural Resins; Adhesives; Compositions Not Covered in Other Places; Applications of Materials Not Covered in Other Places
C10	Oil, Gas or Coke Industries; Technical Gases Containing Carbon Monoxide; Fuels; Lubricants; Peat
C11	Animal or Vegetable Oils, Fats, Fatty Substances or Waxes; Fatty

	Acids Derived from the Same; Detergents; Candles
C12	Biochemistry; Beer; Alcohol; Wine; Vinegar; Microbiology; Enzymology; Genetic or Mutation Engineering
C13	Sugar Industry
C14	Leather; Raw Leather; Depilated or Leather

Source: Prepared by the authors, 2020.

Starting from Table 2, with the Class defined we have the Subclasses and Groups. For the present work attention will be given to Class C10 which is subdivided into 10 Subclasses and consequently into Groups. Within the C10 classification, there are the following Subclasses: C10B, C10C, C10F, C10G, C10H, C10J, C10K, C10L, C10M and C10N.

3. Methodology

The methodological procedures applied to this work were of a qualitative and quantitative nature. Regarding the qualitative sphere, the theoretical basis for the description of patents, Patentiometry (evaluation metrics) and the international classification of patents, adopted by the INPI, was sought. Starting from the contextualization, the quantitative methodological procedures applied were to prospect in the INPI database, the CNPJ of the institutions participating in the years in which there was demand for edicts from the CT-Petro Sectoral Fund. With the purpose of verifying whether the public resources released through the edicts contributed incisively to the technological development. The edicts were published from 2002 onwards. Initially, the search for patents took place on Finep's own website. Due to the fact that no satisfactory results were found, an e-mail was sent requesting the patent deposits of the participating institutions. The feedback from that institution is that such information would be provided by the law of access to information. With Excel spreadsheet, provided by Finep, containing the CNPJs, project titles, financial values released from the participants, the prospective work on the INPI database was started. The procedure was as follows: consult the CNPJ, check the number of patent filing processes, access each process in order to analyze if there was more than one CPI. After this survey, the data were organized in quantitative terms in the years in which CT-Petro notices existed. Therefore, the prospection took place around the patents granted through the field Applied Research in the database page. With the results, analyses were made, seeking to verify whether, within the list of institutions benefited with financial resources, they developed patents and, if so, whether they were granted.

4. Results Found

Initially, the spreadsheet provided by Finep was organized by year (this year is listed as the year of demand of Finep, i.e., the year in which CT-Petro notices were published), separating the institutions by the regions of the country, South, Southeast, North, Northeast and Center-West. Starting for the consultation of the CNPJs, in this part of the work we tried to verify the repetitions of the CNPJs throughout the years, as well as, if among the participants convinced and executors there were repetitions.

Starting the prospection at the INPI base, it was noted that some of the participants did not have patent

deposits. These were left aside for not contributing to the research. It is worth mentioning that the research was done only with the CNPJ numbers, in order to avoid bias in the research.

Thus, we observed the CPI codes used by the applicants in order to trace a profile of higher incidence of codes. When consulting each patent application, we observed how many codes were used (one, two, three, four or more), storing the information collected in order to establish the frequency in which certain codes appeared. Figure 1 shows the highest incidence using only deposits that contained a single CPI. With greater prominence in descending order for C12Q 1/68, B82B 3/00, G06F 17/18 and C12G 3/02.

Figure 1 - Incidence of the CPI Code of the Participating Institutions in the INPI Database

Source: Own authorship, with data from INPI, 2020.

The code C12Q 1/68 (19 times) is in the Biochemistry Class, in the Enzyme Measuring Process group. The code B82B 3/00 (15 times) is in the Processing Operations Class; Transport, in the group of Nano Structures formed by Individual Handling. And code C12G 3/02 (9 times) is in the Chemical Class; Metallurgy, in the Group of Measuring Process or Test involving Enzymes.

Figure 2 - Patent Profile Through the Patent Deposits

Source: Own authorship, with data from INPI, 2020.

In Figure 2, the procedure was quite similar to Figure 1, the difference is that an enlargement of the sample data occurred. In this case, after prospecting at the BPTO, the first IPC code that appeared in all patent filings made by the institutions, both Convenient and Enforcement Agents participating in the edicts, was separated. The data collected were in the years of the CT-Petro demands (2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2012, 2013 and 2015), the years 2011 and 2014 were disregarded for not appearing in the spreadsheet provided by Finep. And from 2016 onwards, the 18-month grace period for deposits was disregarded as it was intended to leave a certain parameter to the participating institutions.

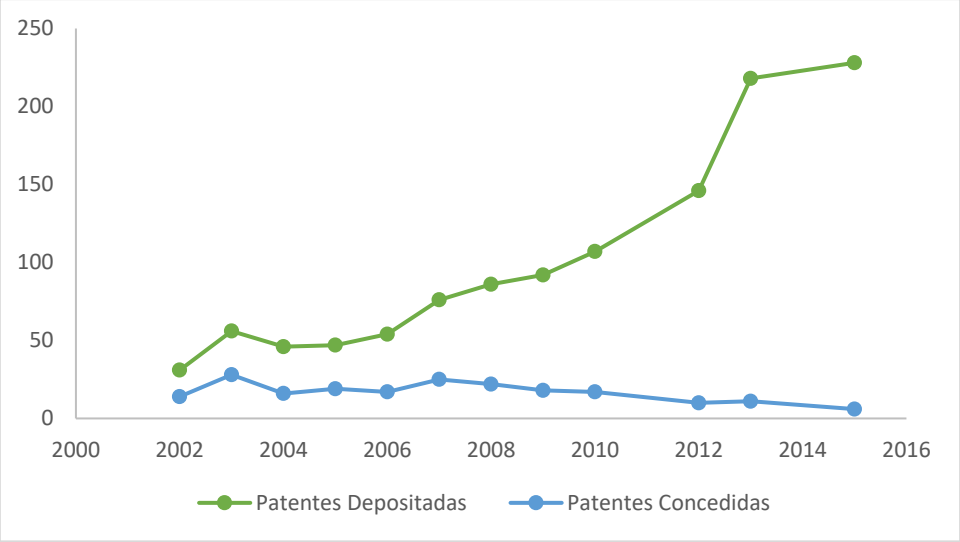
Well, in Figure 2, a change in the frequency of the CPI codes is noted. A61K 9/51 (76 times), followed by A61K 36/185 (42 times), C12Q 1/68 (40 times), A61K 35/644 and A61K 36/48 (both, 33 times) stand out. The code C12Q 1/68 has moved from the first position to the third. Within the IPC Classification, the A61K code is in the Human Needs Class, Preparations for Medical, Dental or Hygiene Purposes group. The C12Q code, as previously mentioned, is in the Biochemistry Class, in the Enzyme Measuring Process group.

After this analysis, it was sought to verify whether in view of the volume of deposits made by the institutions the patents were granted. The research was carried out at INPI's base, in the field Advanced Search, informing the CNPJ number (only the numbers) and marking the option Patent Granted. The procedure regarding the period was the same used in the previous figures (years of demands of the edicts), separating the convening institutions (the ones that signed the agreement) and the executors (the ones that actually executed). It became evident that part of the executing institutions were universities or research institutions, and it can even be noted that in some cases the convening and executing institutions were located in different geographic regions, inferring that there were partnerships for the development of projects. In both figures, it is noted that the curves of deposits and concessions are not close, showing that there is a need for greater incentives and public policies aimed at IP. Even with the increase in the number

of evaluators of deposit processes, the fragility of the Brazilian Patent System can be inferred.

The deposits made by the institutions surveyed in the figure below increased considerably from 2010 onwards, maintaining a growing profile until 2015 (the limit year consulted).

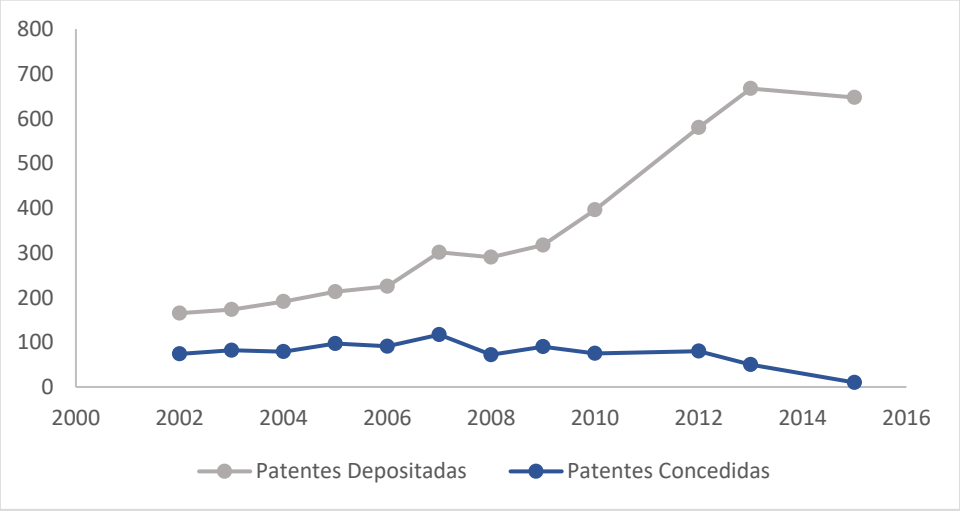
Figure 3 - Evolution of Patents Granted Versus Patents Deposited for Conventional Institutions



Source: Own authorship, with data from INPI, 2020.

However, it is observed in Figure 4 that the ascendancy of the curve within 2008 maintaining increasing until 2014 and with a small fall in 2015. In scientific articles read throughout the work on this situation in other countries, it can be concluded that if we assembled a similar graph, the trend would be that the two curves would be very close due to the simple fact that the patent structures of these countries have a greater speed in the analysis of patent applications.

Figure 4 - Evolution of Patents Granted Versus Patents Deposited for the Executing Institutions



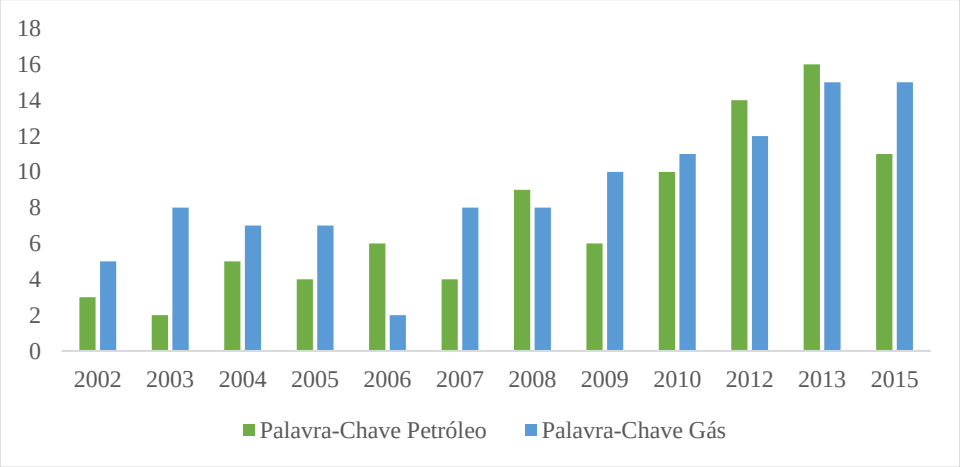
Source: Own authorship, with data from INPI, 2020.

Returning to prospecting by IPC codes, we sought to relate the Class to the production chain of Oil and

Gas, the objective of CT-Petro. When this Sectoral Fund was created it was sought to decentralize the development of Petrobras' R&D and direct the other institutions. The aim was to stimulate the triple helix University-Government-Company. Thus, the prospective process was to separate the institutions that filed patents using IPC C10. A total of 186 patent applications using the C10 code were found, carried out by 47 institutions participating in the edicts of the CT-Petro. Among the 186 applications, 34 patents were granted in this sample containing IPC C10.

After verification by Class IPC C10, the prospective work was around the consultation by keywords "Oil" or "Gas", in the summary of the patent application document. In figure 5, the results are presented, there are not among the names researched one with greater prominence, in certain periods one stands out more than the other. It is worth noting that in the period from 2009 to 2013 the deposits in which its abstract contained the word "Gas" were increasing. Different from the results found for the word "Oil" where oscillations occur in the volume presented.

Figure 5 - Key Word Patent Deposits



Source: Own authorship, with data from INPI, 2020.

5. Final Considerations

With what was presented throughout the text, it can be inferred that even with the investments through the public calls of FINEP, in terms of patents, focused on the Chemistry Class; Metallurgy, the results were not encouraging. It is worth highlighting the importance of the BPTO in view of the limitations to speed up the process of evaluating patent applications, adopting the IPC, which is an international standard. However, its database still has some limitations. During the course of this work, it became evident that applications with more than one CPI are not detailed in the general list of applications per CNPJ.

It is worth noting that the C10 code, when compared with the others presented, had little representativity. The highest frequency for the codes was for the Human Needs class. During the survey of data, it is noted that only the release of financial resources for project development is not the way to expand the development of patents. Public policies to stimulate IP need to be expanded, through capacity building with those involved and partnerships between the largest patent producers in the country and those not producing patents. And that the patents developed can meet the demands of society.

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