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Law and Innovation Policies: An Analysis of the Mismatch between Innovation Public Policies and Their Results in Brazil

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Abstract: This study aims to analyze, from a legal perspective, the public policies of science, technology and innovation offered by the Brazilian government, more specifically, the Brazilian Innovation Act (Lei de Inovação), in order to verify the reasons behind the mismatch between innovation efforts and its results in the economy. We seek to answer, preliminarily, the following questions: (a) What is innovation? (b) Should the state act in the innovation process? (c) What is the relationship between law and innovation policies? (d) Why is there a mismatch between what innovation efforts propose and what we can see in reality? Given these considerations, it becomes possible to answer the central issue of this study: Why is there a mismatch between what the Innovation Act proposes and what we can see as results? The issue was analyzed based on the premise that innovation nowadays is essential to society's development and economy. We concluded that Brazil presents advances in this sector and most of the public policies managed to have efficacy for entrepreneurs, but institutional changes in the process of receiving these incentives and in its supervision are also necessary, such as a better articulation and coordination between entities responsible for its implementation and a better evaluation of public policies, improving them, so that companies may have the same competitiveness of foreign companies. Although Brazil's innovation rates are declining, the use of instruments of state support for innovation is being increasingly adopted, showing that even in adverse situations, they can be seen as advances.

Keywords: Brazilian Innovation Act Research, development and innovation policies, low-growth economies, law and development

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1 Introduction

This study aims to analyze, from a legal perspective, the public policies of science, technology and innovation offered by the Brazilian government, more specifically the Brazilian Innovation Act (Federal Law no. 10.973/2004) in order to verify the reasons behind the mismatch between innovation efforts and its results in the economy.

The Innovation Act was approved on December 2, 2004, regulated on October 11, 2005, by Decree Law no. 5563. It is organized around three points of analysis: the creation of a conducive environment for strategic partnerships between universities, technological institutes and companies; the participation of science and technology institutes in the innovation process; and the shaping of innovation within companies.

We seek to answer, preliminarily, the following questions: (a) What is innovation? (b) Should the state act in the innovation process? (c) What is the relationship between law and innovation policies? (d) Why is there a mismatch between what innovation efforts propose and what we can see in reality?

In low-growth economies, such as Brazil, the private sector does not always have the resources, opportunities, expertise and structure to take the risk of investments in Research and Development (R&D), as Schumpeter (1934) initially assumed. There is some preference to license technology from foreign nations or larger companies, which have already been tested and proven, rather than take the risk of spending millions of dollars in products, services and innovative processes that do not have the expected profit, or even, do not go beyond a mere prototype.

Thus, as highlighted by neo-Schumpeterian economists, the state presents itself as a key player in these countries, since it has financial and technical conditions to stimulate innovation, either through direct measures or through indirect measures.

It is concluded that Brazil advanced in the innovative sector and public policies managed to be attractive for entrepreneurs, although institutional changes are necessary, such as a better articulation and coordination between responsible entities for its implementation and a better evaluation of public policies, for the process of obtaining and supervising of these processes.

The study begins with an explanation of the theoretical links between innovation and entrepreneurship and why the state became more important to incentivize such activities in low-growth economies. The government intervention is important considering businesses' aversion to risk, especially startups and individual entrepreneurs. Section 3 examines the correlation between law

and innovation policies. The reasons behind the mismatch between innovation incentives and results are considered in Section 4. The effectiveness of Brazilian Innovation Act, as a case study, considering empirical data and reports collected by the responsible bodies for the oversight of public investment on innovation, as well as studies of research institutes, which seek to investigate the benefits of the Act under discussion, is the focus of Section 5.

2 Innovation, state and entrepreneurship

Humanity does not progress without innovation. Innovation and entrepreneurship are crucial to a nation's development and, consequently, its society. They enable a conducive environment for creativity, the tread of new paths and a sustainable development.

Through globalization, innovation is becoming increasingly part of a citizen's daily life.¹

Even if innovation is not apparent, it exists in everyday life. It is common to confuse the concept of innovation with the concept of technological innovation. Technological innovation is a part of the innovation class. While all technological innovation can be considered innovation, every innovation is not technological. In this sense, it seems appropriate to introduce the concept of "innovation" that will be used in the course of this article.

For Schumpeter, innovation is the creation of a new good that adequately satisfies existing or previous needs, so that, this way, it can create the new and destroy the obsolete, to introduce new products, new production methods, the opening of new markets, the conquest of new sources of supply and the adoption of new forms of organization.²

Freeman defined innovation as "technical design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment."³ Drucker, seeking to make the relationship between innovation and entrepreneurship, describes innovation as an entrepreneur's task, no matter if it is in an existing business, the government or a startup, to create

1 See David B. Audretsch, *Sustaining Innovation and Growth: Public Policy Support for Entrepreneurship*, 11 *Industry and Innovation*, no. 3 (2004), 167–191.

2 J. Schumpeter, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle* (Cambridge, MA: Harvard University Press, 1934), p. 134.

3 C. Freeman and L. Soete, *The Economics of Industrial Innovation*. (Cambridge: The MIT Press, 1982), pp. 21–22.

resources that build wealth and provide potential with existing resources to create more wealth.⁴

The Organisation for Economic Co-operation and Development (OECD), covering new concepts of innovation, defines the term as the implementation of goods and entirely new services and significant improvements to existing products; implementation of new organizational methods such as changes in business practices, workplace organization or external relations of the company; implementation of new marketing methods, including changes in product design and packaging, in promoting and product placement, and in establishing methods of prices of goods and services.⁵

From the exposed concepts, the reciprocity between innovation and entrepreneurship can be noted. Entrepreneurship can be seen as the implementation of innovative ideas, bringing them to market. Innovation without market introduction is only an invention. An invention is the creation of something new, whether it is an idea, a concept or an abstraction, through a creative process without a defined business purpose, while innovation is the making of this idea a reality by implementing it into something concrete. For the purposes of this article, the definition used by the OECD will be adopted, given its global acceptance, relevant to the topic discussed here.⁶

Innovation and entrepreneurship involve risks. There is no innovation, or entrepreneurship without risk. The risk is intrinsic to the search of the “new thing,” which has not been created and developed by another person/company and which has not yet been implemented and tested in the market. The inventor can either fail, given technical errors, structural and physical possibility of its creation, or he/she can succeed by becoming a successful entrepreneur. It is this fine line between failure and success that entrepreneurship rests.⁷ Knowing the risks and still taking them, given their higher purpose, is essential to the success of an innovation.

Not all countries have markets that incentivize the development and recognition of innovation. In the current business structure, entrepreneurial context and conditions have influence over the success or failure of an innovation. While in the United States entrepreneurs have incentives to invest in R&D, capital available to be raised, the existence of other entrepreneurs that are able to

4 P.F. Drucker, *The Discipline of Innovation* (Boston, MA: Harvard Business Review, 2002), p. 5.

5 OECD, *Manual de Oslo: Proposta de Diretrizes para Coleta e Interpretação de Dados sobre Inovações Tecnológicas* (Paris: OECD, 2004), p. 23.

6 Ulrich Hilpert (ed.), *State Policies and Techno-Industrial Innovation* (London: Routledge, 2002).

7 D. Streit, *Public Incentives in Support of R + D and Innovation in the Federal State* (Hamburg, Germany: Diplomarbeiten Agentur diplom.de, 2003).

network and incubators that help mitigate these risks, increasing the chances of success, there are countries, low-growth economies, such as Brazil, where small and medium enterprises (SMEs) do not have those same opportunities. In these, the entrepreneur does not have a satisfactory “reward” (in the sense of risk-reward), so he/she would have the incentive to invest in R&D and, in the end, offer innovative products to the consumer market. This happens because in most cases the risk to innovate becomes greater than the risk of noninnovating.⁸

In this context of market failures, the introduction of public policies of science, technology and innovation gains relevance, thus provoking a question: Should the state intervene through public policies in the innovation process?

The answer is positive. The state should intervene in the innovation process to fix market failures, considering that the market alone cannot make this adjustment. For them, through a meso-level analysis, in which the structural and qualitative changes can be verified by the economic system, the entrepreneurship, innovation and knowledge should be analyzed closely in the micro-level, given the dynamic nature of this sector, which provides the breakdown of the development inhibitors and allows changing the status quo, by encouraging changes.⁹

Not only technological innovations have influence over the process innovation of a nation, there are also outside influences that must be taken into consideration, as the economic system in the macro-level and the public sector.¹⁰

In the case of public policies on science, technology and innovation, there are four market failures that become relevant in this discussion: (a) externalities; (b) asymmetric information; (c) structural issues; (d) public interest in the leading of innovation. They are systematic flaws that besides inhibiting innovation and entrepreneurship also reduce the overall efficiency of the aforementioned policies.¹¹

Innovation is a dynamic process. There is no “one size fits all” formula, for a particular company, university or state, to create innovation without any risk. The same logic applies to innovation policy. There is no ideal model, since innovation activities differ from rapid growth countries to low-growth

⁸ “Most R&D investments made by private firms are aimed at securing a market advantage. Market advantage is often, but not always, given as intellectual property, mostly patents and copyrights” (S. Scotchmer, *Innovation and Incentives* (Cambridge, MA: The MIT Press, 2004), p. 1).

⁹ H. Hanusch and A. Pyka, *Principles of Neo-Schumpeterian Economics*, Beitrag, Institut für Volkswirtschaftslehre der Universität Augsburg, Volkswirtschaftliche Diskussionsreihe, no. 278 (September 2005), p. 8. Available at: <https://www.econstor.eu/dspace/bitstream/10419/22801/1/278.pdf>

¹⁰ See *ibid.*, and M. Crocco, *Neo-Schumpeterian Approach to Innovation and Keynes's Probability: Initial Explorations*, 19 *Revista de Economia Política*, no. 4 (1999), 15–34.

¹¹ See, also, Douglas Holtz-Eakin, *Public Policy toward Entrepreneurship*, 15 *Small Business Economics*, no. 4 (2000), 283–291.

countries.¹² This process is influenced by several factors, some obvious, as the country's schooling rates or incentives and protection provided by laws to entrepreneurs' inventions, others not so clear, as the quality of science education level in primary schools or quantities of investment funds available to the entrepreneur.¹³

Therefore, considering the diversity and ambiguity of dynamic innovation processes, states seek to address this issue through a multifrontal performance, through investments in sector-specific funds for each type of industry as well as the development of public policies for science, technology and innovation to authorize the participation of several key players, taking into account the complexities and peculiarities of each system.¹⁴ Those key issues should be considered state policies, not government policies, that are transient depending on the elected official.¹⁵

3 What's law got to do with innovation policies?

Having made these considerations on the relationship between the state, innovation and entrepreneurship, we can now analyze the correlation between law and innovation policies. Is law a variable in the innovation process? Is there a relationship between law and innovation? If so, how this happens? Thus it will be observed if there is a correlation, than if there is causality. To answer these questions, first, we will examine the meaning and function of law in this discussion, both by *Law and Development* studies, especially the ideas of Trubek and Santos (2006), and through four substrates presented by Coutinho (2013), namely (i) law as a goal; (ii) law as an institutional arrangement; (iii) law as a tool; and (iv) law as a demand articulator, in a democratic sense.¹⁶

¹² Franz Tödtling, and Michaela Trippel, *One Size Fits All? Towards a Differentiated Policy Approach with Respect to Regional Innovation Systems* (2004), Regionalisation of Innovation Policy, Berlin, available at: <http://epub.wu.ac.at/944/1/document.pdf>.

¹³ OECD, *Entrepreneurship at a Glance 2014* (2014), available at: <http://www.oecd-ilibrary.org/docs/server/download/3014031ec008.pdf?expires=1429546044&id=id&accname=guest&checksum=911B015436D85B6CA27D0E8141C1BA40>, accessed 5 May 2015, p. 86.

¹⁴ See D. Streit, *Public Incentives in Support of R+D and Innovation in the Federal State* (Diplomarbeiten Agentur diplom.de, 2003) and Neil Anderson, Carsten K.W. De Dreu, and Bernard A. Nijstad, *The Routinization of Innovation Research: A Constructively Critical Review of the State-of-the-Science*, 25 *Journal of Organizational Behavior*, no. 2 (2004), 147–173.

¹⁵ C.H.B. Cruz, *Ciência, Tecnologia e Inovação no Brasil: desafios para o período 2011 a 2015*, 10 *Interesse Nacional*, no. 3 (2010), 1.

¹⁶ Diogo R. Coutinho, "O direito nas políticas públicas", in Eduardo Marques and Carlos A.P. Faria (eds.), *A política pública como campo multidisciplinar* (São Paulo: Unesp; Rio de Janeiro: Fiocruz, 2013), pp. 181–200.

At first glance, the relationship between law and innovation policies is not so clear, especially considering that the use of the retrograde approach to the concept of law is not unusual.¹⁷ Through predominantly structural approaches, the meaning of law as a body of laws and regulations (normative acts), as a static legal, formal or procedural study is used. Therefore, the activity of “lawyers” and bureaucratic procedures that all innovators need to hire or overcome is seen, generally, as operational hurdles and lost costs in relation to the corporate goal. By this conservative perspective, law and, hence, its institutions, such as patents, trademark registration, among others, are “more steps” that an entrepreneur must go through in the bureaucratic labyrinth,¹⁸ as it could be producing goods and services instead. The law, using this concept, does not promote any change, serving only as a bureaucratic step in the innovation process.¹⁹

This predominantly structural approach, although accepted by the common sense, needs to be overcome by the consolidation of public policies that are focused on the promotion of innovation processes.²⁰ Law, in relation to the processes of development in its broadest sense, since the twentieth century, is no longer seen as an obstacle, but as an instrument that makes use of domestic laws to facilitate economic growth or as a base for the markets and a way to

17 See Kevin Davin and Prado, Mariana Mota, “Law, Regulation and Development”, in D. Malone et al. (eds.), *Development: Ideas and Experience* (Oxford: Oxford University Press, 2014); Ray Worthy Campbell, *Rethinking Regulation and Innovation in the US Legal Services Market*, 9 NYUJL & Bus, no. 1 (2012), 1–70; Gillian K. Hadfield, *Legal Barriers to Innovation*, 31 Regulation, no.3 (2008), 09–5; Gaia Bernstein, *In the Shadow of Innovation*, 31 Cardozo Law Review, no. 6 (2010), 2257; and Atilla Eris, “Legal and Administrative Constraints to Innovation in Universities”, International Seminar Innovative Approaches to Education in the Private Higher Education Sector (Madrid, Spain: Universidad Europea, 28–29 November 2013).

18 William Kingston, *Innovation, Creativity and Law*, vol. 12 (Berlin: Springer Science & Business Media, 2012), p. 183.

19 With this in mind, we can cite an interview snippet with Minister of US Supreme Court Justice Antonin Scalia, when asked about the quality of the lawyers who appear in court, the respondent stated that “Well, you know, two chiefs ago, Chief Justice Burger, used to complain about the low quality of counsel. I used to have just the opposite reaction. I used to be disappointed that so many of the best minds in the country were being devoted to this enterprise. I mean there'd be a, you know, a defense or public defender from Podunk, you know, and this woman is really brilliant, you know. Why isn't she out inventing the automobile or, you know, doing something productive for this society? *I mean lawyers, after all, don't produce anything.* They enable other people to produce and to go on with their lives efficiently and in an atmosphere of freedom” (“Scalia: ‘We Are Devoting Too Many of Our Best Minds To’ Lawyering” Law Blog (October 9, 2009), accessed 17 June 2015).

20 See R.D. Cooter, *Decentralized Law for a Complex Economy: The Structural Approach to Adjudicating the New Law Merchant*, *University of Pennsylvania Law Review*, no. 5 (1996), 1643–1696.

restrict state intervention.²¹ According to Trubek, the very idea that a legal system of a nation can affect social and economic changes can be traced to the eighteenth century.²²

In this context, it is important to highlight the approach that *Law and Development* studies show in relation to the function of the law and its main scholars, such as Trubek and Santos (2006), Tamanaha (2011), Davis and Trebilcock (2009), Coutinho (2013), Schapiro (2010), Dam (2006), Rodrik (2008), Kennedy (2006), Carothers (2006), Hausmann and Rodrik (2003) and Castro (2014).

In this scope, law and development demands “organized efforts to transform legal systems in developing countries to foster economic, political and social development.”²³ According to Trubek and Santos (2006), the concept and the function of law have undergone several changes since earlier studies in *Law and Development*.²⁴

Nowadays, neither the state nor the markets can, working alone, find the best way for development (*optimal path*). So Trubek suggests that the choices are made by using a strategy in which the two actors, through public–private partnerships, can find the best sectors to invest. This partnership must be accomplished by adopting dynamic testing procedures. Taking this into consideration, the author suggests that law cannot be an instrument for state intervention and not just be a neutral framework for the market to decide, exclusively, whatever to produce. For Trubek, law “should seek to establish partnerships between public and private sectors and institutionalize a process of mutual search for innovative solutions and optimal developmental paths.”²⁵

It is in this context that it becomes relevant to discuss the new roles of law, especially by a functional approach, analyzing its correlation with innovation. To do so, we use the approach used by Coutinho (2013), which analyzes law through four substrates, namely, (i) law as a goal; (ii) law as an institutional arrangement; (iii) law as a tool; and (iv) law as a demand articulator, in a democratic sense.

After all, has law got any effect on innovation? The answer is yes. Law can have a bad effect as it can have a good effect on innovation. There is no neutral position. Law can either impose obstacles to inventors, such as in the creative moment of

²¹ Trubek, David M., *Law and Development 50 Years On* (October 15, 2012). International Encyclopedia of Social and Behavioral Sciences (Forthcoming); Univ. of Wisconsin Legal Studies Research Paper No. 1212. Available at SSRN: <http://ssrn.com/abstract=2161899>

²² David M. Trubek, *Max Weber on Law and the Rise of Capitalism*, Wisconsin Law Review (1972), available at: <http://digitalcommons.law.yale.edu/fss_papers/4001/720>.

²³ Trubek (2012), *supra* note 21, p. 3.

²⁴ See Mariana Mota Prado, *What Is Law and Development?*, 11 Revista Argentina de Teoria Jurídica, no. 1 (2010), pp. 1–20.

²⁵ Trubek (2012), *supra* note 21, p. 6.

invention or in the search of investment in R&D, or it can offer incentives, facilitating business creation, accelerating the processes required to bring their products to market, such as authorization of a regulatory agency, and providing a secure legal environment, conducive to the inventors and their investors.

The difficulty itself is not to evaluate the influence of law in the innovation process, but that *how* this process occurs.

It is that innovation policies, considering its dynamic object, cannot be assessed the same way that a legal rule can be evaluated. In the evaluation of a rule, we use methods that show distance between the researcher and the object of study, which sometimes use scarce and fragile methodological resources, for example, the text of the law, without a systematic view, demonstrating clearly a structural character²⁶, so that the results are binary, either a law is valid or not. In the evaluation of public policies, the approach should be functional, requiring proximity of the researcher with its object, by assessing the practice/reality of the entities responsible to make these a reality. Therefore, public policies are evaluated, whether they are fulfilling their goals and the reasons they are being effective or not, by analyzing the whole context surrounding them.

In recent decades, law and public policy are getting increasingly interconnected. The legal norms are no longer limited to restrict and structure the state, but they are also responsible to structure programs and guidelines for future action of state bodies, through programmatic standards. An example is the 1988 Brazilian Constitution: in its article 21, IX, article 170, article 184, article 193, article 211, § 1, article 215, § 1, article 216, § 1, article 217, article 218, § 3, article 226, § 8 and article 227, §1, it is shown that objectives and results are intended by the constituent power, that is, the law, but how they are to become a reality is the role of public policy.

In this regard, it is noted that, according to Coutinho (2013), the purpose of public policies can be seen from at least two perspectives:

The first angle takes them as given, that is, as products of political choices for which the right or the lawyer have little or no interference. The aims and public policy goals would therefore be defined extralegally, in politics, being the legal framework to eminently instrumental function to accomplish them. Another view sees the law as himself, a defining source of own goals which serves as a means (Daintith 1987, 22). These two descriptions need not be seen as antagonistic or exclusive, as the law in regard to public policy can be seen as much as its constitutive element, and as with instrument, depending on the perspective and the chosen analysis criteria.

It is this connection between law and public policies that proves to be relevant to the classification presented by Coutinho (2013), which will be analyzed below.

26 Coutinho (2013), *supra* note 16.

First, the author, based on studies of Norbert Reich, cites that law can be seen as a goal of public policy. To see the law on this optical, he recognizes that legal rules can formalize goals and indicate the “arrival point” of public policies, as the Brazilian constitutional provisions, cited before, have done. The law thus would be understood “as a normative guideline (prescriptive) delimiting, although generally and without predetermining means, which should be pursued in terms of government action. It is, in that sense, a compass whose north are politically objective data, according to the limits of law.”²⁷

Thus, law is shown in the context of public policies to present cogent traits and binding policy decisions on a program of action, turning into a “duty” of the state and no longer a “faculty.”

Second, Coutinho also mentions that law can be seen as an institutional arrangement, so that it would be a “component of an institutional arrangement to share responsibilities, may, for example, collaborate to avoid overlaps, gaps or rivalries and disputes in public policy.”²⁸ The author, bringing the concern of Komesar (1994) on the inadequacy of purposive dimension shown on the law as goal, suggests that states should not care only with *who* decides and the institutional objective that is decided, but also involve substantially the decision of *what is decided*, so that the legal rules would serve as “a map of public policy responsibilities and tasks,” regulating procedures, structuring runs, as well as enabling the coordination between the actors involved in these policies. To Komesar, “the choice of socially relevant purpose may be required to determine the law and public policy, but it is far from enough. A ‘bridge’ is missing, often overlooked in the analysis, to assume that the outcome of a given right or public policy stems simply from socially relevant order of choice. This absence is the institutional choice.”²⁹

Third, law, to Coutinho, can be seen as a public policy tool. In this light, it serves as “a category of analysis is to emphasize that the selection and formatting of the means to be employed to pursue predefined goals is a legal job.” For example, he cites the “induction mechanism design or reward for certain behaviors, the sanctions design, selecting the type of standard being used (more or less flexible, more or less stable, more or less generic)” which are examples of how law can be used as a tool for public policies to achieve their stated aims. In this context, the flexibility and revision of public policies would be possible, allowing experiments to be performed, respecting, of course, stability and legal

²⁷ *Idem*, p. 19.

²⁸ *Ibidem*.

²⁹ Neil K. Komesar, *Imperfect Alternatives: Choosing Institutions in Law, Economics, and Public Policy* (Chicago, IL: University of Chicago Press, 1994), p. 5.

certainty inherent in the legal system, enabling thus the “calibration and operational self-correcting these policies.”³⁰

Finally, law can be approached as a demand articulator, in a democratic sense. Law, for this purpose, intends to “provide (or depriving) the deliberative mechanisms policies, participation, consultation, collaboration and joint decision ensuring thereby that they are permeable to participation and not insulated in bureaucratic rings.”³¹

In addition to allowing the public scrutiny and their participation as stakeholders, ensuring the minimum requirement of democracy also serves as a bond for the actors responsible for these policies and their oversight, so that law is “comparable to a kind of belt transmission in which agendas, gestated ideas and proposals circulating in the public sphere and jostle for space in technocratic circles.”³²

For the purposes of this study, law, using the meanings studied by Coutinho, will be analyzed as a tool and as an institutional arrangement for public policies of science, technology and innovation, using the senses of the law as a goal and as a social participation channel (demand articulator) as complementary. Hence the question, how these concepts of law correlate with innovation policies?

The law, being seen as a tool, fits perfectly with the needs and peculiarities of encouraging innovation policies. First, because it addresses the law as the formatting of instruments that are going to be employed in the pursuit of the predefined objectives by political spheres. In Brazil, for example, the political sector, especially the Ministry of Science, Technology and Innovation (MCTI), decides on which specific sectors the state should encourage innovation and the law enters in this context to demonstrate *how* the law as a tool can help make this strategic outcome is achieved. A classic example of the aforementioned is the creation of mechanisms of induction or reward for certain behaviors, for example, we can cite the Good Law (Lei do Bem) which grants tax incentives to companies that conduct research and technological innovation development for public policies to achieve their stated aims.

It is important to note two features of this approach: flexibility and revisability of these policies. In the process of innovation, all dimensions of everyday life, whether historical-political, empirical or normative, whether economic or theoretical, get confused. An approach that in the period of its preparation gave the impression that it would be easy to apply and be effective can be proven

³⁰ *Idem*, p. 21.

³¹ *Idem*, p. 22.

³² Coutinho (2013), *supra* note 16, p. 22.

difficult. In this context, it is possible, without major bureaucratic obstacles, to try new approaches, reviewing public policy, correcting it and allowing self-correcting these policies.

Law serves as an instrument to provide cogency for the proposals of policies of innovation, that is, linking policy decisions that, in Brazil, are fragile, to what was decided, under penalty of the judiciary intervention in the administrative sphere, requiring its implementation. This formalization is crucial because it shows that the administrative level, responsible for carrying out these policies, does not have free discretion on this subject, since the law uses measures to ensure accountability on these policies, intervening in case the responsible does not comply without justification, as well as promote accountability.

However, this approach does not seem complete, considering that it leaves the role of institutions in a supporting role. So it is important to adopt the law as an institutional arrangement concept, as this approach allows for coordination and cooperation between the actors and institutions responsible for these policies, not only because they allow a link between them but also considering they admit a division of responsibilities for each institution. This meaning proves to be fundamental in the Brazilian context, given the large number of institutions responsible for science policy, technology and innovation and little coordination between them, as will be seen in the following section.

Law, as highlighted by Coutinho,³³ is presented as a way to ensure an environment conducive to innovation developments. This influence occurs through (a) legal security: a guarantee that, if necessary, the entrepreneur can present a demand to an impartial judge who will decide swiftly, with a decision that will be, as far as possible, predictable in light of the current legislation and not modified at the mercy of political decisions; (b) intellectual property: the law provides safeguards to promote the activity of the inventor, so that he/she has sufficient incentives to continue his/her activities. For example, it provides the possibility to deposit patents and trademarks registration. Moreover, it is not limited to providing such means, but also provides effective jurisdictional instruments in case of violation of these rights, as in the case of injunctive relief; (c) investment security: ensures that investors know their rights and duties with the company and with the state; (d) tasks coordinator: the law, by using rules and principles of public law, provides the necessary framework for a joint coordination between entities responsible for these policies.

33 *Ibid.*, pp. 6–13.

4 Behind the law: why there is a mismatch between innovation policies and economic results?

Verifying that the law has a correlation with the innovation process, we ask: why in most cases, not only in Brazil but also in other countries (Spain³⁴ and Italy,³⁵ for example), is there a mismatch between the proposed public policies to encourage science, technology and innovation and the economic results that can be evaluated after their implementation? Is the “quality of the law” a problem? Is the lack of effectiveness of public policies? Would it be a lack of coordination among the entities responsible for promoting these incentives? With the objective to answer these questions in this section, we discuss the four phases of the implementation of public innovation policies: (a) identification of a problem; (b) formulation and legitimacy of goals and programs; (c) the implementation of the programs; and (d) control of the impacts of these policies. We investigate, critically, the possible obstacles found in these moments that affect the effectiveness of policies, through a juridical perspective. Thus, observing these questions, it becomes possible to, in the next section, analyze its application in the setting of public policy to encourage science, technology and innovation, and, more specifically, as a case study, their application in the Innovation Act.

Therefore, we will analyze six elements of innovation’s public policy that have sufficient decisional opening to affect their economic results, namely (a) the object of these policies – innovation; (b) the quality of the laws that turn public policy into actions; (c) the execution and implementation of these policies; (d) the willingness of private actors to innovate; (e) macroeconomic factors that affect the effectiveness of these measures; and (f) review and dynamic adjustment of public innovation policies. The first element affects the identification of a problem phase; the second element is presented in the formulation phase of innovation policies; the third, fourth and fifth are the implementation of these policies’ phase; and the sixth is the control of the impacts of these policies’ phase.

Public policies, as a rule, pass through the following stages: (a) it is observed and identified as a problem that deserves the attention of the state; (b) goals and objectives of these policies are made through studies, reports,

34 España, Ministerio de Economía y Competitividad. *ERAC Peer Review of Spanish Research and Innovation System Final Report*, available at: <www.mineco.gob.es/stfls/mineco/comun/pdf/140801_Final_report_public_version.pdf>, accessed 3 July 2015, p. 22.

35 R. Coletti, *Italy and Innovation: Organisational Structure and Public Policies* (Roma, Italy: Centro Studi di Politica Internazionale, 2007).

analyses and negotiations, seeking to examine the structuring possibilities of such policies; (c) implementation of the public policy, through the plan and planning, involving the actors of these policies and their own budget allocation for its implementation; and (d) evaluating and analyzing the impacts and the effectiveness of the standard, giving what aspects need to be improved so that the public policy can reach its goal in a better way, faster and less expensive.

Applying this process above, the context of public policies for science, technology and innovation in Brazil can be illustrated as follows (Figure 1)³⁶:

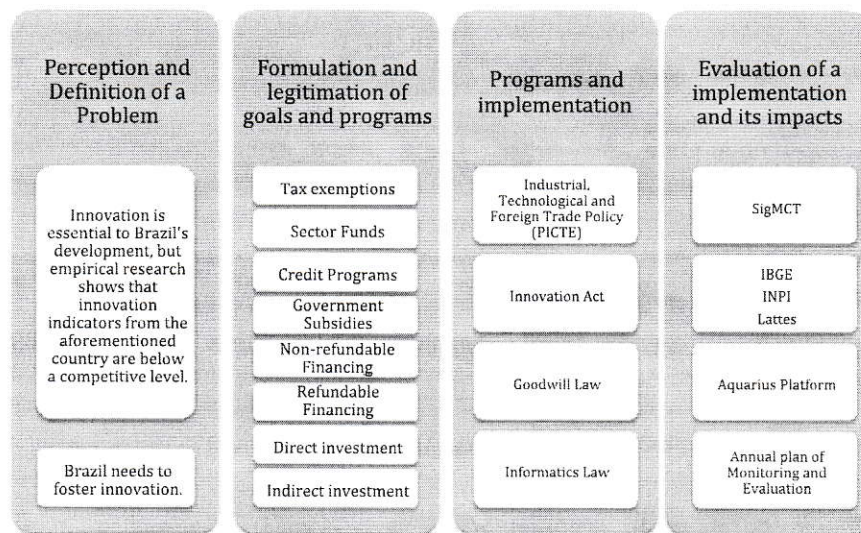


Figure 1: Policy cycle of Brazil's innovation public policies.

Following this process, this section will be subdivided into four sections, each for a moment of the innovation process, analyzing the possible reasons of its ineffectiveness.

4.1 Perception and definition of a problem

In the case of public policies on science, technology and innovation in Brazil, the identified problem lies in the lack of science, technology and innovation in the Brazilian productive sector.

³⁶ Please note that these are only the main instruments. There are others that are complementary (they are not listed).

The innovation process is linked to the development of a nation. With its encouragement, it increases the competitiveness of the economy, providing greater job creation, a more robust and sustainable GDP (gross domestic product) growth and increase in labor quality.³⁷ Even small innovations generate significant economic and social impacts in the future of a nation.³⁸

Although many use the term as a buzzword, there is no doubt that innovation produces economic effects on a society. Arbix notes that empirical research shows that technological innovation and entrepreneurial effort in that direction interfere positively and directly in Brazilian exports. Innovation processes are critical to improving the Brazilian production, education of the workforce, wages, turnover and productivity of both companies and their employees and which are part of the state.³⁹

Considering the importance of innovation, Brazil realized and identified this problem. In the early 2000s, funds for innovation had an average of 1.5 billion reais per year. With the changes that occurred in 2004 after the perception of this problem, public funding for innovation reached the level of 10 billion reais per year in 2010. During this period, the state invested over 50 billion reais in these funds.⁴⁰

Since 2004, as will be seen in the third section, four major guidelines and standards that demonstrate the political will to encourage innovation were created; these are Industrial, Technological and Foreign Trade Policy (PICTE) (2003), Innovation Act (2004), Goodwill Law (2005) and Informatics Law (2004). Besides there were changes of industrial policies taking into consideration increasing innovation, since the PICTE (2004–2008) after the Productive Development Policy (PDP) (2008–2010) and, finally, in plan Greater Brazil (2011–2014).

Accepting that the Brazilian government has identified the problem of these public policies, are there any bottlenecks or legal/policy obstacles that can contribute to the ineffectiveness of such policies and laws that are aimed to encourage innovation? At this stage, the only mistakes that could be made would be to identify the problem with wrong boundaries, for example, stating that the lack of innovation would affect only part of the sector or it could be a conceptual problem, consider (or not) something as innovative, even if international methods and the private market fail to consider that way.

37 G. Arbix, *Inovar ou Inovar: A Indústria Brasileira Entre o Passado e o Futuro*, USP (São Paulo: Papagaio, 2007), p. 21.

38 *Idem*, p. 20.

39 *Idem*, p. 21.

40 F. Rocha, *Does Governmental Support to Innovation Have Positive Effect on R&D Investments? Evidence from Brazil*, Proceedings of the 41st Brazilian Economics Meeting No. 165 (ANPEC- Associação Nacional dos Centros de Pósgraduação em Economia, Brazilian Association of Graduate Programs in Economics, 2014), p. 44.

Both did not occur in Brazil's case. First, the first public policy – PICTE – that showed Brazil's focus on innovation exposed the extent of the problem, encompassing various actors of the productive sector. In this sense, the very PICTE reports that "Brazil needs to structure a National Innovation System that allows the articulation of agents aimed at the innovation process of the productive sector, in particular: companies, public and private research centers, development agencies and funding technological development, supporting metrology institutions, intellectual property, technology management and knowledge management, institutions supporting technology diffusion."

Second, although the concept adopted by Brazilian law does not have the breadth of meaning accepted by the OECD, one cannot envision any conceptual obstacle for the effectiveness of those rules. The concept adopted has sufficient breadth to encompass program objectives of these policies.

4.2 Formulation and legitimation of goals and programs

In the present phase, the contents of innovation policy will be pointed out, individualizing the objectives and results that the state wants to achieve and how these will be achieved (instruments) and in what time frame, identifying the substance of those policies.⁴¹ It should be emphasized that planning is a political act, whose rationality cannot be verified as they can be considered aspirations of different groups and parties that have an interest in innovation policies.⁴² There is no neutral planning.⁴³ The formation and legitimization of goals and programs are the "result of a complex and dynamic interaction of economic, political and ideological,"⁴⁴ so that "the results of economic policies do not depend only on its economic coherence, but also of their political viability and institutional options."⁴⁵

The law has the function to instrumentalize this legitimation of the objectives of policies of innovation, allowing the subject, either through legislature or through the administrative level, to verify legal ways to achieve a certain goal. Thus it presents possibilities for programs that do not meet obstacles in labor

⁴¹ *Idem*, pp. 41–42.

⁴² Henrique Rattner, *Planejamento e Bem Estar Social* (São Paulo: Editora Perspectiva, 1979), p. 156.

⁴³ Bercovici, Gilberto, "Planejamento e Políticas Públicas: Por uma Nova Compreensão do Papel do Estado", in M.P.D. Bucci (ed.), *Políticas Públicas: Reflexões Sobre o Conceito Jurídico* (São Paulo: Saraiva, 2006), pp. 79–98, p. 145.

⁴⁴ *Idem*, p. 143.

⁴⁵ *Idem*, p. 144.

rights, consumer and retirees protection, among others, which are fundamental to the constitutionality and legality of public policy.

In this sense, Marques (2013) points out that “looks less like a design activity, in which the finding of a perfectly formulated idea is the main goal, and more with a craft in which the most important is the adequacy of solutions to problems but also to local conditions in terms of implementation and main actors.”⁴⁶

In Brazil, the formulation of public policies on science, technology and innovation is multifrontal. In order to create conditions for a more friendly market environment for innovation and to the flow of knowledge, key points for a “new standard of competitiveness,”⁴⁷ the Brazilian state encourages innovation through tax exemptions, funds sector, credit programs, government subsidies, nonrefundable financing, refundable financing (through legislation, financing lines in state banks or sector funds), among others, housing and enabling thus both small entrepreneurs and large companies to use them to improve their productivity and market position. Moreover, it produces annual reports on the theme through institutions such as Applied Economic Research Institute (IPEA) and Brazilian Institute of Geography and Statistics (IBGE), as well as through partnerships with universities and research institutions [National Scientific and Technological Development Council (CNPq), for example].

Demonstrating what is the formulation and legitimacy of the goals and programs of innovation policies, it is worth asking if there are any bottlenecks or the legal/policy obstacles that can contribute to the ineffectiveness of such policies and laws that are aimed to encourage innovation. There are four possible failures that may contribute to this situation: (a) the reports and studies on alternative policies are carried out with the wrong methodology, so that the research on the current situation of the sector ends up being wrongly studied; (b) presentation of possibilities/alternatives is made in incorrect ways; (c) lack of precision of its objectives and targets; and (d) lack of planning.

The first two are not envisioned in the Brazilian reality. First, reports and studies on innovation policies are carried out by institutions with national and international support in the area, such as the IPEA, the IBGE, Management and Strategic Studies Center (CGEE) and several universities and research institutions that carry through open calls and notices from the CNPq and the MCTI. In addition, most of these studies and reports are published, freely accessible in web sites of

⁴⁶ Eduardo Marques, “As Políticas Públicas na Ciência Política”, in Eduardo Marques and Carlos Aurélio Pimenta de Faria (eds.), *A Política Pública como Campo Interdisciplinar* (São Paulo: Editora Unesp; Rio de Janeiro: Editora Fiocruz, 2013), p. 44.

⁴⁷ Arbix (2007), *supra* note 37, p. 31.

these institutions so that any researcher or expert in the field can assess and criticize the methodology used and the conclusions that were inferred.⁴⁸

Second, it is the possibility of few public policy alternatives that entrepreneurs can use to take advantage. In the Brazilian scenario, it is the opposite. The state allows entrepreneurs to use tax exemptions (e.g., Goodwill Law), sector funds (e.g., National Fund for Scientific and Technological Development – FNDCT), credit programs (e.g., National Bank for Economic and Social Development – BNDES – Inovação), government subsidies (Innovation Act), nonrefundable financing and refundable financing (e.g., Financier of Studies and Projects – FINEP). The state also provides several possibilities, each suited to the type of company, company size, number of employees, corporate goals, expansion plans, so that in the current scenario little alternatives become an untenable assertion. In view of certain rules and principles adopted by Brazilian law, such as the principle of equality and the principle of efficiency, the admission rules in each of these alternatives should be proportionate and fair in relation to the objective that tries to achieve.

The last two, however, can be observed in the Brazilian reality. Due to the lack of precise objectives, it is possible to observe the all-embracing coverage of the targets set by the competent bodies. The first article of the Innovation Act, for example, reports that this law establishes measures for encouraging innovation and scientific and technological research in the productive environment, aiming at capacity building and technological autonomy and industrial development of the country in accordance with articles 218 and 219 of the Constitution. Article 218, in turn, states that the state shall promote and encourage the scientific, research and scientific and technological capacity and innovation. The Explanatory Memorandum of the Good Law states that the objective is that the Federal Government should stimulate innovation in the company by granting tax incentives for innovation and scientific and technological research in the production environment. The Informatics Law says that its objective is training and competitiveness of the computer industry and automation.

It is difficult to measure these goals. In general, these are not considered as goals, but programmatic objectives that the Federal Government sees as “goals” of achieving technological autonomy and industrial development of the country, which make a serious assessment for their effectiveness in difficult elaboration.⁴⁹

⁴⁸ Andrei Pittol Trevisan and Hans Michael Van Bellen, *Avaliação de Políticas Públicas: Uma Revisão Teórica de um Campo em Construção*, 42 *Revista de Administração Pública*, no. 3 (2008), 529–550, 542.

⁴⁹ Arbix (2007), *supra* note 37, p. 27.

It is noteworthy, however, that since 2012, that has changed. With the enactment of Law 12.593, which seeks to elaborate the Multi-Year Plan (2012–2015), the Ministries, including the MCTI, create their plans, highlighting its objectives and targets in these period. In its Multi-Year Plan (PPA 2012–2015), for example, the MCTI provides its actions and programs, their goals, the institutions responsible for investigating and method to be used. They are precise goals that better define the political and institutional objectives, enabling a better assessment by the competent bodies.

However, the vagueness of Brazil's program goals does not reach the effectiveness of legal and public policy standards in a substantial way. First, because, as previously stated, it is natural to use vague goals for laws that have a greater chance of approval by the Legislature and the Executive. Second, the use of indeterminate terms is not uncommon in the Brazilian legal system, since the Federal Constitution has several vague terms that must be completed in its implementation, so that the conceptual and teleological opening does not justify satisfactorily the ineffectiveness of an innovation policy.

The lack of planning, with focus on the close connection with the implementation of public policies, “plan,” will be analyzed in detail in the next section.

4.3 Programs and implementations

This is the moment that the coordinating role played by the Law shows its relevance, answering some questions, deciding, as highlighted by Coutinho,⁵⁰ what is going to be done? Who does what? Who interacts with whom and in what way? Who interprets the law? Who enforces these laws and policies? Who decides; among other elements relevant to the coordination and effectiveness of innovation policy. The law serves to “compel whom operates to justify and motivate the decisions on the prioritization, selection of media, formulate implementation plans, resource allocation and others considered of interest”⁵¹ in order to shape the institutions that are responsible for the interpretation, elaboration and implementation of these policies.⁵²

It is at this time that the biggest bottleneck of innovation policies in Brazil can be seen. Although there are four examples of policies or laws of substantial importance (PCTE, Innovation Act, Goodwill Law and Informatics Law) that

⁵⁰ Coutinho (2013), *supra* note 16, pp. 6–13.

⁵¹ *Idem*, p. 7.

⁵² M.P.D. Bucci, “O Conceito de Política Pública em Direito”, in M.P.D. Bucci (ed.), *Políticas Públicas: Reflexões Sobre o Conceito Jurídico* (São Paulo: Saraiva, 2006), pp. 1–49, p. 37.

made it through the previous times without substantial changes and have been implemented in scenario, the effectiveness of these rules is not observed in these environments. Why?

The biggest problem is not the quality of the law (they are well structured and written texts as the correct legislative technique), since they follow the principles of Legistics being clear and cohesive (although there are some imperfections that will be demonstrated in the next section), nor is the private entities – businesses and entrepreneurs – whom these standards are addressed, but the coordination and articulation of federal entities in charge of these policies, which are consequences of inadequate planning.⁵³

In Brazil, the difficulty of public bodies to suit the purposes of development policy coveted by the state is not new.⁵⁴ There is no continuity or institutionalization of structures planned for increased compliance of the objectives of policy, so that every plan ends up being drawn up by a different entity of the public administration.⁵⁵ The implementation, in turn, also finds it difficult, as there is no coordination and sound relationship between the sectors responsible for these policies.⁵⁶

This occurs, mostly, as Bercovici suggests, because of internal divisions of the public administration. According to the author, “each administrative body is representative of different political interests, with different strengths every time.”⁵⁷ The responsible actors for the direction of these entities are not experts in the field and are, often, pointed out due to political indications rather than his/her accomplishments. The ex-Minister of science, technology and innovation, Aldo Rebelo, for example, before assuming this ministry, was minister of sports, a totally different area when compared with innovation. The ex-minister, among other positions that shows its inadequacy for the role, denies the global warming phenomenon, stating that “no scientific evidence of global warming projections,”⁵⁸ in addition to already having introduced a bill that prohibited “adoption by any public agency at all levels, of any technological development

53 “The PITCE ran into problems of coordination and lack of detailed plans for an ambitious transformation of the Brazilian economy to the standards of Silicon Valley. This industrial policy, in Mansueto Almeida’s opinion, faced the dilemma between what one wants (a country with a productive structure specialized in high technology products, with exports of goods and services of high added value) and what one already is (a country with a diversified production structure, with competitive advantages in the production of agricultural products, minerals and steel). This “shock of realism” led to the formulation of a broader and more pragmatic industrial policy.” Rafael AF Zanatta, *The Risk of the New Developmentalism: “Brasil Maior” Plan and Bureaucratic Rings*, available at: SSRN 2120002 (2012), p. 12.

54 Bercovici (2006), *supra* note 43, p. 147.

55 *Idem*, p. 147.

56 *Ibidem*.

that spared manual labor without proof that the social benefits accrued from the implementation outweigh the social cost of unemployment generated.”⁵⁹

Now is it not out of the question that this lack of coordination is intended by the political powers responsible for the area, hampering the implementation of its political rivals. In this context, the “confluence of the policy and the law in this respect is given in a field that is sharper than the participation of each of the languages.” In politics, in this case, it glimpses “the model, considering the interests concerned refereeing conflicts, according to the distribution of power, in addition to equate the issue of time, distributing the expectations of results between short, medium and long term.”⁶⁰

An example of this lack of coordination can be seen in the case of SEED (Startups and Entrepreneurship Ecosystem Development), which is an accelerator program, from Belo Horizonte, established in 2013. Since 2013, the program is responsible for fostering 73 companies in 12 countries, which together invoiced R \$23 million, creating 145 jobs. It happened that, in 2015, when the new governor took office, there was an exchange of department responsible for the project, which caused a political fight for the command of the project. Furthermore, although the governor had stated that the program faced no risk in the government’s focus revaluation, the program was eventually terminated without any warning or advance to companies that were part of it.⁶¹

Thus, the first bottleneck that Brazil’s innovation policies must overcome is the lack of coordination and articulation between the responsible actors and the actions and programs they perform. Bucci states that “the environment in which it gives government action is fragmented and borders on the chaotic.”⁶² So rationalization and centralization of adequate government actions are necessary, toward a proper direction, whose steps are clear to the actors involved and the relations between them,⁶³ for example, a minimum of strategic thinking behind the government action.

⁵⁹ Portal Vox, *Novo Ministro da Ciência e Tecnologia é Autor de Projeto de lei Contra as Inovações Tecnológicas*, available at: <<http://noticias.portalvox.com/politica/2014/12/novo-ministro-da-ciencia-e-tecnologia-e-autor-de-projeto-de-lei-contra-inovacoes-tecnologicas.html>>, accessed 2 August 2015.

⁶⁰ M.P.D. Bucci, “Notas para uma metodologia jurídica de análise de políticas públicas”, in Cristiana Fortini, Júlio César dos Santos Esteves, and Maria Tereza Fonseca Dias (eds.), *Políticas Públicas Possibilidades e Limites* (Belo Horizonte: Editora Fórum, 2008), pp. 225–260, p. 37.

⁶¹ Estadão. *Seed fecha as portas em Minas Gerais e startups são ‘despejadas’*, available at: <<http://blogs.estadao.com.br/start/seed-fecha-as-portas-em-minas-gerais-e-startups-sao-despejadas/>>, accessed 2 August 2015.

⁶² *Idem*, p. 252.

⁶³ *Ibid.*

Law, in this context, serves as cogent force of government actions, ensuring that planning takes place in a satisfactory way and is fulfilled. If the political agent responsible for planning acts in an offending way to the objectives of public administration, not investing in sectors arranged in the Annual Budget Law, for example, this can be judged as a Responsibility Crime, so the political agent can lose his/her position, with the possibility of a five-year disqualification, and hence cannot be elected during the aforementioned period (Law no. 1.079/1950), or may also be convicted by Act of Administrative Misconduct and can also be condemned by the sanction presented above, as well as be required to pay back the damage caused to public administration (Law no. 8429/1992).

In the Multi-Year Plan 2012–2015 of the MCTI, in order to see what we mentioned before, it is possible to verify the large number of programs, which at first sight is noteworthy, and even more responsible units. This plan is divided into programs, which, in turn, is subdivided into actions whose implementation has a responsible unit. As an illustration (Table 1), it is possible to check the decentralization of units responsible for actions in each program, totaling 275 actions.

In this plural context, seen in Table 1, the process of implementing a public policy that is collaborative and communicative, not only among state agencies but also among entrepreneurs, engineers, scientists, users and institutions involved in the interactions' productive environment,⁶⁴ finds difficulty in the Brazilian political or government setting.

Poor legal education contributes to this situation. In Brazil, jurists are not prepared to solve puzzles, going beyond the cold text of law books or what the Courts say. There is a formal and positivist education,⁶⁵ which are one of the causes of the small number of studies on public policy, and when they are published, most of them are done with fragile and superficial methodological resources, in most cases through theoretical studies and not empirical research. There are several surveys that state the obligations of state and the need for effective public policies, but do not show the reasons why they are not working; they restrict the discussion to the theoretical aspect of the rules, without learning about them and confronting "its intricacies and details, watching them, describing them and understanding them."⁶⁶

The second concern would be about the budget of those entities in charge. Are they sufficient to fulfill their function? The annual budget of the MCTI in 2015 is

⁶⁴ Arbix (2007), *supra* note 37, p. 29.

⁶⁵ Coutinho (2013), *supra* note 16, p. 4 and políticas and M. Castro, *New Legal Approaches to Policy Reform in Brazil*, 1 *Revista de Direito da Universidade de Brasília*, Brasília, no. 1 (2014), pp. 31–61, at 53.

⁶⁶ Coutinho (2013), *supra* note 16, p. 24.

Table 1: Multi-Year Plan 2012–2015 of the MCTI.

Program	No. of actions	Responsible unit(s)
Inactive Pension and Pensioners of the Federal Government	1	CGRH, CNPq, CNEN, AEB
Management Program and Maintenance of Infrastructure of Federal State Companies	3	FINEP
Special operations: Compliance with Judgments Judicial	11	CNPq, CNEN, INB, NUCLEP, CEITEC
Special Operations: Financing with Return Biodiversity	1	FINEP
Science, Technology and Innovation	12	SEPED e CNPq
	104	INPE, ASSIN, CBGE, CNPq, CNEN, LNA, FINEP, SCUP, SEPED, SEXEC, MPEG, INPA, CBPF, INSA, ON, FETENE, CETEM, IBICT, LNCC, CTI, SPOA, MAST, INT, SETEC, SEPIN, SECIS
Communications for Development, Social Inclusion and Democracy	2	SECIS
Forests, Prevention and Control of Deforestation and Fires	2	INPE
Risk Management and Disaster Response	3	SEPED
Strategic Management of Geology, Mining and Mineral Processing	1	INB
Sea, Coastal Zone and Antarctica	2	CNPq
Climate Change	7	INPE e SEPED
Productive Development	6	CLEITEC e NUCLEP
Space Policy	26	AEB e INPE
Nuclear Policy	24	CNEN e INB
Management and Maintenance of the MCTI	70	SCUP, CGRH, INB, NUCLEP, CNPq, CENEN, AEB, CGRL, CEITEC, SEXEC, SCUP, CGEE, CTNBio, ASCOM

Note: Elaborated by the author.

Source: MCT (2012).

R\$9,909,478,878⁶⁷ (about 3 billion dollars). However, given the austerity situation of Brazil's current economic scenario, it suffered a cut of R\$1,486 billion in its budget,⁶⁸ being below, for example, other ministries that, although they are relevant to the Brazilian productive sector, do not deserve the same priority considering

⁶⁷ Câmara dos Deputados, *Anexo II – Despesa dos Orçamentos Fiscal e da Seguridade Social, por Órgão Orçamentário*, available at: <<http://www.camara.gov.br/internet/comissao/index/mista/orca/orcamento/or2015/lei/ANL13115.pdf>>, accessed 30 June 2015.

⁶⁸ ADESG, *SBPC Critica Corte Orçamentário na Área de Ciência, Tecnologia e Inovação*, available at: <<http://www.adescg.net.br/noticias/sbpc-critica-corte-orcamentario-na-area-de-ciencia-tecnologia-e-inovacao>>, accessed 30 June 2015.

their limited influence in the Brazilian productive–industrial sector, such as agriculture, livestock and supply, which has a budget of R\$11,737,682,086.

These values are considered low by the government bodies and productive sector. By comparison, the total government spend on R&D in the area is less than that of Volkswagen (13.5b), Samsung (13.4b), Intel (10.6b), Microsoft (10.4b), Roche (10b),⁶⁹ among other companies. Note the insignificance of the Brazilian budget when compared to federal budget spending by the United States on R&D in science, technology and innovation, that is, \$135.4 billion.⁷⁰ It is 4,500% the amount spent by the Brazilian federal government.

Finally, the third obstacle that can be verified is that despite the large amount of credit lines and forms of support for innovation some are inadequate.⁷¹ The current model of stimulus policies to innovation processes favors tax exemptions and credit concessions. Both activities benefit large companies that have a greater amount of resources, proving that conditions have to repay loans and already have the resources to invest in the area and benefit from tax exemption. The entrepreneur who is at the start of their journey and in need of initial funds does not have the same conditions. He/she cannot get loans, because he/she does not have sufficient resources to prove that he/she will be able to pay them, nor does he/she have sufficient resources to invest in innovation, taking advantage of a, a posteriori, tax exemption.

In this sense, the National Industry Confederation, in its Industry Strategic Map 2013–2022, suggests that the government should strengthen the lines of nonrefundable grants.⁷² Although the government is not getting their money back, it will be encouraging innovation by its indirect effects, as seen in the second section of this study.

In the history of innovation policies in Brazil, it is observed that there is not a convergence between the interests of the business community and the government, which is critical for effective implementation of these policies. It is noteworthy, however, that in recent years this rationality is changing, especially with the announcement of the plan “Inova Empresa.”

Recently, in 2013, the Brazilian government announced the plan “Inova Empresa,” which provided R\$32.9 billion for Brazilian companies to invest in

⁶⁹ Strategy&, *The Top Innovators and Spenders*, available at: <<http://www.strategyand.pwc.com/global/home/what-we-think/innovation1000/top-innovators-spenders>>, accessed 30 June 2015.

⁷⁰ White House Gov, *The 2015 Budget: Science, Technology, and Innovation for Opportunity and Growth: Science, Technology, Innovation, and STEM Education in the 2015 Budget*, available at: <<https://www.whitehouse.gov/sites/default/files/microsites/ostp/Fy%202015%20R&D.pdf>>, accessed 30 June 2015.

⁷¹ Arbix (2007), *supra* note 37, p. 26.

⁷² Confederação Nacional da Indústria, *Financiamento à Inovação: A Necessidade de Mudanças* (Brasília: CNI, 2014), p. 16.

their sectors of innovation and technology, seeking to make them competitive in the international market, fostering business innovation plans. The project objectives were the reduction of bureaucracy and administrative simplification, reduction of assessment deadlines, credit decentralization and economic support to medium and small enterprises, always focusing on articulation of various public institutions programs, with the coordinated use of instruments: credit grant, equity and nonrefundable, providing, for example, loans with low interest rates (2.5% per annum to 5% per year) and long-term discharge (under 12 years).⁷³

The plan has four lines of funding for research, development and innovation (R&D): economic subsidies to companies (R\$1.2 billion); promotion to partnership projects between research institutions and companies (R\$4.2 billion); equity interest in technology-based companies (R\$2.2 billion); and loans to companies (R\$20.9 billion)⁷⁴ and other R\$4.4 billion provided by partner institutions (ANP, ANEEL, Sebrae and Anatel).

Although, as mentioned before, credit concessions that are responsible for most of the Inova Empresa plan's value have a greater tendency to be used solely by big companies, it can be considered an important project to the productive environment and innovation in Brazil, not only because of the high amounts of money being invested but also by the guidelines guiding the project, namely the bureaucracy, administrative simplification, reduction of the evaluation deadlines, credit decentralization and economic subsidies, which are long-standing requests of entrepreneurs seeking to innovate. In the market, especially the technology sector, the difference of a few months that the project passes through reviews can affect the future of the product.

4.4 Evaluation of public policies' implementation and impacts

Finally, after the implementation of policies, there is the time to evaluate the implementation itself and its outcomes/impacts in the scenario that is intended.

Most state policies can be quantified by known and measurable variables. De Nigri, cites, for example, that the expected results of a policy in infrastructure may be measured: the number of roads, airports and ports built; quality of roads; aircraft flow at a particular airport; and so on. Health policies can be assessed through the

73 Brasil. MCT, *Plano Inova Empresa*, available at: <http://www.mct.gov.br/upd_blob/0225/225828.pdf>, accessed 3 July 2015.

74 Brasil. Palácio do Planalto, *Plano Inova Empresa disponibiliza R\$32.9 Bilhões Para Aumentar a Competitividade Externa das Empresas Brasileiras*, available at: <<http://www2.planalto.gov.br/excluir-historico-nao-sera-migrado/plano-inova-empresa-disponibiliza-r-32-9-bilhoes-para-aumentar-a-competitividade-externa-das-empresas-brasileiras>>, accessed 3 July 2015.

reduction of mortality rates in a given region and/or certain disease and education policies can also be evaluated through student performance on specific tests.⁷⁵ Stimulus policies to innovation processes, in turn, are not easily measured. There are so many factors that affect the process of innovation and knowledge, from the concurrence of government action in one area to macroeconomic factors, which can stimulate (or not) innovation.

Thus, it is common to use measurable indicators such as the number of patents, number of scientific publications in international journals or sums spent by the state and businesses in the area, to verify the results of innovation policies. In this sense, for example, the National Strategy for Science, Technology and Innovation 2012–2015 prepared by the Ministry of Science and Technology evaluates the outcomes through quantitative indicators.

Such indicators used by Brazil are methodologically weak to evaluate this type of policy. These indicators present evidence of innovation, but do not show if innovation happens, that is, does “not itself determine the actual existence of a problem, but they are interpretations that help demonstrate the existence of an issue. Thus contributing to the transformation of issues into problems, especially when they reveal quantitative data, that are able to demonstrate the existence of a situation that needs attention.”⁷⁶ Innovation is a subjective matter, a sense that the product, service, organization model and marketing model brings to the consumer/user, which makes him/her consume or adopt such models. Thus, there is a need for not only a quantitative but also a qualitative assessment approach, the responses that go beyond what can be observed by descriptive indicators.⁷⁷

Brazil’s concern with the evaluation of public policies is new.⁷⁸ In 2012, the MCTI through the ordinance MCTI no. 397/2012 implemented the Policy Monitoring and Evaluation MCTI, trying to analyze, monitor and evaluate innovation policies implemented or financed by the said Ministry, taking into account relevant aspects such as internal training and effective participation of managers in the debate on methodologies and results of the evaluation process and the availability of results for society. As a result of this new policy, one can cite the Annual Monitoring and Evaluation Plan – PAMA 2013/2014.

In these plans, the following indicators are analyzed (Table 2).

75 F. De Negri, *Monitor de Políticas Públicas de C,T&I: A Política de Monitoramento e Avaliação do MCTI*, 3 *Revista Brasileira de Planejamento e Orçamento*, no. 1 (2013), 65–79, at 69.

76 Gilberto Hochman, Marta Arretche, and Eduardo Marques, *Políticas Públicas No Brasil* (Rio de Janeiro: Fiocruz, 2007), p. 90.

77 De Negri (2013), *supra* note 75, p. 70.

78 F.L. Costa and J.C. Castanhar, *Avaliação de Programas Públicos: Desafios Conceituais e Metodológicos*, 37 *Revista de Administração Pública*, no. 5 (2003), 969–992, at 970.

Table 2: Annual Monitoring and Evaluation Plan indicators.

Group of indicators	Type of information	Main sources of information	Focus
Basic indicators	Physical and financial execution Restrictions (obstacles)	Management information system of MCTI (SigMCT)	Implementation/execution
Indicators of resources and supported public	Type of investment Number and profile of beneficiaries (sector, size, etc.)	Integrated System of Financial Administration of the Federal Government (SIAFI); Annual report on Social; Information of the Department of Labor (RAIS) (MTE); IBGE; Aquarius Platform	Use of resources/proceeds
Result indicators	Patents R&D Publications Jobs Exports	INPI IBGE RAIS LATTES Platform	Policy outcomes

Source: PAMA (2014).

Finally, the difficulty from a methodological point of view, to delimitate each policy, that is, to “sort out what should be regarded as an object of study” needs to be emphasized.⁷⁹ As noted earlier, the magnitude of the object is affected not only by endogenous and exogenous factors, which go beyond the methodological approach, but also by cultural aspects⁸⁰ and macroeconomic factors, in a way that becomes almost impossible to isolate the effects of the innovation policy’s program.⁸¹

5 A study of the science, technology and innovation public policies of Brazil

The theoretical elements presented in the previous section, from problem identification to the assessment of its impact, only have practical utility when used in an empirical investigation in certain policies of innovation.

⁷⁹ Bucci (2008), *supra* note 60, p. 251.

⁸⁰ Ana Célia Querino and Juvêncio Borges Silva, *Diversidade Cultural: Proteção e Tutela na Pós-modernidade/Diversidad Cultural: Protección y Tutela en la Post-moderna*, 16 *Direito e Liberdade*, no. 3 (2014), 11–35.

⁸¹ Costa and Castanhar (2003), *supra* note 78, p. 979.

Therefore, seeking to apply the theoretical elements and possible bottlenecks previously shown in the previous section, first, an overview of the (in)effectiveness of public policies to encourage the innovation process in Brazil's economy, through comparative studies of the available Innovation Research survey (PINTEC) will be presented⁸² and, subsequently, a case study on the effectiveness and impacts of the Innovation Act is done, considering data provided by the MCTI, Form Information Intellectual Property Policy Scientific and Technological Institutions of Brazil (FORMICT 2010, 2011, 2012, 2013) and empirical research on the subject. We opted for the analysis of this Act in view of the limited studies on the issue, while other regulations such as the Good Law and the functioning of the Sectoral Funds⁸³ have extensive literature on the subject.

In this way, it will be possible to verify, in practice, the main objective of this work, the reasons behind the mismatch between the incentive policies to the innovation process and Brazil's economic reality.

Innovation research (PINTEC 2011) conducted by the IBGE, with the support of the FINEP and the MCTI for the period 2009–2011 presents a controversial position about the current situation of Brazil's productive sector. While in some respects it is possible to see significant growth, in others, it is possible to verify the falling rates of innovation.

PINTEC used as a conceptual and methodological reference the guidelines set for the third edition of the Oslo Manual, housing the open meaning of the concept of "innovation" presented at the beginning of this study. The approach is carried out with focus on the "subject" – the innovative agent – so that the information presented refers to the behavior, activities undertaken, impacts, incentives, obstacles relating to firms by obtaining performance indicators (output indicators) to provide subsidies and improve effort measures (input indicators).⁸⁴

The survey sample consists of 128,699 companies with 10 or more employees. Note that the criteria "10 or more employees" for sample selection is questionable and deserves reconsideration in future analyses. Although it can hinder the process of getting answers in view of the large number of companies

⁸² See Luiz Ricardo Cavalcante and Fernanda De Negri, *Trajetória Recente dos Indicadores de Inovação No Brasil*, No. 1659, Texto para Discussão (Instituto de Pesquisa Econômica Aplicada (IPEA), 2011).

⁸³ See João Alberto De Negri, Fernanda De Negri, and Mauro Borges Lemos, *O Impacto do Programa FNDCT Sobre o Desempenho e o Esforço Tecnológico das Empresas Industriais Brasileiras*, 7 Políticas de Incentivo à Inovação Tecnológica No Brasil, cap. (2008); Carlos H.B. Cruz and Luiz De Mello, *Boosting Innovation Performance in Brazil* (2006); and Bruno César Araújo, et al. *Impactos dos Fundos Setoriais nas Empresas*, 11 Revista Brasileira de Inovação (2012), available at: http://www.oecd-ilibrary.org/economics/boosting-innovation-performance-in-brazil_357276015553, 85–112.

⁸⁴ Cavalcante and De Negri (2011), *supra* note 82, p. 8.

in these parameters, it should be noted that it is the younger companies (start-ups) that have a greater tendency for innovation, seeking to differentiate their products and services of its competitors.

According to PINTEC, using the most current version of the triennial survey,⁸⁵ among these 128,699 companies, 45,950 products have implemented new or significantly improved processes, leading to an overall rate of innovation of 35.7%. Because of adverse macroeconomic conditions and currency appreciation, IBGE (2011) does not make a direct comparison with previous rates. However, making a thematic delimitation – the growth rate of innovation in Brazilian industries – one can observe a decrease in the rate of innovation. In 2000, the rate was 31.5%, which rose to 33.4% in 2005 and then to 38.1% in 2008.⁸⁶ Currently, according to the current innovation research, this rate, that measures results of efforts toward innovation,⁸⁷ dropped to 35.6%.

It should be noted, as well, that incentive policies to the innovation process lost its momentum in the Brazilian scenario. The enactment of these measures coincided with a moment of economic growth in Brazil, with favorable macroeconomic factors. At times with unfavorable situations, postcrisis time, 2008, it is observed that the industry could not keep their investments in innovation, prioritizing aspects that have less risk, contributing to the fall of the rate of innovation.

The Brazilian Agency for Industrial Development, presenting data for the years 2012, 2013 and 2014, also sees a substantial decline in innovation indicators. According to the Agency, the innovation rate for 2012 was 51.8%, and 50.2% in 2013, as the fourth quarter of 2014 this percentage reached 47.8%.⁸⁸

It happens that the dynamics in innovation in Brazil has a strong connection with macroeconomic trajectory. Innovation involves uncertainties and risks that are assumed by high costs in R&D. In times of deceleration and economic slowdown, as occurred in 2011 and 2012, one can verify the connection between the macroeconomic elements and the rate of innovation and thereafter recovery mid-2013 until early 2014, when it began declining again considering the macroeconomic scenario in Brazil, with high spending and low fiscal responsibility.⁸⁹

Brazil, even in times of positive growth of innovation rates and the economy, failed to invest and innovate, which is crucial “to reduce the technological

⁸⁵ PINTEC 2014, for the period between 2012 and 2014, is currently in development, since June 2015.

⁸⁶ Fernanda De Negri, *Elementos Para a Análise da Baixa Inovatividade Brasileira e o Papel das Políticas Públicas*, 93 *Revista USP* (2012), 81–100, at 83.

⁸⁷ See Cavalcante and De Negri (2011), *supra* note 82, p. 14.

⁸⁸ ABDI, *Sondagem de Inovação: 4. Trimestre 2014 Outubro/Novembro/Dezembro* (Brazil: ABDI, 2014), p. 18.

⁸⁹ *Idem*, p. 19.

Table 3: Importance of innovative activities.

	Industry	Gas and electricity	Selected services
Training	59.7%	67.5%	57%
Machines and equipment acquisition	51%	30.2%	51.9%
Software acquisition	46.7%	65.5%	46.7%
Acquisition of external knowledge	13.5%	14.3%	13.5%
External acquisition of R&D	6.4%	30.9%	12%
Internal activities of R&D	16.9%	28.3%	36.1%
Introduction of technological innovations to the market	29.6%	10.9%	30.1%
Industrial design and other technical preparations	29.6%	10.9%	29.5%

Note: Elaborated by the author.

Source: PINTEC (2011).

Table 4: Relevance of innovation impacts.

	Industry	Gas and electricity	Selected services
Improved the quality of goods or services	81.7%	84.9%	84.6%
Expanded the range of offered goods or services	66.7%	18.5%	70.2%
Maintain the company's participation in the market	83.4%	64.9%	77.9%
Expanded the company's participation in the market	73.8%	7.1%	73.8%
Allowed to open new markets	62.6%	4.3%	54.4%
Increased the capacity of production or service provision	75.7%	37.9%	79.1%
Increased flexibility of production or service provision	73.7%	24.3%	70.5%

Note: Elaborated by the author.

Source: PINTEC (2011).

About the mechanisms provided by public policies to encourage the innovation process of Brazil, the most widely used instrument was the financing for the purchase of machinery and equipment (25.6%) and other support programs (such as Foundations for Research Support – FAPs, RHAE Innovation and CNPq), followed by venture capital investment programs of the BNDES and the FINEP.

The primacy of the financing for the purchase of machinery and equipment is not new, since, as demonstrated by David et al. (2000), the effects of government aid is predominantly of cost.⁹⁶

Empíricos e Estratégias no Brasil, 2 Revista Brasileira de Inovação, no. 3, available at: <http://www.ifi.unicamp.br/~brito/artigos/inte-pacheco-brito.pdf> (2004), 323–361.

⁹⁶ See Paul A. David, Bronwyn H. Hall and Andrew A. Toole, *Is Public R&D a Complement or Substitute for Private R&D? A Review of the Econometric Evidence*, 4 Research Policy, no. 29 (2000), 497–529 and Kickingier and Almeida (2010), *supra* note 92, p. 186.

The less used mechanisms were economic subsidies (1.0%) and the financing of R&D and technological innovation projects in partnership with universities or research institutes (1.3%).

Compared with PINTEC 2008, there was an increase in the use of at least one government tool to support the innovation process, from 22.8% to 34.6% (about 14,300 industrial enterprises). Big businesses are the ones most benefited from government programs, since the use of government support is proportional to the size of the company. For example, the government support is used in 33.4% of the company with between 10 and 99 employees, 40.4% of those with between 100 and 499 people, and reaches 54.8% in companies with 500 or more employees.⁹⁷

The most commonly used instruments are the tax incentives for R&D and technological innovation under the Good Law, growing from about 440 industrial enterprises (2006–2008) to 1,044 (2009–2011) and financing for the purchase of machinery and equipment, benefiting 11,300 companies in this sector, an increase of 108% compared with the 2008 survey.

Regarding the obstacles to the innovation process, lack of qualified personnel increased in importance among obstacles to innovation shown by companies. In industry, in 2003–2005, this problem was in sixth place and later in 2006 and 2008, rose to third place and, in the current version, is in second place with 72.5% of importance given by the companies in the sample.

The main obstacles to innovation, according to the survey data, are the economic costs and excessive risks of innovation and the lack of qualified personnel.⁹⁸ There is no doubt that the availability of skilled manpower affects the competitiveness and technological capacity of the country in which the company is part,⁹⁹ this being one of the microdeterminants of innovation and economic growth (Table 5).¹⁰⁰

These three obstacles can be mitigated through company–university collaboration. This partnership is already used in Brazil, but has low scale to significantly affect the rate of innovation of a country, as can be seen by the limited percentage (1.3%) of Brazilian companies, which use public funding to auxiliate the process of innovation, by financing R&D and technological innovation projects in partnership with universities or research institutes. So it is

⁹⁷ See Carlos Américo Pacheco, *O Financiamento do Gasto em P&D do Setor Privado No Brasil e o Perfil dos Incentivos Governamentais para P&D*, 89 *Revista USP* (2011), 256–276, at 261.

⁹⁸ J.A. De Negri and M.B. Lemos, *Avaliação das Políticas de Incentivo à P&D e Inovação Tecnológica no Brasil. Nota Técnica* (Brasília: IPEA, 2009), p. 6.

⁹⁹ De Negri (2012), *supra* note 86, p. 93.

¹⁰⁰ *Idem*, p. 90.

Table 5: Bottlenecks of innovation.

	Industry	Gas and electricity	Selected services
Lack of qualified staff	72.5%	24.5%	72.1%
High innovation costs	81.7%	83.2%	81.5%
Excessive economic risks	71.3%	80.0%	73.8%
Shortage of funding sources	63.1%	4.3%	64.1%

Note: Elaborated by the author.

Source: PINTEC (2011).

necessary to expand, accelerate and integrate this collaborative model in the industrial policy of the country.¹⁰¹

This adaptation is not about removing the autonomy of universities and research institutes, making them “slaves” of market desires. However, it is important to bring the reality of the labor market to researchers.

From the point of view of businesses, this collaboration is not only a way to participate in the community, seeking more than acquiring knowledge through partnerships, but also recruit future talent from universities that has significant consequences for the future of companies.¹⁰² According to Kicking and Almeida, based on data collected by IPEA, companies that have investments in knowledge grow 21% more than those that do not invest. In addition, they are more productive than the average companies; pay higher salaries to its employees (on average 80.5% more)¹⁰³ and spend more time in the company, having greater stability (30.4% more than the average)¹⁰⁴; invest more in training and capacity building, affecting the quality of innovation; and grow faster than the others.¹⁰⁵

Thus, this is an important collaboration for the transition from “industrial economy” to “knowledge economy,” which the globalized world today lives.¹⁰⁶

For De Nigri, the weak interaction between universities, Scientific and Technological Institutions (ICT)/Centers for Technological Innovation (NITs)

¹⁰¹ Carmine Taralli, *Universidade-Indústria: parceria na inovação*, 25 Revista USP (1995), 42–47, at 44.

¹⁰² Flávio Fava de Moraes, *Universidade-empresa: existe catalisador?*, 25 Revista USP (1995), 16–19, at 19.

¹⁰³ De Nigri and Lemos (2009), *supra* note 98, p. 93.

¹⁰⁴ *Idem*, p. 3.

¹⁰⁵ Kicking and Almeida (2010), *supra* note 92, p. 184.

¹⁰⁶ Pablo D'Este and Pari Patel, *University–Industry Linkages in the UK: What Are the Factors Underlying the Variety of Interactions with Industry?*, 36 Research Policy, no. 9 (2007), 1295–1313, at 1296.

and the private sector is not a cause of low innovation in the economy, as is often pointed out, but a consequence of the low innovative dynamism of the economy. The author illustrates this statement by pointing out that “where there are companies developing innovations, this interaction happens through necessity and as a result of own innovative process in the industry.”¹⁰⁷

Considering the importance of these issues and the small percentage of its use from innovative companies, the Innovation Act is analyzed in the following sections, its effectiveness and, critically, the potential bottlenecks that can be solved.

5.1 The Innovation Act *on the books*

The Brazilian Innovation Act, Law no. 10.973, of December 2, 2004, regulated by Decree Law 5.563, serves to stimulate innovation and scientific and technological research in the Brazilian industrial environment. The objective is that Brazil, with these measures, can reach technological independence and achieve an ideal industrial development, as disposed in the articles 218 and 219 of the Brazilian Federal Constitution.

Recently, given the importance of the issue to the objectives of the Brazilian state, Constitutional Amendment No. 85 was enacted, modifying articles 23 and 24 of the Federal Constitution, affirming the Federal Government, States, Federal District and municipalities as the competent authorities to provide the means of access to culture, education, science, technology, research and innovation. According to article 218 of the aforementioned Constitution, the state shall promote and encourage the scientific, research and scientific and technological capacity and innovation. Therefore, the internal market, part of the national heritage, will be encouraged so as to enable the cultural and socioeconomic development, population welfare and the technological autonomy of the country, pursuant to article 219 of the Constitution.¹⁰⁸

According to Matias-Pereira and Kruglianskas, the Brazilian Innovation Act had its development based on three components: (a) the creation of an enabling environment for partnerships between universities, technological institutes and industries; (b) stimulate the participation of science and technology institutes in the innovation process; and (c) encourage innovation in business.¹⁰⁹

¹⁰⁷ De Negri (2012), *supra* note 86, p. 92.

¹⁰⁸ See L. Monte-silva and T. Dantas, *Incentivos Públicos à Inovação: Análises, Críticas e Proposições*, 3 Geintec – gestão, inovação e tecnologias, no. 3 (2013), 221–234.

¹⁰⁹ J. Matias-Pereira and I. Kruglianskas, *Um enfoque sobre a lei de inovação tecnológica do Brasil*, 39 Revista de Administração Pública, no. 5 (2005), 1011–1028.

In the case of the Innovation Act, cooperation is encouraged, along the lines of Triple Helix, between the state, businesses and ICT, where the internal and external relations are governed by the NIT. ICT are agencies or public entities that have, by institutional mission, among others, to accomplish basic or applied research activities of scientific or technological character. The NIT, on the other hand, is a nuclei or body that is composed of one or more ICTs in order to manage its innovation policy.

It is emphasized, however, that the NIT should not replace the internal investments in R&D made by the private sector, making it its innovative center, but rather serve as a support, generating the connection between the university and the research institutes and business. Important to remember in this discussion is that the “locus of innovation” is the company, being relevant that companies have enough heterogeneity for a satisfactory performance of the Brazilian production system.¹¹⁰

Indeed, this collaboration has proven crucial in the evaluation of criteria that companies do when they need an innovation to remain competitive, that is, to answer the question “make or buy?”: whether the company will make investments to create an innovation itself or whether it would be better to buy it, either through an acquisition or through contracts and agreements.

According to a report of the Cambridge Enterprise, University of Cambridge, “Report on survey of Brazilian Technology Transfer Offices,” produced by Livesey, in which 22 NITs were analyzed (in this case, the authors call it TTO, which means “*technology transfer office*”), an average NIT is one core created in 2006, under the university with more than 1,000 teachers, and has seven components, two of which have relevant academic credentials and specialize in intellectual property. Every year (*turnover*), two members leave the NIT and the *Nuclei* has 17 *disclosures* and 10 patents.¹¹¹

In short, it is noted that it is a structural-formal law, restricting itself to present what the NIT must *have* (organizational) and *what for* (goals), but does not show *how* (instruments), leaving this task to the executor of public policies.

One of the main problems of the Innovation Law is its lack of coordination with the industrial development policy of the country and with other instruments to support innovation processes. The problem is not the quality of law that is predominantly structural, pointing out the skills of the agents responsible

¹¹⁰ De Negri (2012), *supra* note 86, p. 85.

¹¹¹ For a comparative analysis, in the United States, the average university licensing office receives “sixty-nine invention disclosures per year and applies for patents on about half of them. But universities apply for four times as many patents per R&D dollar as private industry” (Scotchmer (2004), *supra* note 8, p. 5).

for its execution and organizational issues, but if this is implemented in reality, as will be seen below. Thus, the mismatch between what is proposed and what is actually done by the state in the case of the Innovation Law is not present in the identification/diagnosis of a problem, neither at the time of training and legitimacy of goals and programs nor at the time of implementation and (re) adjustment and correction at the time of assessment of their impacts.¹¹²

5.2 The Innovation Act *in action*

Arriving at these conceptual clarifications and objectives of these actors, we can now analyze the Innovation Law's impact on university–industry collaboration and the reasons that may explain the underperformance of encouraging the process of innovation policies to make its use as a tool for development and promotion of competitiveness, using as a basis the grounds presented in the section in this previous study. This analysis uses as fulcrum empirical data and reports collected by the responsible bodies for the oversight of public investment to innovation, as well as studies of foreign research institutes, which seek to investigate the benefits of the Act under discussion.

The most recent empirical data about this theme is a report called “Form Information Intellectual Property Policy Scientific and Technological Institutions of Brazil” (FORMICT), provided annually by the MCTI. Despite the difficulties of evaluating R&D policies, notably due to subjectivity of the objects of these policies, such as knowledge and innovation, the information proves to be valuable for the analysis of the inadequacies and deficiencies of NIT. To do this comparative analysis, the application forms were analyzed for the years 2010, 2011, 2012 and 2013, and research relevant institutions on the subject as the IPEA, IBGE and research groups on the subject.

In the aforementioned report, the consolidated data of 2013 is used as a base year, with data provided by the ICT to the MCTI, through Form Information Intellectual Property Policy, available in the report “Intellectual Property Policy Scientific and Technological Institutions of Brazil,” so it is possible to make a descriptive and quantitative analysis. Based on the scenario presented, we will study the reasons for the (in)effectiveness of the legal measures, analyzing the reasons that may contribute to this situation. Furthermore, a qualitative analysis will be done through the report of the Cambridge Enterprise, University of Cambridge, “Report on survey of Brazilian Technology Transfer Offices,” prepared by Livesey.

¹¹² De Negri and Lemos (2009), *supra* note 98, p. 9.

This quantitative report was answered by 261 institutions, of which 194 are public (74.3%) and 67 private (25.7%). Public institutions are made up of 50.9% corresponding to the federal level (133 NIT), 21.1% from the state field (55 NIT) and 3.3% related to the municipal level (6 NIT). With regard to federal institutions, federal universities have the highest quantity (22.2%, 58 NIT), followed by the Federal Institutes of Education, Science and Technology (14.2%, 37 NIT), the State Education Institutions (11.5%, 30 NIT) and the Institutes of Public Technological Research (10.7%, 29 NIT) (Table 6).

Table 6: Institutions that answered the FORMICT.

	2011	2012	2013
Private	17.6%	17.1%	25.7%
Public	82.4%	82.9%	74.3%
Federal	57.4%	59.6%	50.9%
State	22.2%	20.7%	21.1%
Municipal	2.8%	2.65%	2.3%

Note: Elaborated by the author.

Source: FORMICT (2012, 2013, 2014).

It should be noted that the investments are, mostly, limited to public institutions, even though Law no. 10.973 allows private institutions to create their own NIT. In addition, the homogeneity of the investment appears in the federal level, with more than half of the investments in institutions related to innovation policies under discussion, notably due to the high investments of the Federal Government (União) in Federal Universities and their postgraduate programs, with greater importance of three major federal agencies: the National Post-Graduate Program – CAPES, CNPq and FINEP,¹¹³ while the state level corresponds to less than one-quarter of the area investments and finally the municipal field with a mere 3.3%. In this context, it is important to emphasize that state universities and local research institutes still find themselves in a growth phase, with smaller investments than the federal level, so it should be noted that the value of institutions of state and municipal fields has a tendency to increase the heterogeneity of this indicator.

So the first question that deserves mention is the reason why most NITs that answered the questionnaire are subordinated to public institutions, corresponding to three quarters of the sample, while only one-quarter is filled by private

¹¹³ R. de Lotufo, “A Institucionalização dos Núcleos de Inovação Tecnológica e a Experiência da Inova Unicamp”, *Transferência de Tecnologia: estratégias para estruturação e gestão dos Núcleos de Inovação Tecnológica* (Campinas: Komedi, 2009), pp. 41–74, at 47.

institutions. Why does this happen? First of all, most institutions that have NITs are public because the Innovation Act requires public universities to create their cores, not opening a discretionary margin as about its existence/creation, but as the budget, institutional incentives, among other things. Private institutions that do not have this obligation choose to observe the experience of NIT in public institutions and evaluate its possible implementation in the private sector.

Second, it is important to point out that the completion of the questionnaire is required for the participation of ICT in public tenders and calls for the support of technological innovation. There is also the possibility that in 2012, private institutions observed a decrease in the pursuit of research by the private sector, so to take part in calls and public announcements, decided to fill out the form here studied, helping in growth of more than 50% fill rate.

About the regionalization of the NIT throughout the country, it was found that from the public institutions that answered the form, 40.7% are in the Southeast, 21.7% in the Northeast region, 17.0% in the South, 11.9% in the North and only 8.8% in the Midwest. In relation to private institutions, 40.3% reported that they are located in the South, 35.8% in the Southeast, 13.4% in the Northeast, 7.5% in the North and 3.0% in the Midwest (Table 7).

Table 7: Regionalization of NIT.

	2010	2011	2012	2013
Southeast	37.2%	39.8%	40.9%	35.9%
South	25.6%	23.9%	22.8%	23%
Northeast	21.3%	20.5%	19.2%	19.5%
North	7.9%	8.5%	8.3%	10.7%
Midwest	7.9%	7.4%	8.8%	7.3%

Note: Elaborated by the author.

Source: FORMICT (2011, 2012, 2013, 2014).

While it is possible to observe the progress in the implementation of NITs in the North, a regional concentration in the South and Southeast can be noted. Why does this happen? This, as highlighted by De Nigri and Lemos, indicates the regional technological difference of the Brazilian productive scenario, since most of the companies who deposited more patents are located in the above regions¹¹⁴ and in addition, the five universities deposited over the last 10 years patents in those regions. The universities are the University of Campinas (Unicamp), Federal University of Rio de Janeiro (UFRJ), Federal University of

¹¹⁴ De Negri and Lemos (2009), *supra* note 98, p. 5.

São Paulo (USP), Federal University of Rio Grande do Sul (UFRGS) and Federal University of Minas Gerais (UFMG).¹¹⁵

In this case, regional cumulation is not a problem of law, but implementation of the public, especially the bodies responsible for dissemination and implementation of these institutions. There is an expected focus on regions that have a greater number of industries, leaving in the background the less developed regions that need the assistance of a competent NIT to help the local economy.¹¹⁶

As for the existence of an implemented innovation policy, that is, if the NITs have formal documents with general guidelines that guide the actions of the institution in activities related to innovation, intellectual property protection and technology transfer, research reported that 68.6% of public institutions and 71.6% of private institutions have an implemented innovation policy. Despite the statistics involving public institutions, in this study, being in general bigger, it is observed that, private institutions have a higher value of institutions that have implemented innovation policy than the public ones.

It happens that when private institutions, which have no obligation to create a NIT, decide to create such institutions, they already have a previous planning and the proper risk–reward assessment for the business model adopted. This does not occur in the same way in the public sector, particularly considering that in public institutions, sometimes these nuclei are created by public administrators as only with the minimum conditions of existence, with no incentive for the development of interactions and growth of NIT. As an example, a university can create one, but designate few resources and people; this way, without providing conditions for it to flourish, the NIT is supposed to fail.

Livesey points out that despite the Innovation Act making mandatory that every university has its own NIT, it does not mean everyone will be “equal” and with the same resources. The future of the NIT depends on the scale and focus established by the university to which it belongs.¹¹⁷

The amount collected through licensing, royalties and consulting is not enough to the NIT to become self-financing. Their self-sustainability is expected, with the mainstay of the overall experience, within 8–10 years after

¹¹⁵ Biancca Scarpeline Castro and Gustavo Costa de Souza, *The Role of Technological Innovation Centers in Brazilian Universities*, 8 *Liinc em Revista*, no. 1 (2012), 4.

¹¹⁶ About the role of universities as engines of local economic development Janet Bercovitz and Maryann Feldman, *Entrepreneurial Universities and Technology Transfer: A Conceptual Framework for Understanding Knowledge-Based Economic Development*, 31 *The Journal of Technology Transfer*, no. 1 (2006), 175–188, at 185.

¹¹⁷ F. Livesey, *Report on Survey of Brazilian Technology Transfer Offices* (Cambridge: Cambridge University, Cambridge Enterprise, 2014), p. 6.

is implementation.¹¹⁸ In Brazil, after more than 10 years of implementation of the NIT, there are NITs that do not have a minimum of financial autonomy.¹¹⁹

As regards the implementation stage of the NIT, it was found that most of the research's public institutions have implemented the NIT. In concrete data, 140 (72.2%) public institutions have implemented the NIT, 37 (19.1%) reported that they are under implementation and 17 (8.8%) reported that the NIT is not being implemented.

In the case of private institutions, it is noted that the implementation of NIT is considerably less when compared with public institutions. Among private institutions, 26 (38.8%) reported that they have implemented the NIT, 29 (43.3%) stated that the NIT is in the implementation phase and 12 (17.9%) have no NIT implemented and it is not being implemented.

Generally speaking, one can observe progress in the implementation of NIT in higher education institutions. Between public and private institutions, 166 (63.6%) reported that their NITs have been implemented, 66 (25.3%) reported that the NIT is under implementation and 29 (11.1%) reported that they have not been implemented (Table 8).

Table 8: Implementation progress of NIT.

NIT	2010	2011	2012	2013
Implemented	94	116	141	166
In implementation	60	49	39	66
Not implemented	10	11	13	29

Note: Elaborated by the author.

Source: FORMICT (2011, 2012, 2013, 2014).

Steady growth of the implementation of the nuclei in the studied period is noted. It also highlights the increase in the implementation of these private institutions, which is recommended for a healthy university–industry collaboration. This growth taking place can be assigned by the high number of private universities in Brazil and the competitiveness of these colleges, increasing the search of these institutions of differentiation.

It is noteworthy, however, that in article 4, section I, the Innovation Act does not encourage sharing of ICT satisfactorily. This can be seen by the high number of cores that informed the exclusivity of its ICT. In the case of public institutions, 150 (84.7%) reported that their ICT is exclusive and 27 reported that

¹¹⁸ Castro and Souza (2012), *supra* note 115, p. 136 and Scotchmer (2004), *supra* note 8, p. 236.

¹¹⁹ Castro and Souza (2012), *supra* note 115, p. 136.

Table 9: Sharing of NITs.

	2011		2012		2013	
	Exclusive	Shared	Exclusive	Shared	Exclusive	Shared
Public institutions	86.3%	13.6%	85.1%	14.9%	84.7%	15.2%
Private institutions	96.2%	3.8%	96.2%	3.8%	90.9%	9.1%
General result	87.9%	12.1%	86.7%	13.3%	86.2%	13.8%

Note: Elaborated by the author.

Source: FORMICT (2012, 2013, 2014).

the ICT is shared with other institutions (15.2%). Among private institutions, 5 (9.1%) reported that their ICT is shared and 50 reported that their ICT is exclusive (90.9%) (Table 9).

Article 4, section I, of the Innovation Act, which allows ICT, for remuneration and for a determined period, under contract or agreement, to share their laboratories, equipment, tools, materials and other facilities with micro and small businesses in activities related to technological innovation to achieve incubation activities, without prejudice to its main activity, is not having the desired effect. The purpose of the norm is to enable micro and small businesses that otherwise would have no possibility of access to certain equipment and laboratories due to the high investment required and the risks involved to, through contracts and agreements, use them for innovation within their business. However, as can be seen from the data presented in the report, 84.7% of NIT public institutions and 90.9% of private institutions are exclusive, not allowing the desired sharing by the Act.

Why does it happen? Is there any reason for that most ICTs are exclusive? This high percentage can be attributed to two reasons. First, the ICTs and the NITs themselves do not disclose that possibility in a satisfactory manner, so that even of the existing “supply,” other institutions and entrepreneurs do not know this possibility so that the “demand” to change this policy is not observed. Second, the high number of exclusive ICTs can also be attributed to weakness and little investment in these. The priority in the use of equipment is the people who are part of the university or research institution, so that if there are few facilities for people who have priority, it reduces the possibility of sharing with third parties.

As for activities carried out by the NIT, the Ministry of Science and Technology subdivides these into two subgroups: (a) essential (in terms of the first paragraph of article 16 of the Law of Innovation); (b) complementary.

The activities that had higher implementation rates are quoted among the essential: (a) monitoring the processing of applications and the holding period

of the IP (70.7%) (article 16, sole paragraph, item VI of the Act. innovation); (b) assess the convenience and promote the protection of the creations developed at the institution (68.5%) (article 16, sole paragraph, item IV of the Innovation Law.); (c) ensure the maintenance of the institutional policy to stimulate IP protection (66.4%) (article 16, sole paragraph, item I of the Innovation Law).

Among additional activities, on the other hand, that had higher rates of implementation are: (a) events (68.1%); (b) privacy policy (63.4%); (c) training performed by the NIT (59.5%); (d) guidance to researchers (58.6%); e) standardized documents (55.2%).

In relation to the complementary activities that had lower rates of implementation are: (a) marketing innovation (10.8%); (b) economic evaluation of inventions (12.9%); (c) valuation of technology (13.4%); (d) supply and demand registration (19.0%); (e) social innovation (19.8%).

It should be noted that the least implemented complementary activities are those involving the economic aspect and the technological registration by the NIT. The registration of the offer and demand, as example, is an essential activity for cooperation between the NIT and other institutions such as private companies, to be effective. Analogously, economic evaluation of inventions, which are essential for *stakeholders* with limited resources and need to maximize their investments for profit so that they can increase market growth occur. Now, “if there is no demand from domestic and international companies for that research it will be impossible to have commercialization of any kind.”¹²⁰ Livesey reports that in his research, a third of managers believe that there is interest for domestic innovation, while two-thirds do not believe that interest.¹²¹ This affects, in turn, the formal and informal relationships between the NIT and incubators, investment funds and angel investors.¹²²

The NIT, mainly, deals with the coordination of patent applications made by its faculty and students and to maintain the existing relations between the university and companies.¹²³ For the most part, there is no expansion plan of these centers, taking into account its importance, so that budgets and number of employees remain stagnant at a minimum. The NITs are not truly technological innovation centers, but more a TTO, that is, limit the transfer of technology and intellectual property, not encouraging as well in the innovation process, which is necessary in emerging nations.

¹²⁰ Livesey (2014), *supra* note 117, p. 6.

¹²¹ *Ibid.*

¹²² Douglas Cumming, *Government Policy Towards Entrepreneurial Finance: Innovation Investment Funds*, 22 *Journal of Business Venturing*, no. 2 (2007), 193–235.

¹²³ Castro and Souza (2012), *supra* note 115, p. 136.

Finally, the number of institutions, which are part of the sample of this research, that have applications for intellectual property protection is worth noting. Among public institutions, 60.3% (117 institutions) have reported that applications for intellectual property protection are being applied for or granted in the year in research, while 39.7% of institutions (77 institutions) said they have no applications for the year 2013.

Moreover, it was found that the vast majority do not have technology transfer agreements, fundamental to observe the practice of applying innovations in the market. In the base year 2013, 45 institutions reported having contracts for that year, of which 37 are public and 8 private.

It should be noted, however, that according to Livesey,¹²⁴ the vision appointed by earlier studies that the only ways to make the connection between the knowledge of the university and businesses would be through commercialization and technology transfer has been modified. New routes, such as spin-outs, joint research projects and consultancy, are gaining prestige at universities, as a way to transfer its innovation to the commercial/industrial area.¹²⁵ The process of knowledge transfer between these actors occurs with several connection channels; instead of reducing them, it should be expanded to enable more dynamic collaboration between academia and industry.¹²⁶ After all, in recent decades, the role of the university in national innovation systems has been modified.¹²⁷

In the context of the Innovation Act, it is important to note that although the role of each *stakeholder* in the Triple Helix model is dynamic, each actor has priority activities and skills, which are the focus of its institutional objectives.

The university and the NIT have a wide margin to work with more exploration projects, sometimes remote and without regard to their usefulness and functionality than applied studies of companies,¹²⁸ since university researchers are “primarily motivated by the pursuit of knowledge for its own sake.”¹²⁹ While

¹²⁴ F. Livesey, *Report on Survey of Brazilian Technology Transfer Offices* (Cambridge: Cambridge University, Cambridge Enterprise, 2014), p. 5.

¹²⁵ About the variety of channels through which university researchers interact with industry, see J. Guimon, *Promoting University-Industry Collaboration in Developing Countries: The Innovation Policy Platform* (World Bank, 2013) and D'Este and Patel (2007), *supra* note 106, p. 1296.

¹²⁶ See D'Este and Patel (2007), *supra* note 106, p. 1296 and Bercovitz and Feldman (2006), *supra* note 116, p. 182.

¹²⁷ Bercovitz and Feldman (2006), *supra* note 116, p. 185.

¹²⁸ C.H.B. Cruz, *Ciência, Tecnologia e Inovação no Brasil: Desafios para o Período 2011 a 2015*, 10 *Interesse Nacional*, no. 3 (2010), 13.

¹²⁹ Scotchmer (2004), *supra* note 8, p. 235.

the universities study the fundamentals of science, such as the reason and the story behind a particular object of the study, this does not occur in business because in “the R&D lab of a company, where there is no function of educating students, the only reason for the research activity is to improve the products or processes of which the company depends. Therefore, research has very applied nature.” It’s a different organizational culture, for example, the deadlines and research object, which can affect the success of these two actors of innovation. It is necessary to find a balance between the two.¹³⁰

Companies and universities can engender collaborative projects to be successful and provide subsidies for the origin of innovations. However, it is noted “the global experience is that this cooperation is limited from the viewpoint of the university and the company’s point of view.”¹³¹

In this context, for a change of rationality, one must consider the interests of the institutional arrangements of universities and research institutions and companies.¹³² Lee, in an empirical study on the sustainability of university–industry collaboration, shows the main reasons for this partnership.¹³³ To the academia, the advantages to collaborate with industry are: (a) to supplement funds for one’s own academic research; (b) to test the practical application of one’s own research and theory; (c) to gain insights in the area of one’s own research; (d) to further the university’s outreach mission; (e) to look for business opportunity; (f) to gain knowledge about practical problems useful for teaching; (g) to create student internships and job placement opportunities; (h) to secure funding for research assistants and lab equipment; (i) to look for business opportunity.

From the point of view of businesses, the advantages of collaborating with academia to Lee¹³⁴ are: (a) to solve specific technical or design problems; (b) to develop new products and processes; (c) to conduct research leading to new patents; (d) to improve product quality; (e) to reorient R&D agenda; (f) to have access to new research via seminars and workshops; (g) to maintain an ongoing

130 Lawrence Dooley and David Kirk, *University-Industry Collaboration: Grafting the Entrepreneurial Paradigm onto Academic Structures*, 10 *European Journal of Innovation Management*, no. 3 (2007), 316–332, at 321–322 and Pablo D’este and Markus Perkmann, *Why Do Academics Engage with Industry? The Entrepreneurial University and Individual Motivations*, 36 *The Journal of Technology Transfer*, no. 3 (2011), 316–339.

131 *Ibid.*

132 Markus Perkmann, et al., *Academic Engagement and Commercialisation: A Review of the Literature on University-Industry Relations*, 42 *Research Policy*, no. 2 (2013), 423–442, at 424.

133 Yong S. Lee, *The Sustainability of University-Industry Research Collaboration: An Empirical Assessment*, 25 *The Journal of Technology Transfer*, no. 2 (2000), 111–133, at 113.

134 *Idem*, pp. 113–114.

relationship and network with the university; (h) to conduct “blue sky” research in search of new technology; (i) to conduct fundamental research with no specific applications in mind; (j) to recruit university graduates.

Therefore, in most cases the support of the university to businesses does not occur through research, as expected, but “by something more sophisticated and more impressive: the training of young minds, which makes them able to use the knowledge and the ability to think critically.”¹³⁵ Thus, the most important aid from the university to companies and to society occurs through the creation of critical sense in students, making them critical thinkers and not mere repeaters who cannot solve problems and puzzles.

Therefore, “university–industry collaboration is usually recognized as rare, weak, and limited in terms of the nature of the positive feedback between the two institutional actors (Arocena and Sutz 2003).”¹³⁶ This collaboration “typically involves low-level industrial innovation, concentrated on consultancy rather than on knowledge-intensive services because universities focus on basic research (Arocena and Sutz 2001). Meanwhile, industry aims to adapt and upgrade imported technology rather than undertake R&D (Bell and Pavitt 1995).”¹³⁷

It is important that the focus of this collaboration is on segments that have windows of opportunity in which the private sector does not invest, and new and competitive sectors still have space to grow.¹³⁸ Therefore, an important interaction is with the private sector so that investments are not made in areas already populated and with a lot of competition in the market, hindering the success of this collaboration. Moreover, one should not only increase the number of resources to the area, but also improve the quality of research, since improving the quality of academic research has strict connection with the possibility of greater interaction with industry.¹³⁹

Lee points out that “while collaborating with a firm on an R&D project, the university faculty member may serendipitously gain a valuable insight into a personal research area. The return-on-investment approach, if applied literally, requires that we express this theoretical insight in monetary terms. Likewise, we would be required to express all in economic terms about the learning of practical

¹³⁵ *Ibid.*

¹³⁶ E. Albuquerque, W. Suzigan, G. Kruss and K. Lee, *Developing National Systems of Innovation: University-Industry Interaction in the Global South* (Cheltenham: Edward Edgar, International Development Research Centre, 2015), p. 160.

¹³⁷ *Ibid.*

¹³⁸ De Negri and Lemos (2009), *supra* note 98, pp. 7–8.

¹³⁹ D’Este and Patel (2007), *supra* note 106, p. 1299.

knowledge relevant to teaching, the creation of internship opportunities for students, and the personal networks developed out of collaboration.”¹⁴⁰

It is observed that despite advances promoted by the Innovation Act major changes in the promotion of innovation policies toward encouraging the private sector to invest in R&D are still needed. This Act is an important innovation for the Brazilian scenario, as it demonstrated the concern of the legislature and the Brazilian legal system, providing the legal framework necessary for an institutional cooperation. However, after more than a decade without major changes, changes to improve the Brazilian Innovation Act appear necessary.

According to the results of the report of the Cambridge Enterprise, managers of Brazilian NIT agree with that statement. When asked whether those responsible agree or disagree with the following statement “The current structure of national law regarding technology transfer (Innovation Law in 2004) works well and does not need to change” three-quarters of the survey sample (75%) disagreed with this statement, indicating that for them, the current legal framework does not work effectively for their goals.

Public policy changes cannot be asystematic without observing the particularities of each market and their respective offers and demand, that is, without seeking to answer the desires of consumers.¹⁴¹ The problem of innovation policies in Brazil is not based on the subjective “will” of entrepreneurs to innovate and take risks. After all, a study made by the Global Entrepreneurship Monitor (2015) says that Brazil is the first in the ranking of entrepreneurship, nearly 8 percentage points ahead of China, the runner-up, with a rate of 26.7% in the entrepreneurship rate. According to that study, three out of ten Brazilian adults between 18 and 64 years have a business or are involved with the creation of a business.¹⁴² The problem is that the private sector does not have the right incentives, especially given the bureaucratic public administration, lack of legal certainty, complex tax structure, delays in the patenting procedure, to make greater investments in innovation.¹⁴³

Today, there is a Law Proposal for creation of the Code of Science, Technology and Innovation, elaborated by several scientific and technological entities, which is pending in the Chamber of Deputies, PL no. 2177/2011, and the

¹⁴⁰ Lee (2000), *supra* note 133, p. 112.

¹⁴¹ See Charles Edquist, *The Systems of Innovation Approach and Innovation Policy: An Account of the State of the Art*, DRUID Conference (Aalborg, 2001), p. 11.

¹⁴² Global Entrepreneurship Monitor. *Report* (2015), available at: <<http://www.gemconsortium.org/docs/cat/1/global-reports>>, accessed 5 May 2015.

¹⁴³ Cruz (2010), *supra* note 128, p. 4.

Senate, PLS no. 619/2011, which won importance after the recent approval of the Constitutional Amendment 85.

In comparison with the Innovation Act, it is noticeable that this proposal seeks, in all its chapters, to expand the objects of the law, making sure every stakeholder involved in R&D is encouraged to have greater interaction with other entities. It also seeks to put “innovation” at the heart of this law expanding concepts and definitions used in the current Act bringing it to its core. As an example, the concept of ICT is expanded and transformed into Science, Technology and Innovation Entity – ECTI, hosting new types of institutions, and not only confines itself to science and technology, but also has, at least in symbolic level, innovation.

However, these changes have more symbolic value than effective, since it does not affect the main reason for the ineffectiveness of the law of innovation, which is an inadequate implementation.

The implementation of public policies to encourage science, technology and innovation should consider the four objects of analysis that are part of the technical change’s black box: (a) the opportunities for innovation; (b) incentives for these opportunities to be exploited; (c) the ability of the agents responsible for achieving the goals that they aim to achieve; (d) institutional arrangements that incentivize such change,¹⁴⁴ based on a consideration of law as goal and institutional arrangement, showing the need for articulation and coordination of government support.

6 Conclusion

We attempted to expose the possible reasons behind the mismatch between what innovation efforts propose and what it is possible to see as a result. First, we tried to show the relationship between the state, innovation and entrepreneurship, investigating how the institutional arrangement of the state and the market affect innovation outcomes. It was possible to see that state should, in the current context, not only correct market failures, but also encourage the creation of new key sectors for the creative economy, especially with guidelines based on the social sphere, forgotten sometimes by private companies.

To elaborate on that, we investigated the correlation between law and innovation policies, trying to verify *if* and *how* the law impacts innovation

¹⁴⁴ Giovanni Dosi, *Opportunities, Incentives and the Collective Patterns of Technological Change*, 107 *The Economic Journal*, no. 444 (1997), 1530–1547, at 1532.

policies. First, we conceptualized what “law” means for this study, considering a functional approach, not only structural as earlier studies do. By using Coutinho’s (2004) typology, we saw that the adequate concept is to see law as a tool and as an institutional arrangement for public policies of science, technology and innovation, using the senses of the law as a goal and as a social participation channel (*demand articulator*) as complementary. With that, we saw that law affects innovation and how it happens, either through beneficial channels, such as a coordinator or articulator of demands from various entities, auxiliating with the correction and revision of public policies that are not working, or disadvantageous ways, such as imposing restrictions that affect how innovation should happen.

After we exposed the correlation between law and innovation policies, we investigated the policy cycle that science, technology and innovation public policies go through and possible reasons behind inefficacies in each stage. We saw that the biggest bottleneck of this issue is not on the quality of the law, but *how* these policies are implemented. There is not enough planning and self-correction between the actors responsible for such task. We showed, from a legal perspective, how these measures should be changed to be more effective, based on one main proposition, the rationalization of the responsible actors, that is, each one should know *what* to do, *how* to do it and how to *evaluate* its efficacy and change if needed.

The test of such proposition was done on the last section with a case study, based on an empirical research with data from the Innovation Act’s effectiveness. We saw that the Brazilian Innovation Act presents advances to the research and innovation sector, and especially contributes to elaborate public policies that managed to be effective for the social actors. However, there is a need for several institutional changes in the review process, as to obtaining and supervising of incentives. Support and subsidies should be improved so that the young companies may have the same competitiveness of big and foreign companies.

Moreover, we noted that the Innovation Act failed to make the private sector increase, significantly, their investments in private innovation policies to encourage their own science, technology and innovation mechanisms. Still, in the Brazilian scenario, the largest investments for innovation sector come from public funds, and not the private sector, or a mixed solution as is desirable.

In the case of the Innovation Act, the institutional arrangement between universities and their nuclei, and between NIT and third parties proved itself flawed.

In the case of the institutional relationship between universities and their respective NITs, it was observed that although these have been implemented due to legal requirements, the universities do not promote them satisfactorily.

They invest only the minimum necessary to operate without any legal intervention, or invest solely on the issues that can be measured quantitatively, as the number of patent deposits, and put aside the qualitative aspect, which is to encourage innovation among students who study there.

In the case of the institutional relationship between the NITs and third parties, it was found that it is still very limited, particularly with regard to the sharing of instruments, whose permission to share is allowed by law. This failure can be attributed to both NIT and universities. First, because there is no advertising of the possibility of sharing, of which third parties may use. Second, considering that there are few institutions that, although allowed by law, have a regulation regarding how the sharing must occur. Third, it can also be attributed to the failure of the MCTI and the Ministry of Education in the limited amount of instruments that scientists from universities can use, so that resources available to share are remote.

Finally, considering all the framework presented in this study, we present as suggestions of legal changes that must be made, either legislatively or administratively, so that innovation policies have greater efficiency in the Brazilian economic scenario, such as the following.

First, we must seek the rationalize innovation policies. Currently, there are numerous opportunities available to entrepreneurs and that companies can use, but nevertheless, there is no uniformity in the application of these policies. There are policies, for example, that just repeat steps that have been already taken, without great differential, thus contributing so that when sought, the entrepreneur has certain fear in which innovation policy to use. Therefore, we propose a rationalization of these policies, deciding on the skills of each sphere of federal state, standardizing requirements and objectives, but without, however, losing the vastness of possibilities that can be used.

Second, provide greater autonomy to the financing entities and their projects. Although, in general rules, the evaluation process of the projects is to be considered fair and impartial, the political agents, responsible for directing the money to finance such entities, are not. Currently, for example, a Senator who received donations of textile companies could, even if it is observed that there is no need for it, make a political agreement for a project aimed at this area to be realized. And in carrying out the project, the performers, normally, are Secretaries appointed by the executive branch, who also have political purposes. It is clear that if given greater autonomy to funding bodies the possibility of political intervention will not be fully removed, but nevertheless, this is mitigated to a minimum.

Third, it must promote measures to encourage the collaboration of all stakeholders in the innovation process, through benefits. The Innovation Act,

for example, could add obligations for universities and NIT regarding the advertising of such measures, ensuring they are, taking into account the cost-benefit, presented in widely circulated journals and web sites. It can also use measures to ensure more resources to the authors who share, since, in this way, those responsible will have incentive to collaborate and encourage the sharing of laboratories, for example.

Fourth, we must encourage the formation of employees and retention in these companies. In Brazil, it is not uncommon for newly formed students to try to get public jobs, because they have a stability that private companies cannot guarantee. Thus, one should elaborate innovative measures that focus not just buying new machines and software, but also in shaping the knowledge of their employees, ensuring that it has greater security and stability in their work and have a greater framework of knowledge to innovate. For example, one can introduce measures to ensure that companies pay less tax in relation to expenditure on employee training, as in the case of spending on workshops, training courses, master's degree and other ways of improvement.

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