Partnerships for the production of patents through the CT-Petro sector fund

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Abstract

This paper seeks to investigate whether Brazilian public policies to encourage public-private partnerships for patent development through the CT-Petro Sector Fund were effective. This fund was created with the objective of developing the Brazilian petrochemical industry after the breach of the Petrobras monopoly in the late 1990s. Until that time, this state company developed all research in this sector. The structure of this article begins with the bibliographic survey of the agents involved in this production chain and how they organized to maintain the productive level of R&D. Finding out about the transfer of funds through FINEP public notices, researchers and companies were attracted and encouraged to create products and services. Whether competition between companies has resulted in improvements to the development of patents for the industry in question. The aim of this job is to demonstrate the interest of the state in transferring its former predominant role to agents Companies and Universities (and/or Research Centers).

Keywords: *Public-Private Partnerships, Patents, Sector Fund, Public Resources.*

1 Introduction

The Brazilian history of research and exploration of the oil and natural gas production chain occurs practically all at Petrobras, during the forty years of total monopoly in exploration and refining, all resources were released through policies that met the company's demands. Since 1994, other actors have been included in this context, among them the CT-Petro sector fund.

The structure around R&D existing in national territory until the 1990s, within the oil production chain was maintained exclusively with public resources, being justified by the fact that Petrobras has public share capital and holds a monopoly for exploration. With the breaking of the monopoly, an environment was created for companies to develop research in this area. The legal framework with the publication of Law 9.478, of August 6, 1997, which regulates the national energy policy, as well as, on the activities of the oil monopoly, of the creation of the National Energy Policy Council and the National Petroleum Agency - ANP (BRASIL, 1997). It has contributed considerably to expanding the range of partnerships between the agents involved.

These changes created spaces so that not only the State develops research, however, part of these were still in charge of the state itself. After the inclusion of these agents in this productive model, percentages were delimited which should be returned by the exploiting companies to the government so that the resources were directed to companies and research institutions. This link was carried out by means of promotion notices published through agencies, among them the Financier of Studies and Projects - FINEP.

According to Negri & Squeff (2016), there is a very small participation in the use of infrastructures for research and technological development laboratories in the country, around 6%. Thus, it appears that in the country there is no culture of partnership between research institutions and companies, thus maintaining a bottleneck that prevents the true application of Brazilian research within society.

FINEP is an institution focused on the country's scientific, technological and economic development. Acting as a funding agency for C, T & I, a funding agency for innovation and also as a Bank for financing innovation. The present work focuses on the analysis of the resources released by Finep for scientific research and infrastructure through sectorial funds, more precisely, from the CT-Petro sectorial fund. This was the first, created in 1999, being in fact implemented since the 2000s, with a gradual evolution of the release of resources since 2005 (FERNANDES, 2008). In this way, the research will be developed analyzing the data of resources released from 1999 to 2018.

With the breakdown of Petrobras' monopoly in 1995, it can be noted that the opening to private national and international companies in the oil and gas production chain stimulated investments in infrastructure and technologies. As part of the national companies that operated in this area, they did not yet have strong competitiveness with foreign ones, the incentive policy was created through the sectoral fund CT-Petro. Part of what is collected from the exploration returns to society through funding notices, so that new products and technologies are developed that emerge the country in the first levels of the international scenario.

With the implantation of CT-Petro, the National Science and Technology Plan for the Oil and Natural Gas Sector - CTPetro was created. With objectives aimed at the sustainable development of the oil sector,

conservation of the environment, cost reduction, greater participation of the Brazilian scientific community and serving as a basis for diagnosing opportunities for the country in the oil industry (MCT, 1999).

A fundamental aspect of the energy sector is that neither the economy nor its policies are constant: they are subject to technological changes. Technologies that are widely harnessed may disappoint, while entirely new technologies may appear unexpectedly (GUPTA, 2016).

Thus, the Sectorial Funds through the TC, aim to support incisively, companies and society, the production of R&D, seeking to solve technological, social and environmental problems in the country (SANTOS, 2016). Constantly stimulating innovative activities in the Brazilian economic scenario (FURLAN JUNIOR, 2015).

The research is presented by a brief review of the literature in order to solidify the basis for the analysis of the prospected data. Presenting also, the historical context of the laboratory and research structures developed before the monopoly was broken. And after the implantation of CT-Petro, describing the evolution of companies and research institutions that participated in the public notices published by FINEP. Seeking to associate the evolution of partnerships according to changes in Brazilian legislation that aim to encourage greater participation by companies and research institutions for improvements within the aforementioned production chain.

2 Literature Review

2.1 Historical context

The global energy system depends basically on the oil and natural gas production chain, there is an incessant search all over the planet for this type of fuel. Such interest drives the development of new technologies and innovations in the form of exploration in various parts of the globe. In Brazil, it is no different and there are several public and development policies to stimulate the aforementioned production chain. For many years, oil has been coveted by several countries in the world because of its application in the most diverse economic activities, generating, including wars between countries. Creating an extremely fierce geopolitical competition. Being highly valuable assets over which companies and countries maintain constant competition (OVERLAND, 2015; GUPTA, 2016).

In Brazilian territory, the formation of the innovation system in P&G arose through the discoveries and demands of Petrobras. In the 1960s, with the volume of demands of the P&G production chain and the public policies aimed at the economic development of the country, there was creation of the National Innovation System – NIS. The system was created based on the need for innovation networks through triple helix models, observing such models applied in other countries (NEGRI & SQUEFF, 2016). It is worth mentioning that even with the breaking of the monopoly, the state company still owns part of the technology developed for exploration within the territory.

In the 1970s, with the National Development Plan, there were more incentives and public resources to leverage specific sectors of the Brazilian economy. However, it was in the 1980s that what became known as the active learning network emerged. In this network, knowledge was generated through partnerships between Petrobras and research institutions in the country. Such collaborative network worked in research in the exploration of deep waters, creating the sectorial system of innovations, aiming to increase the

technical productive capacity of oil and natural gas (MORAIS & TURCHI, 2016; NEGRI & SQUEFF, 2016).

The research network for P&G was solidified with the collaboration of engineering companies, universities and research centers, from the Procap 1000 and Procap 2000 projects, in the 1990s. Procap 1000 was the first technological training program in information systems. production for deep waters, in its performance period (1986-1991) 109 multidisciplinary projects were developed. Part of all the technologies developed by Petrobras were carried out at the Research Center - CENPE. Procap 2000 was the technological training program in production systems for (ultra) deep waters (MORAIS & TURCHI, 2016).

In the 1990s, with the breaking of the Petrobras monopoly, the creation of the ANP and CT-Petro the cooperation between teaching and research institutions were deepened with the industrial sector. ANP is responsible for managing the amount corresponding to 1% of the gross revenue of companies operating in the exploration of P&G.

> *"This new orientation was based on the allocation of sources of stable financing, provided by the respective sectors, such as resources from oil royalties, contributions from companies on the result of the exploitation of natural resources belonging to the Union and of billing of companies benefited by the Informatics Law, among other sources of funds. The idea behind this financing model, in addition to allowing the necessary continuity to scientific and technological developments, is to promote interactions between companies and institutions, in order to consolidate sectorial innovation systems*" (MORAIS & TURCHI, 2016, p 326).

With the policy of strengthening CT-Petro from the 2000s onwards, the installation of laboratories focused on the oil and natural gas production chain was intensified, aiming to meet the demands not only of Petrobras and other companies operating in the area. After 2006, with the discovery of the pre-salt, a range of opportunities was created for the development of S&T in that area (MORAIS & TURCHI, 2016; NEGRI & SQUEFF, 2016).

It is noted that part of the technological development of this sector occurs considerably in the Southeast region. This is due to the fact that this region has oil production for the year 2013, the percentage of 89% of the country's total production, implying that the greater the production, the greater the demand for new technologies and production processes, as well as part of the money generated from the revenue that goes back to R&D. The Northeast region occupies the second prominent position regarding the infrastructure of the laboratories, thus creating an argument for 40% of the resources released by CT-Petro to be directed to this part of the national territory. (FURTADO & FREITAS, 2009; MORAIS & TURCHI, 2016; NEGRI & SQUEFF, 2016).

2.2 Legislation and agents involved

Brazilian legislation, to direct public policies to encourage the competitiveness and performance of companies and other agents involved in the oil sector, is broad. With the opening of this market, it is clear that for the national industry to be protected, some rules must be clear to anyone interested in exploring this national resource. Oil in different parts of the world has already created conflicts and wars between

countries, as well as, it has an extremely active participation in the stock market within the world economic scenario (OVERLAND, 2015; SARWAR et al, 2019).

Arcuri (2016) states in his studies that part of the countries in the world with good rates of economic and social development, had strong incentives by means of public policies in order to leverage innovation and technology in their respective territories. In the case of Brazil, the National Innovation System - SNI in recent years has implemented policies to promote S&T to improve the SNI. It is essential to implement the triple helix and that all three agents involved perform their role efficiently.

As previously stated, to maintain management and control of what happened in this sector, the legislation needed to make it clear what can and cannot be done by those involved.

In 1997, Law 9,478, which deals with national energy policy, was enacted. In its first article, it deals with the rational use of energy sources, having as main objectives:

> *"I - preserve the national interest;*
> *II - promote development, expand the labor market and value energy resources;*
> *III - protect consumer interests in terms of price, quality and offer of products;*
> *IV - protect the environment and promote energy conservation;*
> *V - guarantee the supply of oil products throughout the national territory, under the terms of § 2 of art. 177 of the Federal Constitution;*
> *VI - increase, on an economic basis, the use of natural gas;*
> *VII - identify the most appropriate solutions for the supply of electricity in the various regions of the country;*
> *VIII - use alternative sources of energy, through the economic use of available inputs and applicable technologies;*
> *IX - promote free competition;*
> *X - attracting investments in energy production;*
> *XI - increase the country's competitiveness in the international market.*
> *XII - to increase, on economic, social and environmental bases, the participation of biofuels in the national energy matrix ..." (BRASIL, 1997).*

Analyzing the last paragraphs of the article, it is evident the concern regarding the promotion of competitiveness, investments, protection of the environment, the labor market and economic use in all forms. After the law was enacted, the State needed to monitor all activities. In this context, the National Petroleum Agency and the National Energy Policy Council appear. Both act as regulators in relations between companies, research institutes and the consumer market.

With regard to the work of the National Energy Policy Council - CNPE, it is worth mentioning that its performance, in addition to meeting the policies aimed at the national energy system, includes monitoring and create guidelines for the exploration of concession blocks or production sharing, creating strategies and policies economic and technological development of the oil industry (BRASIL, 1997).

The National Petroleum Agency - ANP aims to promote the regulation, contracting and inspection of economic activities that are part of the oil, natural gas and biofuels industry. In its article 8, of Law nº 9.478 / 1997 and items it says that the ANP must:

> *"II - to promote studies aiming at the delimitation of blocks, for the purpose of concession or contracting under the production sharing regime of exploration, development and production activities; (Wording given by Law nº 12.351, of 2010)*
> *...*
> *IV - prepare the public notices and promote the bids for the concession of exploration, development and production, signing the resulting contracts and inspecting their execution;*
> *...*
> *VI - establish criteria for the calculation of pipeline transportation tariffs and arbitrate their values, in the cases and as provided for in this Law;*
> *...*
> *IX - enforce good practices for the conservation and rational use of oil, natural gas, its derivatives and biofuels and for the preservation of the environment; (Wording given by Law No. 11,097, of 2005)*
> *X - stimulate research and the adoption of new technologies in exploration, production, transportation, refining and processing; ..." (BRASIL, 1997).*

The ANP as a regulatory agency represents the State in the activities previously performed by Petrobras. With this law it is evident that the breaking of the monopoly opened space for other institutions besides the State to act, however, as oil is a highly requested natural resource it could not leave loopholes in the law which could impact on national sovereignty. Like this:

> *"Art. 21. All rights to explore and produce oil, natural gas and other fluid hydrocarbons in the national territory, including the land part, the territorial sea, the continental shelf and the exclusive economic zone, belong to the Union, with its administration ANP, except for the powers of other bodies and entities expressly established by law. (Wording given by Law nº 12.351, of 2010)*
> *...*
> *Art. 23. The activities of exploration, development and production of oil and natural gas will be carried out through concession contracts, preceded by bidding, in the form established in this Law, or under the production sharing regime in the pre-salt and strategic areas, according to specific legislation. (Wording given by Law No. 12,351, of 2010)" (BRASIL, 1997).*

Historically, the world economy since the discovery of oil has been linked to the oscillations caused by its supply and demand. The country, having a considerable volume of oil, needs to get the most out of its exploration. As at that time, the SNI was not yet fully able to meet all the demands that arose from this chain, it was up to the Government to open space for its exploration but maintaining control, that is, it would be acting only as a mediator, leaving other institutions in charge functions exercised until then. Following the world economic model of the 1990s, of Minimum State (MORAIS & TURCHI, 2016; VEN & FOUQUET, 2019).

With the exploration under new molds, a special fund was created, mentioned in Art. 50-F, of Law nº 9.478 / 1997, which reads that part of the resources will be destined to States, Municipalities and, for areas such as education, infrastructure, health, security, research, science and technology, environment, among many others. Another article makes the ANP's work with companies that are in the exploration activity more specific:

> *"Art. 72. During the five-year period, counted from the date of publication of this Law, the Union will ensure, through the ANP, to the refineries operating in the country, excluded from the Union monopoly, pursuant to article 45 of the Transitional Constitutional Provisions, operational and economic conditions, based on the criteria in force, applied to the refining activity.*
>
> *Single paragraph. Within the period provided for in this article, the following will be observed:*
>
> *I - (VETOED)*
>
> *II - refineries undertake to submit to ANP an investment plan for technological modernization and expansion of the productivity of their respective refining parks, with a view to increasing production and consequently reducing the subsidies granted to them;*
>
> *III - the ANP will periodically assess the degree of competitiveness of the refineries, the realization of the respective investment plans and the consequent reduction in subsidies related to each of them" (BRASIL, 1997).*

Until then, we have highlighted the importance of legislation, the Government and the ANP. In addition to these, the Financing Agency for Studies and Projects - FINEP is a fundamental part of this oil chain in Brazil. It was created in 1967 by Decree nº 61.056, with the objective of setting up the Brazilian scientific and technological park, acting in the financing of studies and programs necessary for modernization and industrialization. To add to this new scientific structure, in 1969, the National Fund for Scientific and Technological Development - FNDCT "was created with the purpose of providing financial support to priority programs and projects for scientific and technological development, notably for the implementation of the Basic Plan for Scientific Development and Technological - PBDCT" (FINEP, 2019).

After the creation of FINEP, its legal framework underwent changes and repeals of its decrees. Currently, Decree No. 1,808 / 1996 is the one that approves the Statute of the Financier of Studies and Projects. In its first articles it is explained that the public company linked to the Ministry of Science and Technology - MCT exercises the function of Executive Secretary of the FNDCT (BRASIL, 1996).

The purpose of FINEP is to support studies, projects and programs aimed at scientific, technological and economic development in Brazil. Thus, its performance occurs in:

> *"I - granting legal entities financing in the form of a loan, opening of credits, or even participation in the respective capital, subject to the legal provisions in force; (Wording given by Decree No. 2,471, of 1998)*
>
> *II - finance studies, projects and programs of interest to the country's economic, social, scientific and technological development, promoted by national companies abroad; (Wording given by Decree nº 7,954, of 2013)*

> *III - grant a guarantee or surety; (Wording given by Decree nº 7,954, of 2013)*
> *IV - hire consulting services; (Wording given by Decree nº 7,954, of 2013)*
> *V - enter into agreements and contracts with national or foreign, public or private, and international entities; (Wording given by Decree nº 7,954, of 2013)*
> *VI - carry out financial operations authorized by the National Monetary Council; (Wording given by Decree nº 7,954, of 2013)*
> *VII - raise funds in the country and abroad; (Wording given by Decree nº 7,954, of 2013)*
> *VIII - granting grants; (Wording given by Decree nº 7,954, of 2013)*
> *IX - grant to Brazilian legal entities, under public or private law, and to individuals, cash prizes for competitions aimed at recognizing and stimulating innovation activities; and (Included by Decree No. 7,954, 2013)*
> *X - carry out other financial transactions. (Included by Decree No. 7,954, of 2013)" (BRASIL, 1996).*

With the performance of FINEP through the FNDCT, it is expected that the Brazilian scientific and technological park will be able to raise levels, seeking to approach the technologically and economically developed countries (ARCURI, 2016).

According to Turchi & Arcuri (2017), part of investments in S&T in Brazil are public by means of public development policies and, also, by public companies such as Petrobras and Embrapa. With regard to private companies, the investment indicators are very few and the business culture still persists that investment in S&T is cost and not investment.

In this way, the FNDCT's role in structuring the national SNI is evident. Also, according to Turchi & Arcuri (2017), the creation of a national legal framework, followed by the perception of how the SNI of other countries, such as Korea and Taiwan, was implemented, resulted in investments with public resources in the creation of sectorial funds, agencies and policies to promote science. In the case of funds in particular, the creation of these funds from the 1990s onwards did not achieve the desired objectives even with a large volume of projects and expansion of the themes of the public notices.

To better understand this dynamic, it is necessary to understand the performance of the FNDCT and its legal regulations. In 2007, the legal framework of the FNDCT was substantially changed by Law 11,540, which expanded its objective, assigning it the purpose of financing innovation and scientific and technological development with a view to promoting the country's economic and social development. Decree No. 6,938, of August 13, 2009, regulating the FNDCT (BRASIL, 2009; FINEP, 2019).

> *"Art. 11. For the purposes of this Law, support for programs, projects and activities in Science, Technology and Innovation - C, T & I, comprising basic or applied research, innovation, technology transfer and the development of new technologies for products and processes, goods and services, as well as the training of human resources, scientific and technological exchange and the implementation, maintenance and recovery of research infrastructure for C, T & I" (BRASIL, 2009).*

In the article cited above, the main objectives of the FNDCT are evident. The financial resources referring to the revenues of this fund can be: reimbursable - destined to technological development projects of

companies; non-refundable - to finance capital and current expenses; and as a capital contribution - being an alternative to encourage impact projects.

Within the structure of the FNDCT, the structure of the Board of Directors stands out, in addition to being composed of representatives of the Government, there are also representatives of the scientific community, the business sector and workers in the area of S&T (BRASIL, 2009; MELO, 2009).

With Decree nº 6.938 / 2009, article 10 describes the sources of financial resources of the FNDCT, namely:

> *"I - the appropriations enshrined in the annual budget law and their additional credits;*
>
> *II - portion on the value of royalties pertaining to the production of oil or natural gas, pursuant to item "d" of item I and item "f" of item II of the caput of art. 49 of Law No. 9,478, of August 6, 1997;*
>
> *...*
>
> *VI - percentage of revenue defined in the main paragraph of art. 1 of Law 9,994, of July 24, 2000, aimed at promoting scientific research and technological development activities in the space sector;*
>
> *...*
>
> *X - proceeds from the income from its investments in programs and projects, as well as in investment funds referred to in art. 15;*
>
> *XI - resources from tax incentives;*
>
> *XII - loans from financial institutions or other entities;*
>
> *XIII - contributions and donations from public and private entities;*
>
> *XIV - return on loans granted to FINEP; and*
>
> *XV - others that may be destined to you" (BRASIL, 2009).*

Still within the legal norms that support S&T, Decree 2,851 / 1998 deals with programs to support scientific and technological research in the oil industry. This decree defines how royalties will be distributed, the formation of administrative committees and which regions will have guaranteed percentages,

> *"... Of the portion of the royalty value that exceeds five percent of production, owed by concessionaires for exploration and production of oil and natural gas, ..., the Ministry of Science and Technology will be responsible for twenty-five percent, for finance programs to support scientific research and technological development in the oil industry, of interest to companies in the sector ..." (BRASIL, 1998).*

The route of the financial resource is as follows: the item collected by the National Treasury Secretariat - STN is passed on by the Integrated Financial Administration System - SIAFI to the FNDCT, responsible for managing these amounts, in which it needs to leave at least 40% for the regions North and Northeast in the form of compensation for oil exploration. To meet the legal requirements, FINEP, through the FNDCT, publishes funding notices. In this context, the Sectorial Funds appear. The first of these is the CT-Petro created in that period and, which had its activities started from 2000.

2.3 CT-Petro sector fund and the FNDCT

As previously stated, the National Fund for Scientific and Technological Development - FNDCT is the main mechanism for companies and research institutions to access resources for S&T. Since the 1960s, public policies have been created to facilitate this access. From 1997, in order to strengthen the petrochemical industry, the first sectorial fund, CT-Petro, was created. In the following years, 15 more sectoral funds were created, namely: CT-Agribusiness, CT-Aeronautics, CT-Amazonia, CT-Aquaviário, CT-Biotechnology, CT-Energy, CT-Space, CT-Hydro, CT-Info, CT-Infra, CT-Innovate Auto, CT-Mineral, CT- Health, CT-Transport and CT- Yellow Green (FINEP, 2019, MCTIC, 2019).

The main objective to justify the creation of CT-Petro is that it was necessary to stimulate the performance of several research institutions and companies, this role was previously fully played by PETROBRÁS, being justified because until 1997 there is still a monopoly in the exploration of oil by this company.

The activities considered priority by CT-Petro are: 1- deep waters; 2- new exploratory frontiers; 3- advanced oil recovery; 4- well engineering; 5- ducts; 6- refining; 7- natural gas; 8- petroleum products; 9- new materials; 10- instrumentation, process control and detection methodologies; 11- monitoring and conservation of the environment; 12- conservation and rational use of energy; 13- information and planning (NEGRI & SQUEFF, 2016).

Negri et al (2018) point out that the incentive for the creation of sectorial funds came from the breaking of the oil monopoly in the early 2000s and to prevent Brazil from being held hostage by multinational companies operating in the country.

One of the basic motivations that led to the creation of Sectorial Funds was the need to prevent the process of privatization of large state-owned companies and, the end of the monopoly on oil exploration that occurred at that time, could have a negative impact on scientific and technological development. Brazilian. Significant part of the existing R&D infrastructure as well as some important advances in the development of new technologies and products, which until then, depended directly or indirectly on state-owned companies, such as Petrobras, Telebrás, Eletrobrás and Embraer. Obviously, even implicitly, the creation of Sectorial Funds can also be understood as a recognition that the majority of private companies, with national or foreign capital, still presented a relatively low performance for the development of R&D and innovation activities in the country (FERNANDES, 2008; MIRANDA & ZUCOLOTO, 2015; TIRONI, 2015).

The effective institution of CT-Petro was based on Decree 2,851 / 1998, which dealt with programs to support scientific and technological research applied to the oil industry (BRASIL, 1998; FINEP, 2019). In 1999, the then MCT created the coordination committee and approved the national Science and Technology plan for the Oil and Natural Gas sector - CT-Petro for the period 1999-2003 (FINEP, 2019). With the approval of the plan, the Operational Manual was prepared to guide the actions of this sectorial fund.

The Sector Funds Coordination Committee is provided for in art. 6, of Law No. 11,540, of 2007:

> *"Art. 6 For the purpose of promoting the integrated operational management of the Sectorial Funds, the Ministry of Science and Technology will establish a coordination committee chaired by its Executive Secretary and integrated by the presidents of the Management Committees of the Sectorial Funds of Science and Technology and of the entities linked or supervised responsible for the execution*

> *and evaluation of the resources allocated to the FNDCT. Single paragraph. The duties and operational procedures of the coordination committee will be established in an ordinance of the Ministry of State for Science and Technology" (BRASIL, 2007).*

Regarding the operating manual, it is described that the activities of CT-Petro will be guided by the elaboration of studies directed to P&G under order or induced action. And R&D projects that contain basic research, applied research, experimental development, non-routine engineering, basic industrial technology and technical support services (FINEP, 1999).

It is evident that these actions are coordinated by FINEP, through the FNDCT with the objective of adjusting the country to international S&T trends, seeking to improve the Brazilian peculiarities (MIRANDA & ZUCOLOTO, 2015).

FINEP - Financier of Studies and Projects has three lines of action, namely: Agência de Fomento de C, T & I; Innovation Promotion Agency and Innovation Financing Bank. In other words, it finances various stages of scientific and technological development in the most varied productive areas of the country, with a considerable increase from 2008 on, stimulating partnerships between companies and teaching and research institutions. With regard to CT-Petro, part of the incentives were through economic subsidies, that is, non-refundable in this way, it is understood that if there is no need for reimbursement and these public resources need to return to society in some way (Santos, 2016).

From 2001, after the low adhesion of the companies, FINEP launched public notices and invited companies to participate in these seeking to strengthen the University-Company relationship. Aiming to replace the import of products and processes, to counter the incipient national scenario in S&T. That same year, a public notice was also launched to create a collaboration network in the Northeast region to support R&D. Resulting in the following networks:

- exploratory risk network;
- cooperative research network N / NE of natural gas;
- network for the assessment, prevention and recovery of damage caused in the area of prospecting and transportation of natural gas and oil in the Brazilian Amazon;
- network for the recovery of contaminated areas;
- network for environmental monitoring and areas under the influence of the oil industry;
- mature field engineering network;
- geology and geophysics network of mature fields;
- N / NE's special materials multitasking network;
- computational modeling network;
- instrumentation and control network;
- catalysis network;
- network of fuels and lubricants;
- asphalt research network (QUEIROZ, 2006).

In view of the above, it is worth noting that the FNDCT was created concurrently with FINEP, in the late 1960s. Even so, it went through a period of stagnation in relation to investments to develop its activities. Since it was only with the creation of the Sectorial Funds, which occurred in the last year of the 1990s and

in the first years of the 2000s, that the vitality of the FNDCT was recovered. The period between 2000 and 2008 was marked by an extraordinary expansion of the FNDCT. Between 2009 and 2015, there were five years in which the FNDCT applied amounts close to R $ 2 billion (in constant values from December 2015) and two exceptional years, 2010 and 2014 with investments close to R $ 3 billion. In 2015, FNDCT investments decreased to around R $ 2 billion. The fact that the FNDCT invested only R $ 383.2 million in the first 9 months of 2016 foreshadowed the possibility of the fund returning to levels similar to those of the 1990s, when its existence and relevance were questioned (NEGRI & SQUEFF, 2016; SENADO, 2016).

In 2016, a committee was created in the Senate to monitor the situation of the FNDCT, as well as that of CT-Petro. The main concern of this commission is to verify the real application of these public resources, because "The oil sector, the main source of FNDCT resources, with its high growth in recent years, stands out as an example, at the same time promising for development of the Country..." (SENADO, 2016, p.94).

In the same report from the Federal Senate, the perception of the fragility of the managerial structure of resources aimed at the dissemination of S&T through Sectorial Funds and the FNDCT is evident, even with the entire legal framework, there are loopholes which redirect the resources destined to certain programs and / or greater transparency is lacking in how the financial resources were applied. In other words, there is a question as to whether these resources really contributed to improvements in the production chain for which they were created (QUEIROZ, 2006).

> *"It is always necessary to keep in mind that the funds' shares are investments and, as such, are only justified by obtaining gains in excess of their costs. It is evident that, especially as it is public policy, the analysis of earnings should not be restricted to direct financial returns only, but to a wider range of direct and indirect benefits that the action can provide, such as the qualification of professionals, job creation and tax collection. Even so, priorities must be defined based on technical and objective criteria and considering that the volume of resources to be invested will always be limited, which implies, in the need to select a finite number of actions, leaving others aside" (SENADO, 2016, p. 143).*

It is noted that the predominance of the government in the management committees of the sectorial funds may represent the little participation of the private initiative, it is noticed that the Brazilian academy has many studies for technological and economic development, however, there is no monitoring of what is really coming the society. When the funds were created, they aimed precisely at stimulating research outside the governmental scope, public resources were injected to make this happen. It is necessary to seek to understand the reason for the little private participation, inferring how interesting it would be to manage committees in a participatory way (FABRIS, 2016; SENADO, 2016; NEGRI et al, 2018).

With the new legal framework and the definition of goals for Brazilian science, it is noted that the Government tried in various ways to encourage entrepreneurs to participate in this sector. Reinforcing the performance of the triple helix, in which the Government agent acts as an intermediary between the Company and the University. The publication of the green book, provided an environment for entrepreneurs to define their demands and, at the same time, finance research around them (FABRIS, 2016; NEGRI et al, 2018; QUEIROZ, 2006).

Regarding the importation of public policies to stimulate S&T, it is worth noting that companies will only be interested in developing technologies that immediately meet their demands, however, society is not maintained only with what the market determines. There are several types of demands from the population, which often do not arouse the interest of business organizations in meeting, so it is necessary for the State to act to encourage means to meet such demands and / or supply many of these. In Brazil, there is a strong role of the State in stimulating and releasing financial resources for the development of S&T and, in an economic environment with little liquidity, there is a strong need to establish public-private partnerships, something still new, in the Brazilian financing patterns (NEGRI et al, 2018, FABRIS, 2016; QUEIROZ, 2006).

Another public entity important to the development of R&D in this area is the ANP, because of the legislation it is responsible for monitoring the transfer of financial resources to the Government, as a form of compensation for the exploration of P&G and passing on the entities involved so that they can reach research institutions (ANP, 2015).

> *"The following institutions are eligible for this fund: i) universities, public or private, non-profit; ii) research centers, public or private, non-profit; and iii) public and private companies in partnership, as partners of the ICTs, in the form of an agreement, for the development of new technology-based products, processes and services"* (MORAIS & TURCHI, 2016, p 326).

In the work of Morais & Turchi (2016) they carried out a mapping of the structures around the P&G production chain, from the level of education of the workers, to the structures of the laboratories, developed research, recipes and impact on the economy of the regions involved.

Regarding the infrastructure of the laboratories, after the implantation of the CT-Petro it is noted that these were structured and, in some regions, even created. Since more than half of all the laboratories opened took place between the years 2010 and 2012 (NEGRI & SQUEFF, 2016). This structuring of the laboratories took place through non-reimbursable financing.

The structure of non-reimbursable financing has the character of an economic subsidy and has been applied directly to the promotion and increase of innovation and economic competitiveness activities. It is well known that economically and socially developed countries stimulate innovation, technology and its transfer, as a way of validating innovation and technology created within the modalities of Intellectual Property - PI. It is understood that everything that is created through IP needs to reach society in some way, in the country there are still few studies and / or surveys on this feat (FABRIS, 2016; NEGRI & SQUEFF, 2016).

As of 2008, the Institute for Applied Economic Research - IPEA in partnership with MCTI and CNPq began a study to discover what had been produced by the Sectorial Funds in Brazil. Such funds are one of the biggest incentives for the development of research and technology development, however, until the publication of the first survey report on the subject, little data was available on what had actually been accomplished. It is known that throughout the national territory there are priority areas for the country to develop, public resources have been released for this and, however, it is not really known what has been accomplished (FERNANDES, 2008; SENADO, 2016).

> *"Studies on the subject have emphasized not only the issue of diversity and complementarity required in the current stage of scientific development, but also the importance of the collective learning process in the generation of new knowledge and its technological applications" (MORAIS & TURCHI, 2016, p. 317).*

Brazilian laboratories find partnerships with development agencies and Brazilian companies of utmost importance, to the detriment of partnerships with foreign institutions. Confirming that such cooperation is given to the financing of projects, that is, Brazilian research institutions and laboratories are largely unable to support themselves with their own revenues. Unlike other countries, such as the United States (FABRIS, 2016).

As of 2005, despite budget limitations, advances in the development of S&T could be seen, since there has been a considerable increase in doctors in the country, exchange of students, publication of articles in indexed international journals and prominent papers for Brazilian science. However, as of 2014, associated with all political and economic instability in Brazil, the resources allocated to S&T have been decreasing considerably. It is possible to notice the departure of several researchers from the country, the resources destined to the sectorial funds were directed to other areas, further distancing the possibilities of private initiative companies to enter into partnerships with academia and public entities in developing R&D (SENADO, 2016; QUEIROZ, 2006). This Brazilian scenario is the opposite of what occurs in other parts of the world, it is noted that "The success of the leading countries in the international technology market is directly related to the long-term policies sustained for decades ..." (ARCURI, 2016, p. 584).

It is observed that public policies, despite having legislation to support them, are still vulnerable. When there is a reduction in the collection of public revenues, there is a tendency to withdraw financial resources from funds like these. Directly impacting medium and / or long-term research projects. Queiroz (2006) finds that part of the public resources that should be invested in the fund through the FNDCT are being used as reserves for payment of public debt and investment, resulting from the lack of revenue to be invested in the public budget. This situation is recurrent and, in the case of CT-Petro, the amounts referring to the first years were used for other purposes and can no longer be repaid. In this way, the Government agent for being the key player in the triple helix between Companies and Universities, giving legal and financial support, is allowing these inconsistencies that ends up distancing the participation of companies in establishing public-private partnerships (SENADO, 2016).

Even with this scenario, there are possibilities and progress in relation to the use of the infrastructure implanted in the laboratories with public resources, mainly with those of the FNDCT. Negri & Squeff (2016) carried out a mapping of these structures assembled after the CT-Petro, this work was through the application of a Web Surwey questionnaire sent to researchers in order to discover the situation of the laboratories and their respective activities developed.

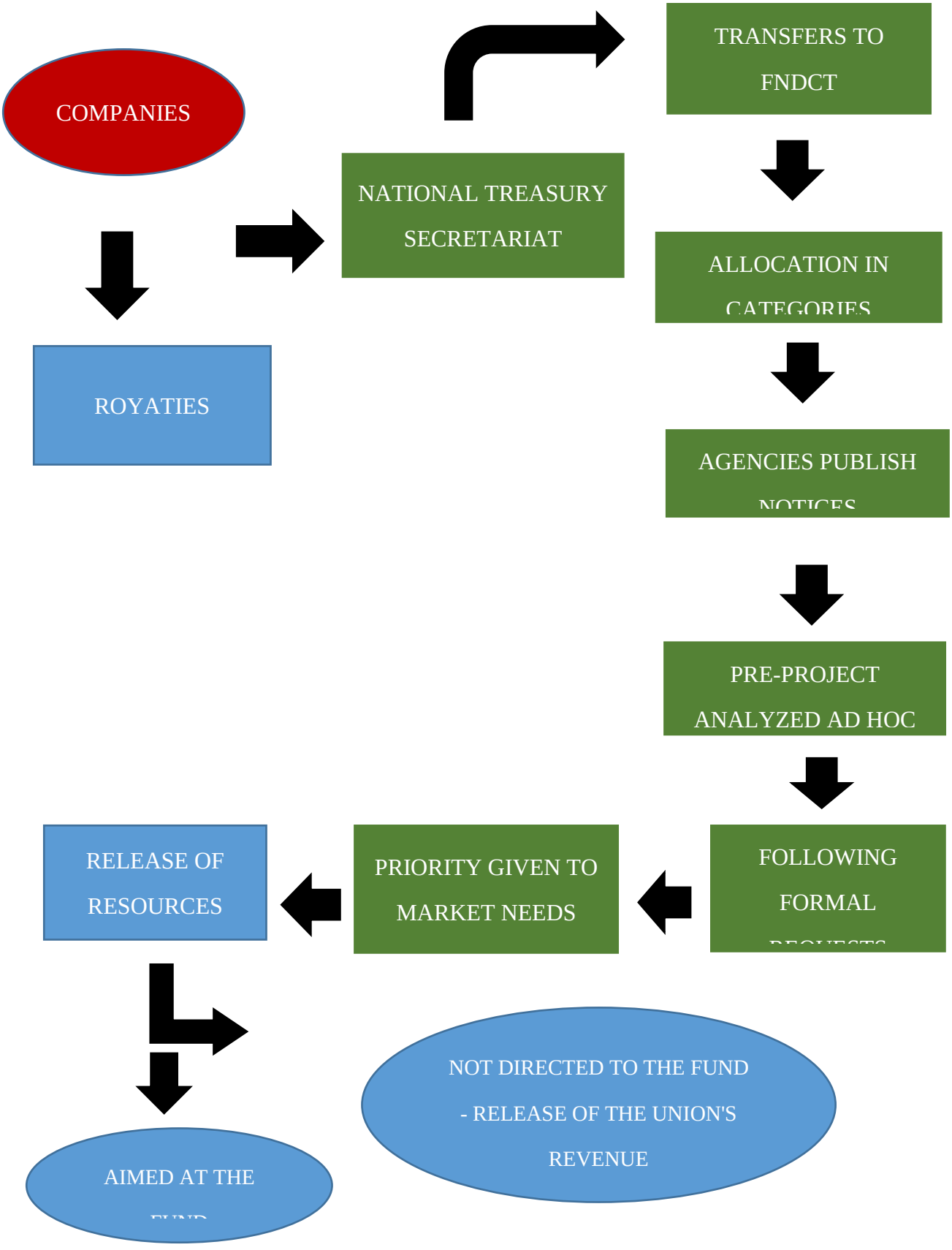
> *"Although there are a large number of research laboratories that claim to perform service provision activities, this is a sporadic activity among them ..." "... Clearly, and as expected, the laboratories analyzed are mainly focused on research and teaching. The exposed results indicate that the activities of providing technological services, technological extension and the development of new technologies occur*

> *at a much lower intensity in the scope of these infrastructures than the teaching and research activities: 35% of the respondents affirm to carry out technology development on a continuous basis and 18% indicate the provision of technological services at the same intensity ..." (NEGRI & SQUEFF, p. 37, 2016).*

Within the structure set up to meet the demands of CT-Petro, the main laboratories operating in the country stand out in developing activities for the manufacture of products, extraction of oil and natural gas, support activities for the extraction of oil and derivatives (NEGRI & SQUEFF, 2016; MORAIS & TURCHI, 2016). From this structure, it appears that the activities developed in laboratories were not purely basic research (even though it is quite important for science), but applied research. And being applied research at some point, it needs to be protected through the modalities of intellectual property and its transfer, through technology transfer contracts (FABRIS, 2016). However, in CT-Petro legislation it is not evident that a product needs to be generated and it needs to be protected by Brazilian industrial property law. The executive secretariat (FINEP) is responsible for monitoring it. In the Senate committee (2016), members highlight this concern when they question whether the approved projects contributed to the generation of jobs, to obtain patents, among others.

This same committee suggests that objective goals be created to better measure the approved projects aiming at mastering technologies, developing better products and obtaining patents.

Figure 1. Flowchart of the outflow of resources from oil exploration companies for R&D



Source: Prepared by the authors, 2019.

The flowchart in Figure 1 shows the current structure of the sector funds. If the last two diagrams are observed, this process is closed, thus missing the follow-up after the resources are directed to the fund. According to the legislation, this is the path to be followed; however, after approval of the project and destination of the resource, there is no information in the Brazilian legal norms about what was actually created with these resources. It appears that if there were a better monitoring of this structure, it would have a positive impact on the participation of companies in improving partnerships. Among the obstacles to the development of R&D in Brazilian science, the fragility regarding the resources allocated stands out. It is noted that even having legislation to stimulate and give legal security, there are still oscillations regarding the destination of finances according to political changes. The tendency is that each new government management increases such fragility (NEGRI & SQUEFF, 2016).

A common feature in technologically developed countries is "… the granting of tax incentives, subsidies and the opening of lines of credit for companies that invest in research; regulation of the market through laws that protect intellectual property and encourage innovation; a government procurement policy that favors national industry; among others" (QUEIROZ, 2006, p. 31).

In the national territory, there is a well-structured legislation, however, there are still flaws with regard to tax incentives and intellectual property. Few entrepreneurs know what IP is and what it is for, even in the academy there are still people who do not know it. It is noted that the image of IP in the country needs to be improved. Disclosure policies are needed on the importance of protecting everything that results from human capital. In the next topic, it will be described about patents and research institutions in Brazil.

2.4 Patents and research institutions

Public policies to encourage S&T, in general, are characterized by:

> *"... strong articulation between commercial and technological policies, progressive decentralization / regionalization, significant government participation in R&D spending, adoption of policies to encourage technological cooperation between companies, combination of horizontal and vertical / sectorial measures, and concern with technological diffusion" (QUEIROZ, 2006, p.30).*

These characteristics are observed in countries with development and technological advances in the most diverse areas. Countries that are not concerned with protecting their creations through intellectual property cannot sustain the stimulus to innovation and technology, and it can be said that countries that did not act in this protection, unfortunately, were not successful in competing in the market, as well as improving technological performance indicators of the country (QUERIOZ, 2006; FABRIS, 2016).

As described throughout the article, it appears that part of Brazilian businessmen and society is unaware of what will become Intellectual Property. According to the World Intellectual Property Organization - WIPO, PI can be defined as:

> *"To literary, artistic and scientific works; the interpretations of the performers and the performances of the performing artists, the phonograms and broadcasting broadcasts; inventions in all fields of human activity; scientific discoveries; industrial designs and models; industrial, commercial and service brands, as well as commercial firms and trade names; protection against unfair competition and*

> *"all other rights inherent in intellectual activity in the industrial, scientific, literary and artistic fields."* (Convention Establishing the World Intellectual Property Organization, signed in Stockholm on 14 July 1967; Article 2, § viii)

IP is restricted to the temporal dimension - it ensures the right to financial gains for a certain period of time, then falls into the public domain; the scope of law - each PI object has a protection boundary; legal certainty - if someone financially exploits his creation without due right; and territoriality - with regard to industrial property, protection occurs in a given territory of a country, with the exception that protection may be via PCT - Patent Cooperation Treaty (INPI, 2019; OMPI, 2016).

In some cases, breeders choose to deposit via PCT instead of going directly to the National Institute of Industrial Property - INPI. This is justified by the period of analysis here in the country being longer than abroad, presenting yet another barrier to national S&T.

When the deposit occurs via PCT, the objective is to facilitate the protection of the invention in several countries and the economy with costs (NOGUEIRA, 2013). Even with the condition that each country has specific legislation regarding IP, it is noted that there is mutual respect between the countries that are part of the PCT and CUP Agreements in order to avoid diplomatic conflicts (INPI, 2019).

Returning to the definition of Intellectual Property, there are three classifications, among its relative rights: Copyright and Related Rights, Sui generis Law and Industrial Property that covers patents, industrial design, trademarks, geographical indication and repression of unfair competition (OMPI, 2016).

With respect to Brazilian legislation regarding Industrial Property, Law No. 9,279 / 1996 describes and regulates rights and obligations related to IP:

> *"Art. 2º The protection of industrial property rights, considering its social interest and the technological and economic development of the country, is effected through:*
>
> *I - granting of invention and utility model patents;*
>
> *II - concession of registration of industrial design;*
>
> *III - grant of trademark registration;*
>
> *IV - repression of false geographical indications; and*
>
> *V - repression of unfair competition*" (BRASIL, 1996).

Since any invention that has novelty, inventive step and has an industrial application can be patentable (BRASIL, 1996). A creator or entrepreneur must patent in order to guarantee exclusive commercial exploitation rights, establish a strong position in the market, increase the return on invested capital, the creation reward providing an environment for new creations, positive image of the company for demonstrating technical level and technological capacity as well as providing knowledge to society, avoiding duplication in R&D and, finally, facilitating technological monitoring and research activities of its competitors (OMPI, 2016).

When the inventor and/or entrepreneur are going to make a patent filing with the INPI and / or another international patent office, they need to carry out the so-called search for precedence. In this search, it is verified whether what is being claimed is actually due. That is, if there is no misuse of intellectual property (CLARKE, 2018).

The INPI makes available on its website all the information regarding the procedures for the deposit, after the completion of all stages, an 18-month confidentiality period is granted. After this period, the analysis of the application process begins counting. In Brazil, the average for the granting of an invention patent is around 10 years, the opposite of what occurs in countries such as the USA, Japan, Taiwan, and so many others (SENADO, 2016; INPI, 2019).

In addition to having a technology park formed in recent years (NEGRI & SQUEFF, 2016), we still face few professionals specialized in IP in the country, mainly working at INPI.

Clarke (2018) points out that the volume of patents deposited at patent offices has been growing considerably:

> "*The existing volume of patent documents is huge. Publicly available free patent databases, for example Espacenet, PatentScope and DepatisNet [6] give access to tens of millions of patent documents. The cumulative volume of patent documents is growing rapidly too; 2.9 million patent applications are reported as having been filed in 2015 worldwide* [7]" (CLARKE, 2018, p. 1).

It is observed that even with all the advances through public policies such as CT-Petro, the Brazilian scenario is not favorable to compete in the international scenario. Schiavi & Hoffmann (2015) point out that part of the companies operating in the oil production chain that filed patents in Brazil were foreign companies.

De-Carli et al (2017) state that patent production can generate economic returns through commercial technologies, systematizing knowledge through science that can be applied in practice, expanding the interaction between those involved in the national innovation system (government, company and university). It is necessary to encourage Brazilian companies to come to take the lead in the process of generating patents (SENADO, 2016).

In other countries, there is a movement towards bringing universities and research institutes closer to companies and / or business corporations. In Germany, for example, researchers, in addition to producing science, aim to work on the state of technology, the promotion of entrepreneurship and commercialization through patents (BLIND et al, 2018).

> "*It is an option to commercialize one's own research results directly by referencing one's own patents in standards and indirectly by using standardization as an opportunity to establish collaborations with companies as a starting point for raising funds for common research projects or contract research"* (BLIND et al, 2018, p.1).

In this way, this work tries to present what was actually developed through partnerships and public policies through CT-Petro. Mainly, if the objective of leveraging the oil production chain was met satisfactorily. Verifying if with the implantation of the Brazilian technological park there was the diffusion of intellectual property through the filing of patent applications, as well as, if these were through public-private partnerships. Or only, research institutions and universities have developed products and processes that have been patented.

3 Methodology

The methodology applied in the work was predominantly qualitative, carried out through articles specific to the area, institutional reports and what the academy has made available on the subject in recent years. Regarding the analysis of patents created with FNDCT resources, patents developed through the CT-Petro notices were requested to FINEP, by the Access to Information Law. Initially, it is reported that there is no list of patents generated by the participating companies. Thus, the CNPJ of the winners of public notices and / or public calls was requested. With the fulfillment of this request, the spreadsheet provided by FINEP was organized, per year of the demand. Afterward the spreadsheet data were separated by the large South / Southeast and North / Northeast and Midwest regions. Regions separated in this way, within the CT-Petro itself, to meet the demand of 40% of resources obligatorily destined to the North / Northeast.

With the basic data provided by FINEP, the evolution of the participation of agents in the agreements and partnerships signed was analyzed and it was verified whether the main objective for the existence of the CT-Petro Sectorial Fund to strengthen the relations between University-Government-Company had occurred. In the data analysis, it is attested that part of the institutions participating in the FINEP notices are public and / or focused on teaching and research. Inferring a pattern of participating projects developed for pure research, to the detriment of applied research.

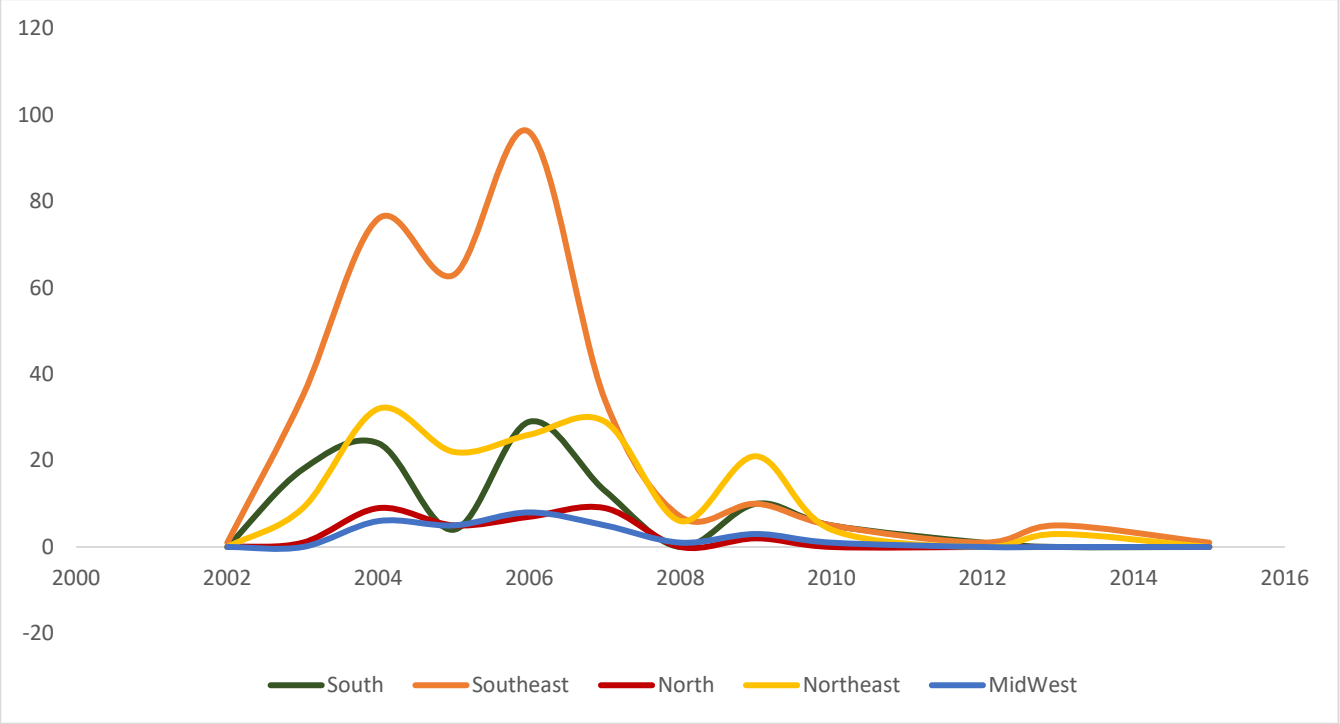
Due to the volume of participating institutions between 1999 and 2018, it was not feasible to apply questionnaires to all the participating agents in order to verify whether patents were developed and technology transfer was carried out, as well as whether the research developed was applied to the needs of the Brazilian market.

4 Results and Discussion

The main data used in this research were provided by FINEP, after requesting information through the Brazilian Access to Information Law. The spreadsheet made available presented 652 projects during the period from 2002 to 2015, and the region with the largest number of projects was the Southeast region with 334 projects, making up a percentage in the analyzed period of 51.23%. It is worth mentioning that even though CT-Petro was created to stimulate the great Northeast, Midwest and North regions, over time, there were no significant changes for the region. Thus, maintaining the concentration in the South-Southeast axis. Figure 1 shows the evolution since the approval of the first project by the FINEP notices, in 2002, until 2018. This study seeks to show the evolution of projects and resources released in the 20-year period, however, even though it was created in 1999 the participation of institutions took place only in 2002. With the University Support Foundation of the Federal University of Uberlândia (MG). During the period from 1999 to 2002, the actions were in creating a normative framework for the actions of the edicts to attract the most diverse partners. The figure below shows that the period between 2002 and 2008, had a higher volume of approved projects, under the assumption that there was a greater release of public funds, with greater emphasis on the Southeast region of the country. The second and third places were disputed between the South and Northeast regions. The Southeast region, historically, attracts a greater number of researchers and research institutions, as well as a greater industrial concentration, inferring that this history may have

impacted on a high number of institutions participating in the edicts. It is worth noting that most of the institutions participating in these calls are universities or foundations linked to Brazilian universities.

Figure 2 - Evolution in the number of projects approved by the CT-Petro Sector Fund by region in the period 2002 to 2015



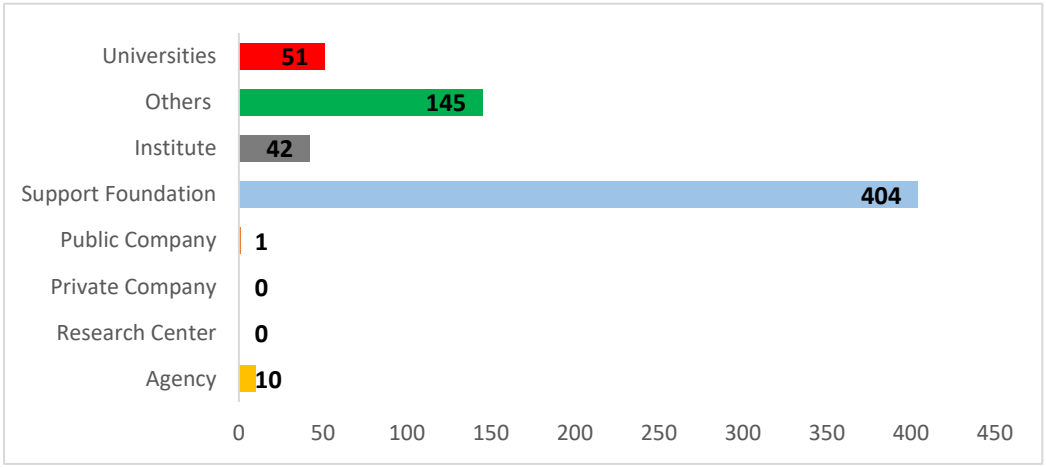
Source: Prepared by the authors, 2019.

The main characteristics of the CT-Petro public notices are the encouragement of partnerships between different profiles of institutions, thus, the personalities of those in agreement and executors are noted, it is understood that such form of structuring envisions the work between different institutions and exchange of information. experiences among professionals working on the projects. After prospecting in the INPI database, with the institutions' CNPJ, it can be noted that in some projects the convenient CNPJ was the same as the executing CNPJ, thus inferring that the partnerships did not occur at a public-private level in large proportions. It was identified that part of the institutions participating in the FINEP notices had the highest percentage of participation for the Support Foundations and Universities. Even with such incentives, the partnerships for the development of R&D, between the Government-University-Enterprise agents were still few significant.

Figures 3 and 4 show the participating structures of the institutions, with respect to those in agreement, the highest percentage is with Support Foundations, being accompanied by Others and Universities. It is evident that the participation of companies, both public and private, did not occur. Reaffirming that the participation of companies in this context in Brazil needs more stimuli and / or proposals for public policies that arouse confidence and interest to interact with institutes and / or research centers. Demonstrate that the country, like other countries in the world, can develop applied research in a larger volume. When it comes to analyzing figure 4 which deals with the executors of the winning projects,

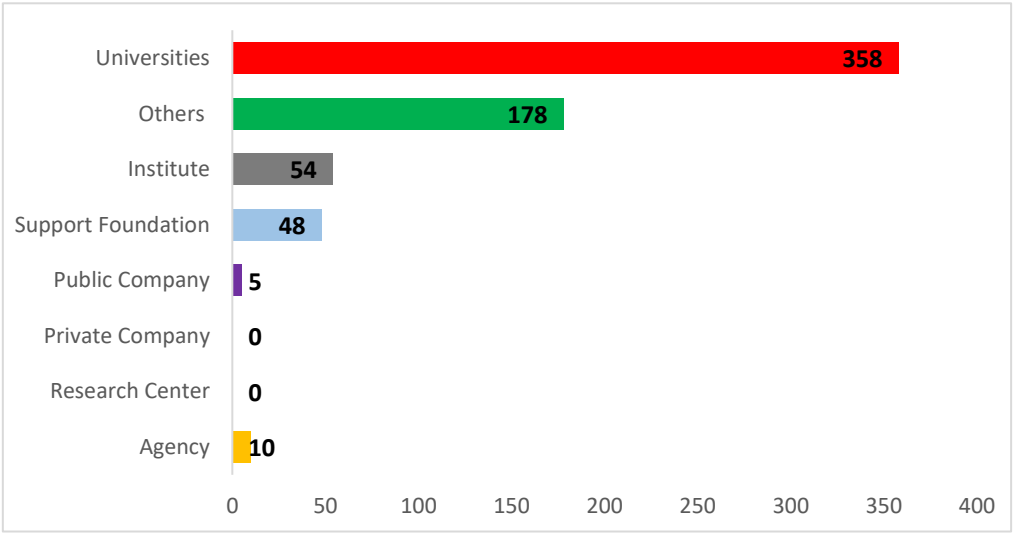
there are some changes, among them, the participation of public companies (around 1%). Even with minimal representativeness, it creates expectations that this distribution among participating agents can be balanced. It is worth mentioning that in the scenario of executors the highest percentage of performance is among Universities (54,83%), then by Others (27,26%). Given what was presented in the figures and what was presented in the literature review above, it appears that part of the Support Foundations and Universities have very close institutions. Negri et al (2016) highlight in the mapping carried out, that a good part of the Support Foundations existing in the country were created so that Public Universities could act in partnerships with private agents without creating problems for them.

Figure 3 – Distribution in the CT-Petro Announcements, of the Participating Institutions as Convenient in the Period 2002 to 2015



Source: Prepared by the authors, 2019.

Figure 4 – Distribution in the CT-Petro Announcements, of the Participating Institutions as Executor in the Period 2002 to 2015



Source: Prepared by the authors, 2019.

After the analysis of the distribution of the number of projects among conveners and executors, the present work was directed to prospect in the INPI database, seeking the quantity of patent applications filed in the years in which the institutions had projects approved by CT-Petro's edicts. Table 2 shows the distribution of patent application filings between covenant and executor.

Table 1 – Distribution of patent application filings in the INPI Database

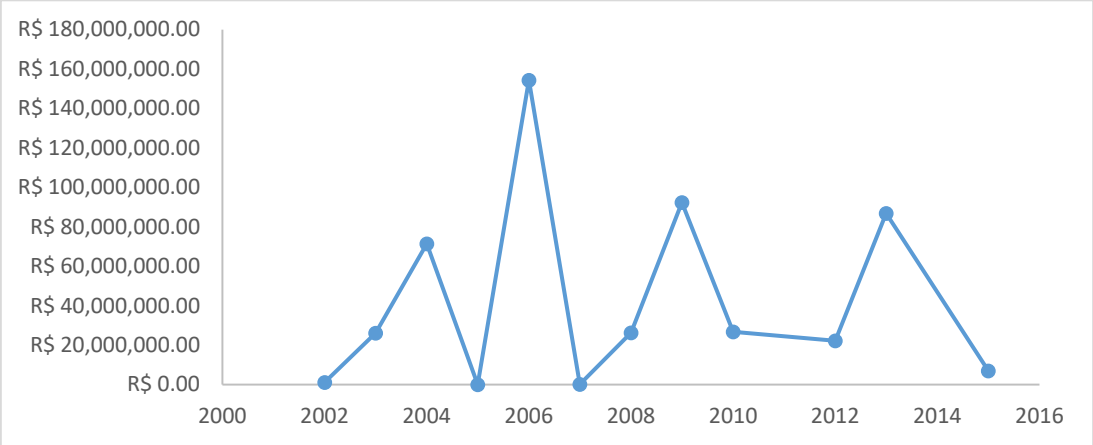
Year	**Patent**	
	Contracting Party	**Executor**
2002	47	172
2003	65	193
2004	60	205
2005	62	220
2006	71	234
2007	89	338
2008	101	302
2009	101	335
2010	121	436
2012	164	632
2013	231	709
2015	241	778
Total	**1353**	**4554**

Source: Prepared by the authors, 2019.

With the data in the table 2, it is noted that the executors made a greater volume of patent application filings, especially in recent years. In order to minimize the bias of the research and provide greater security to the results obtained, the analysis of the participating CNPJs was worked on, in which the repetition of the participating institutions between the contractor and the executor was verified. Between 2002 and 2015, 217 participated in the sample of CNPJ of the participating institutions, and of this sample only one institution appears with the name company in its corporate name, the Agricultural Research and Rural Extension Company of Santa Catarina SA - Headquarters, the other participants predominantly foundations, associations, universities and research institutes. Another information to be highlighted is that the period under analysis is from 2002 to 2015, but in 2011 and in 2014 there were no results for patent filings of the surveyed CNPJs. The prospecting was carried out between the months of September and December 2019, since that time there were no deposits for the period 2016 to 2018. The prospecting option only by the CNPJ number sought to avoid biased results due to the similarity of the participants' names.

Regarding the volume of public resources released by FINEP for the referred Sectorial Fund, Figure 4 shows the evolution, with the highlight being in the year 2006. From 2008, there are small fluctuations with a considerable drop from 2014.

Figure 5 - Value of Financial Resources Released by FINEP



Source: Prepared by the authors, 2019.

It can be inferred from Figure 5 that there is a growth in the volume of financial resources released after the publication of the first public notice. It is noted that this growth does not continue over the years, with 2006 as the peak. Thus, it can be inferred that the enactment of Law Nº 10,973/2004 stimulated the participation of institutions. Another factor that can be induced in this behavior of the release of resources is that they are linked to the profiles of the governors of the executive (SENADO, 2016).

5 Final Considerations

From what was exposed throughout the text it is noted that even with the change in the structuring of the research development within the oil and gas production chain, in national territory, it is still necessary to work public policies to stimulate the private initiative of approach research institutions and academia. Even with the release of a considerable amount of public resources to assemble the entire structure that currently exists, only one company participated, which by the way is public.

In the current world economic situation, the trend is the adoption of public policies with profiles the action of the State Minimum, the tendency is for an increasingly minimal state, exercising the role of mere legislator within the relations between public and private. It is known that private enterprise has many demands and it is not interesting to assemble a team just to develop research. The academy has a qualified workforce and is able to meet these demands, what is lacking is greater interaction and trust between the agents.

In the global P&G chain, the strongest remains and there are a large number of large companies at work and many political interests that in some cases have already caused wars between several countries.

With the new discoveries of oil reserves within the Brazilian territory, the maintenance of programs such as CT-Petro is extremely important. Aiming at a better performance of the application of public resources. Until the monopoly was broken, research laboratories in the area were restricted to Petrobras, with the sectorial fund, laboratories in all regions could be structured. However, the structuring of laboratories should not be just for infrastructure. Such laboratories and researchers need to act in punctual ways, keeping research pure but also doing applied research so that citizens can feel served, that is, see the result of public taxes paid to public coffers.

It is expected to create an environment for a society with more jobs an environment for a society with a greater number of jobs, greater and better training of its professionals and with economic competitiveness with any other country in the world. Not forgetting the importance of stimulating protection through Intellectual Property for everything that is created and developed in order to increase the number of Brazilian patents. It may impact the importance of national technology in the international scenario.

References

ANP – Agência Nacional de Petróleo. Petróleo e Estado. Rio de Janeiro. 2015. Disponível em: http://www.anp.gov.br/images/publicacoes/livros_e_revistas/livro-petroleo-e-estado-ANP.pdf. Acesso em abr/2019.

ARCURI, M. Políticas de CT&I e Financiamento Público à Infraestrutura de CT&I: Comparações Internacionais e Mapeamento da Infraestrutura Nacional. Cap. 14. E-book: Sistemas Setoriais de Inovação e Infraestrutura de Pesquisa no Brasil. Orgs: NEGRI, F. de; SQUEFF, F. de H. S. IPEA. FINEP. CNPq. Brasília. DF. 2016. Pg. 581-616. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=27203. Acesso em: jan/fev de 2019.

BLIND, K.; POHLISCH, J.; ZI, A.; Publishing, patenting, and standardization: Motives and barriers of scientists. Research Policy. 47 . 2018. Pg. 1185–1197. Disponível em: https://www.sciencedirect.com/science/article/pii/S0048733318300696. Acesso em: jun/2019.

BRASIL. Decreto nº 1.808, de 07 de fevereiro de 1996. Aprova o Estatuto da Financiadora de Estudos e Projetos - FINEP. Disponível em: http://www.planalto.gov.br/ccivil_03/decreto/D1808.htm. Acesso em: mar de 2019.

_____. Lei nº 9.279, de 14 de maio de 1996. Regula direitos e obrigações relativos à propriedade industrial. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/l9279.htm. Acesso em: jun de 2019.

_____. Lei nº 9.478, de 06 de agosto de 1997. Dispõe sobre a política energética nacional, as atividades relativas ao monopólio do petróleo, institui o Conselho Nacional de Política Energética e a Agência Nacional do Petróleo e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/l9478.htm. Acesso em: jan de 2019.

_____. Decreto nº 2.851, de 30 de novembro de 1998. Dispõe sobre programas de amparo à pesquisa científica e tecnológica aplicados à indústria do petróleo, e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/decreto/D2851.htm. Acesso em: mar de 2019.

_____. Lei nº 11.540, de 12 de novembro de 2007. Dispõe sobre o Fundo Nacional de Desenvolvimento Científico e Tecnológico – FNDCT; altera o Decreto-Lei nº 719, de 31 de julho de 1969, e a Lei nº 9.478, de 6 de agosto de 1997; e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2007/Lei/L11540.htm. Acesso em: mar de 2019.

_____. Decreto nº 6.938, de 13 de agosto de 2009. Regulamenta a Lei nº 11.540, de 12 de novembro de 2007, que dispõe sobre o Fundo Nacional de Desenvolvimento Científico e Tecnológico - FNDCT, e dá outras providências. Disponível em: http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2009/Decreto/D6938.htm. Acesso em: mar de 2019.

CLARKE, N. S.; The Basics of Patent Searching. World Patent Information. 54. 2018. S4-S10. Disponível em: https://www.journals.elsevier.com/world-patent-information. Acesso em: jul de 2019.

DE-CARLI, E.; SEGATTO,

FABRIS, J. P. Conexões entre Empresas e Universidades. Tese de Doutorado em Ciência da Propriedade Intelectual. Programa de Pós-Graduação em Ciência da Propriedade Intelectual. Universidade Federal de Sergipe. São Cristóvão. SE. 2016.

FERNANDES, L. M. R. A FINEP e a Inovação nas Empresas. Estudos e Pesquisas Nº 236. In: XX Fórum Nacional Brasil "Um Novo Mundo nos Trópicos". Anais FINEP. Rio de Janeiro. 2008.

FINEP - Financiadora de Estudos e Projetos. Disponível em: www.finep.gov.br. Acesso em: mar/2019.

_____. Diretrizes Gerais. Plano Nacional de Ciência e Tecnologia do Setor Petróleo e Gás Natural – CTPetro. Versão 1. Dez. 1999.

FURTADO, A. T.; FREITAS, A. G. Nacionalismo e Aprendizagem no Programa de Águas Profundas da Petrobras. **Revista Brasileira de Inovação**, v. 3, n. 1, p. 55-86, 17 ago. 2009.

FURLAN JUNIOR, T.J. A Política Científica e Tecnológica no Brasil e a Racionalidade Inovacionista. Revista Espaço Acadêmico. Nº 165. Fevereiro. 2015. Mensal. Ano XIV. Disponível em: http://www.periodicos.uem.br/ojs/index.php/EspacoAcademico/article/view/25706

GUPTA, K. Oil price shocks, competition, and oil & gas stock returns — Global evidence. Energy Economics 57. 2016. Pg. 140–153. Disponível em: www.elsevier.com/locate/eneeco. Acesso em: mar/2019.

INPI – Instituto Nacional de Propriedade Industrial. Disponível em: http://www.inpi.gov.br/. Acesso em: mai/2019.

MCT – Ministério da Ciência e Tecnologia. Plano Nacional de Ciência e Tecnologia do Setor Petróleo e Gás Natural. Diretrizes Gerais. Versão 1. Portaria MCT 552 de 08/12/1999. Disponível em: https://www.mctic.gov.br/mctic/opencms/fundos/fndct/fundos_CeT/ct_petro/ct_petro.html. Acesso em: jan de 2019.

MIRANDA, P.; ZUCOLOTO, G.; Conhecimento com Perfil Inovador nas Infraestruturas Científicas e Tecnológicas no Brasil. Radar – Tecnologia, Produção e Comércio Exterior. Nº 37. Diretoria de Estudos e Políticas Setoriais de Inovação, Regulação e Infraestrutura. IPEA. Fev. 2015. Disponível em: http://www.ipea.gov.br/portal/images/stories/PDFs/radar/radar_37_27022015.pdf. Acesso em: abr/2019.

MELO, L.M. de. Financiamento à Inovação no Brasil: análise da aplicação dos recursos do Fundo Nacional de Desenvolvimento Científico e Tecnológico (FNDCT) e da Financiadora de Estudos e Projetos (FINEP) de 1967 a 2006. Revista Brasileira de Inovação, Rio de Janeiro (RJ), 8 (1), p.87-120, janeiro/junho 2009. Disponível em: https://periodicos.sbu.unicamp.br/ojs/index.php/rbi/article/view/8648976/15523. Acesso em: jan de 2019.

MORAIS, J. M. de. Uma Avaliação de Programas de Apoio Financeiro à Inovação Tecnológica com Base nos Fundos Setoriais e na Lei de Inovação. Cap. 2. E-book: Políticas de Incentivo à Inovação Tecnológica no Brasil. Orgs: NEGRI, J. A. de; KUBOTA, L. C. IPEA. Brasília. DF. 2008. Pg. 107-148. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=5569. Acesso em: mar de 2019.

MORAIS, J. M. de; TURCHI, L.; Infraestrutura Científica e Tecnológica do Setor de Petróleo e Gás Natural no Brasil. Cap. 7. E-book: Sistemas Setoriais de Inovação e Infraestrutura de Pesquisa no Brasil. Orgs: NEGRI, F. de; SQUEFF, F. de H. S. IPEA. FINEP. CNPq. Brasília. DF. 2016. Pg. 315-366. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=27203. Acesso em: jan/fev de 2019.

NEGRI, F. de. Inovação e Produtividade: Por Uma renovada Agenda de Políticas Públicas. Radar Artigos. Repositório do Conhecimento do IPEA – RC IPEA. 2015. Disponível em: http://repositorio.ipea.gov.br/handle/11058/5980. Acesso em: jan de 2019.

NEGRI, F. de; RAUEN, A. T.; SQUEFF, F. de H. S.; Ciência, Inovação e Produtividade: Por uma Nova Geração de Políticas Públicas. Cap. 11. Desafios da Nação – Artigos de Apoio. Volume 1. Orgs: NEGRI, J. A. de; ARAÚJO, B. C.; BACELETTE, R. Brasília. IPEA. 2018.

NEGRI, F. de; SQUEFF, F. de H. S. O Mapeamento da Infraestrutura Científica e Tecnológica no Brasil. Cap. 1. E-book: Sistemas Setoriais de Inovação e Infraestrutura de Pesquisa no Brasil. Orgs: NEGRI, F. de; SQUEFF, F. de H. S. IPEA. FINEP. CNPq. Brasília. DF. 2016. Pg. 15-62. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=27203. Acesso em: jan/fev de 2019.

NOGUEIRA, G. A. S.; PCT Tratado de Cooperação em Matéria de Patentes. Curso de Extensão em Propriedade Intelectual. Diretoria de Patentes – INPI. UnB. Brasília. DF. Agosto de 2013.

OMPI – Organização Mundial da Propriedade Intelectual. Curso DL101PBR – DL- 101 Curso Geral de Propriedade Intelectual – DL101PBR. 2016.

_____. Disponível em: https://www.wipo.int/about-wipo/pt/offices/brazil/index.html. Acesso em: mai/2019.

OVERLAND, I. Future Petroleum Geopolitics: Consequences of Climate Policy and Unconventional Oil and Gas. Sustainability of Energy Systems. Energy vs. Development. Wiley Online Library. 2015. Disponível em: https://onlinelibrary.wiley.com/doi/full/10.1002/9781118991978.hces203. Acesso em: jan de 2019.

QUEIROZ, N. M. Os Fundos Setoriais de CT&I: o caso do CT-Petro e sua execução pelo CNPq. Dissertação de Mestrado. Centro de Desenvolvimento Sustentável. Universidade de Brasília. Brasília. DF. 2006. Disponível em: http://repositorio.unb.br/handle/10482/4771

SANTOS, G. R. dos. Características da Infraestrutura de Pesquisas em Energias Renováveis no Brasil. Cap. 5. E-book: Sistemas Setoriais de Inovação e Infraestrutura de Pesquisa no Brasil. Orgs: NEGRI, F. de; SQUEFF, F. de H. S. IPEA. FINEP. CNPq. Brasília. DF. 2016. Pg. 229-270. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=27203. Acesso em: jan/fev de 2019.

SARWAR, S.; SHAHBAZ, M.; ANWAR, A.; TIWARI, A. K.; The importance of oil assets for portfolio optimization: The analysis of firm level stocks. Energy Economics 78. 2019. Pg. 217–234. Disponível em: www.elsevier.com/locate/eneeco. Acesso em: mar de 2019.

SCHIAVI, M. T.; HOFFMANN, W. A. M.; Cenário Petrolífero: Sua Evolução, Principais Produtores e Tecnologias. Revista Digital de Biblioteconomia e Ciência da Informação. V. 13. N. 2. P.259-278.

Maio/ago. 2015. Disponível em: http://periodicos.bc.unicamp.br/ojs/index.php/rdbci. Acesso em: jun de 2019.

SENADO. Relatório CCT – Avaliação de Políticas Públicas. Comissão de Ciência, Tecnologia, Inovação, Comunicação e Informática. Fundos de Incentivo ao Desenvolvimento Tecnológico. Brasília. DF. 2016. Disponível em: http://legis.senado.leg.br/comissoes/comissao;jsessionid=40CC56D0FEB47563FD0AB66BB0EF48CC?0&codcol=1363. Acesso em: mar/abr 2019.

TIRONI, L. F.; Serviços Tecnológicos nas Estatísticas Nacionais e na Inovação. Radar – Tecnologia, Produção e Comércio Exterior. Nº 40. Diretoria de Estudos e Políticas Setoriais de Inovação, Regulação e Infraestrutura. IPEA. Ago. 2015. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=26143. Acesso em: abr 2019.

TURCHI, L. M.; ARCURI, M. Interação Institutos Públicos de Pesquisas e Empresas: Avaliação das Parcerias. Cap. 3. E-book: Políticas de Apoio à Inovação Tecnológica no Brasil: Avanços Recentes, Limitações e Propostas de Ações. Orgs: TURCHI, L. M.; MORAIS, J. M. de. IPEA. Brasília. DF. 2017. Pg. 81-112. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=30774. Acesso em: jan/fev de 2019.

VEN, D. J. van de; FOUQUET, R. Historical energy price shocks and their changing effects on the economy. Energy Economics Vol. 62. 2017. Pg.204–216. Disponível em: www.elsevier.com/locate/eneeco. Acesso em: fev de 2019.