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ARTICLE

Epistemic policies: Sectoral funds, support for innovation, and science in Brazil

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Abstract

This article consists of an analysis of the legislation which instituted the Sectoral Funds Programme in the 1990s and 2000s. The objective is to characterize the initial components and strategies of the programme, as well as its role in the context of Science, Technology and Innovation (STI) policies at the time. It should be said that I will not look at this legislation as a jurist or public policy analyst, who would see it as a structure of normative acts or an instrument of state governance. As an anthropologist, I will seek in this legal structure a discourse, that is, the defence of a certain conception of science. I am interested in the fact that such legislation registers and, at the same time, arranges the construction of an episteme, that is, a new view on science, knowledge and the arrangements necessary to connect them with society. The theoretical debate underlying this article derives from the anthropology of science, which offers us an insight into science and epistemes that is needed for the continuity of analyses.

Keywords | Sectoral Funds; Innovation Policies; Anthropology of Science

1. Introduction

Between the late 1990s and early 2000s, the so-called Sectoral Funds were created in Brazil. They are a complex legal and institutional apparatus, whose main purpose was to recover the budget of the science and technology (S&T) sector, which, for decades, had been undergoing a serious crisis, related not only to a lack but also to an instability of resources. Uncertainties regarding the budget of S&T funding agencies had been an old complaint of the Brazilian scientific community. To solve the problem, the Sectoral Funds established earmarked revenues, that is, a mechanism through which a share of several taxes, such as Contributions for Intervention in the Economic Domain (CIDE), oil royalties and financial compensation, would be deposited directly into the account of the National Fund for Scientific and Technological Development (FNDCT). With this, the budget of this fund would supposedly not suffer from budget instabilities, because it would not depend on transfers from the national treasury.

Some taxes were created specifically to feed the Sectoral Funds, while others were modified to meet this purpose. Thus, in its first year of operation, the estimated collection of the programme was already of R$ 1.2 billion, which represented more than double the average annual budget of the FNDCT, which was around R$ 550 million and, at the height of the crisis, in 1997, fell to less than R$ 150 million (MELO, 2009).

In addition to securing resources, the Sectoral Funds also established a new management model for the FNDCT. The most important change was the use of resources to finance research related to the productive sector from which the sum was collected. Thus, the share collected from oil royalties would be used to finance research on oil and gas; the sum collected from contributions paid by energy companies would be used to finance energy research, and so on, with respect to the most diverse sectors of production. Initially, 16 sectoral funds were created.

The creation of this programme was part of a broader historical process, which consisted of the establishment of policies to support technological innovation in Brazil, which included the Industrial, Technological and Foreign Trade Policy (PITCE), of 2003, and the 2004 Law of Innovation, among others. The purpose of these policies, in addition to restructuring the S&T field, was to put it at the service of the economic agenda. In fact, what was at stake was the implementation of a new conception of economic development, whose pillar would be precisely the concept of innovation. Generally speaking, this concept designates the production or use

of knowledge (presumably, but not necessarily scientific) in order to generate new products or production processes. In this sense, according to a classical formulation, innovations differ from simple inventions precisely because they provide economic advantage for the producer (SCHUMPETER, 1982). Also, innovations can be incremental or radical: the former are characterized by improving existing products and processes; the latter, by developing essentially new products or processes, thereby being able to generate disruptions and open new markets (DOSI, 1982). In any case, the premise was that, in the so-called knowledge society, science and innovation are the main way to add value to economic production. The future of countries, their competitiveness in the global market, their development projects, their ability to generate wealth and well-being for the population would depend on their capacity to innovate and create environments favourable to innovation in companies.

The formulation of innovation policies in Brazil was one of the most important chapters in the recent history of science in the country, not only because it has indeed restructured the sector, but because it introduced a new vision on science, on its role regarding society, on its importance for increasing economic activity and promoting the public interest, etc.

This article consists of an analysis of the legal-normative structure of the Sectoral Funds, that is, the laws and decrees by which they were implemented, and which define, at least partially, their basic characteristics as a public policy. Rarely does the literature on these funds reveal the legal matter that constituted them and what exactly they proposed when they were implanted. This leads to the formulation of questions and objections which are often inconsistent with the very nature of the programme. Thus, the prospect here is to fill this gap.

The general objective of this work is to analyse the proposal of articulation between science and economic activity promoted in the Sectoral Funds. The economic use of science is not inherent to it. Science, by definition, consists of the practice of knowledge production, marked by certain rules and particularities, which have been debated since classical antiquity and are constantly rebuilt by scientists (LATOUR; WOOLGAR, 1997; LATOUR, 2001; STENGERS, 2002). Today – or in Modernity (ROSENBERG, 2006) –, it has become the main way to add value to economic production, but this relationship is not immediate. On the contrary, it is mediated by several factors, of a practical or conceptual nature. It is these very mediations that I will seek to identify in the following analysis.

The specific objective is to show the conception of science enacted with the Sectoral Funds. What is understood as science when one seeks to put it at the service

of economic development? What kind of speech can we identify in the regulatory structure of the Sectoral Funds? I will argue that innovation policies can be defined as epistemic policies, alluding to what Karin Knorr-Cetina called epistemic cultures. The thesis here is that, by conforming a certain view on science, knowledge and their relations with the public interest and economic development, these policies influence (or may influence) our own epistemes, that is, "how we know what we know" (KNORR-CETINA, 1999).

To achieve these goals, two objects will be analysed: the first is the document "The Acceleration of the National S&T Effort" – prepared in 1999 by the then Ministry of Science and Technology (MCT) –, which proposed the creation of the Sectoral Funds. The document comprised the objectives, justifications, strategies and basis of the programme (PACHECO, 2007). The second is, of course, the legislation of the Sectoral Funds, i.e., the laws and decrees that constituted them legally. An exegesis of this material will be made in order to answer the questions proposed.

It should be said that I will not look at this legislation as a jurist or public policy analyst, who would see it as a structure of normative acts or an instrument of state governance. As an anthropologist, I will seek in this legal structure a discourse, that is, the defence of a certain conception of science. I am interested in the fact that such legislation registers and, at the same time, arranges the construction of an episteme, that is, a new view on science, knowledge and the arrangements necessary to connect them with society. This is, in my view, what makes this object susceptible to anthropological interest and analysis.

It should also be said that, by locating in innovation a factor of epistemological change, my interest is in science, rather than in innovation *per se*. I propose to study innovation with the objective of understanding the history and policies of science in Brazil. Consequently, the century-old theoretical debate on innovation, located mainly in the economic sciences, will not be the focus here. The theoretical debate underlying this article derives from the Science and Technology Studies (STS) field, also known as anthropology of science, which offers us an insight into science and episteme that is needed for the continuity of analyses.

In the next section, I will outline this theoretical debate, presenting the concepts that support the thesis defended here. In the third section, I will describe the legal-normative structure of the Sectoral Funds, including the aforementioned document by the Ministry of Science and Technology. The fourth section will present the results of the analysis, discussing the themes defined as objectives of this article. The last section will present the conclusion.

2. STS and the problem of episteme(s)

The theoretical proposal of this article is to hold a discussion on the Brazilian STI policy inspired by the STS field, especially its anthropological lineages. Although this use of STS is not common, I will argue that it can be extremely useful, because these studies illuminate important aspects of the topic, especially regarding the definitions of science and its relations with society. As an initial effort in this sense, I will analyse the debate around the idea of episteme.

One point of inflection in the history of this debate is the work of Michel Foucault. As it is widely known, a great contribution of this author is the redefinition of the relations between knowledge and power (FOUCAULT, 1979, 1988, 2006). Foucault does not look for the structures that condition or explain the production of scientific knowledge, nor does he identify in science an autonomous and neutral instance, ontologically removed from society. On the contrary, he conceives knowledge and power as relational instances, mediated by various devices, such as sexuality, security, health. At the heart of this vision is the idea of episteme, with which Foucault defines both the way of producing the bodies of knowledge of a given time, as well as the power relations to which those bodies of knowledge give rise.

STS have led the task of correlating knowledge (encapsulated by the concept of science) and its social and political environment (which encloses the concept of power) to the latest consequences. From Ludwik Fleck (FLECK, 2010) to Isabelle Stengers (STENGERS, 2002), through David Bloor (BLOOR, 2008), this has been a motto of these studies.

Bruno Latour explains that the *raison d'être* of laboratory ethnography is precisely to overcome the opposition between the context and the content of science, that is, to establish a symmetrical relationship between these domains, allowing for a description of science (its contents) that does not separate it from its social and political environment (its context) and neither reduces it to this environment. This idea of symmetry is crucial for the analysis proposed here, because it is precisely about identifying non-reductionist correlations between the context and the content of science (LATOUR; WOOLGAR, 1997).

However, STS took a step forward in relation to Foucault: they showed not only that epistemic analysis cannot dispense with historical and social analysis, but also that episteme itself is variable, diverse, non-homogeneous.

John Law and Annemarie Mol are the ones who most clearly hold this debate with Foucault. Law (2004) is uncomfortable with the idea of a single episteme

explaining centuries of history of Western society. For him, the episteme that emerged at the end of the 18th century can hardly explain how to organize knowledge and powers at the beginning of the 21st century. The author is more aligned with the STS view – particularly of Latour and Woolgar (1997) – according to which the modes of scientific knowledge are defined by inscription devices, that is, by the technological and conceptual machinery built in the process of knowledge production, carried out in laboratories. Hence the importance of the ethnographic perspective, which, for Law, is distinguished from Foucault's in terms of empirical scope (LAW, 2004).

However, Law argues that, contrary to what Latour and Woolgar suggest, inscription devices do not produce a single mode of knowledge, that is, a single episteme: on the contrary, there are several conceptual and technological pieces of machinery, which arrange different practices, different modes of knowledge and, consequently, different ways of assembling and erecting reality.

Annemarie Mol (1999, 2002) develops a similar argument. As she describes the process of producing the diagnosis and treatment of arteriosclerosis, she shows that the disease (as well as the body itself) is a multifaceted phenomenon, that is, a composite reality, enacted in different ways, using different strategies, technologies and devices. She makes a point of explaining that reality is multiple, but not fragmented, because these different ways of enacting or building it are in constant dialogue (and occasional dispute), in a process defined as coordination. Thus, she arrives at the same criticism of John Law's regarding Foucault, i.e., that there is no single episteme, through which a single reality is produced. On the contrary, there are several epistemes and diverse ways of ordering the relations between knowledge and power.

The problem of epistemological heterogeneity is addressed, with another theoretical stance, by Karin Knorr-Cetina, when formulating the concept of epistemic cultures (KNORR-CETINA, 1999). By comparing two forms of science, the author shows the diversity or disunity of the sciences. This diversity concerns, first, the practices of knowledge production, the way the process of knowledge production is conducted in laboratories. In this sense, it is a diversity of methods and logics of production of concepts – what is meant by objectivity, empirical field, object, etc.

Secondly, going back to a founding debate of the STS field, this diversity concerns the way science relates to its social and political environment. Knorr-Cetina starts from the observation that we are living in the knowledge society and that science, through diverse technicians, specialists and experts, actively participates in the construction of institutions, bureaucratic processes, social practices in general. Thus,

diversity in science unfolds in a diversity of expertise, technicalities and specialties that make up different forms of participation in society. In this sense, diversity in science implies a diversity in knowledge, in a broad sense, that is, a diversity of worldviews, of modes of knowledge, of the technological and conceptual machinery used to apprehend the world; a diversity, therefore, in the ways of participating in the very construction of reality. It is these different modes of knowledge that she terms epistemic cultures.

This assumption of epistemological variability appears in other lineages of science studies, which envisioned, through other paths, the possibility of transformation of science via an interface with "external" factors, among which economic activity stands out. This is what Paul Rabinow explains when discussing the convergence of science and industry in the 1980s in the United States (RABINOW, 1999). Analysing the biotechnology sector, he shows that this proximity resulted from the intensification of partnerships between universities and companies in projects aimed at developing marketable knowledge, that is, products with high value added, due to their high scientific content. According to the author, this phenomenon has transformed the way both universities and companies conceive their activities: the production of knowledge has become closer to industrial production than to the production of scientific papers; in turn, the industry has begun to incorporate elements of academic life, such as hiring researchers, holding conferences and building libraries.

Michael Gibbons also discusses this, describing what he calls Mode 2 scientific knowledge production, which would be distinguished from the traditional Mode 1 precisely by incorporating, in its process, the perspectives of practical application, economic exploitation, and interfaces with other sectors of society. Thus, one of the characteristics of Mode 2 is precisely the difficulty (or impossibility) of distinguishing basic/fundamental research from applied/corporate research (GIBBONS, 1994).

Andrea Bonaccorsi, in turn, analyses the emergence of the so-called new sciences (information, life and materials sciences) and shows the blending of knowledge and technology, knowledge and engineering, and discovery and manufacturing that occurs in them (BONACCORSI, 2008). The author explains that his intention is to go beyond Gibbons and to show that these blends do not only stem from political transformation and shifts in the modes of governance of science, but also from changes in scientific practice itself and in the history of science. In this sense, epistemological changes may explain the emergence of science interfaces with economic activity and the generation of technologies and innovations. This counterpoint is important to ratify that it is not a question of proposing reductionism

here, as if the legal/institutional context ultimately determines epistemes. It is rather a question of assuming the importance of correlations of science with its social and political environment for the formation of these epistemes.

All these ideas converge in the thesis that epistemes – scientific practices, modes of knowledge production – are variable, diverse, heterogeneous, and change throughout history and in comparison with sciences, precisely because they are built in relation to the social and political environment, that is, they are not autonomous or separate from power, history, society and culture.

Thus, the basic argument of this article is that one of the factors that contributes to this immanent process of redefinition of science is public policy, more specifically the regulatory structure, put under analysis here. The construction of this structure, the discourse that bases it and the practices that it arranges can be part of this process of reconstruction of epistemes. That is why I call them epistemic policies.

3. Design and construction: origin and legal structure of the Sectoral Funds

Let us then inspect the Sectoral Funds as an important chapter in the history of science and its policies in Brazil. Legally, the process of creating these funds began with Law n. 9,478/1997, the so-called Petroleum Law, which instituted a new energy policy in the country, becoming known for having broken Petrobras' monopoly on oil exploration and refining in Brazil. From then on, private companies began to operate in the sector under concession. In return, oil royalties, i.e., a tribute paid to the State by these companies, were created.

Article 49 of this law determined the transfer of part of these royalties to the MCT, with the objective of financing scientific and technological research in the oil and gas area (BRASIL, 1997). Decree n. 2,851/1998 regulated this transfer, determining a series of rules, including the fact that research should meet the demands of the industry (BRASIL, 1998). For such, the decree brings, in Article 7, the definition of scientific and technological research that would inform the application of resources:

> *Art. 7th. For the purpose of the provisions of this Decree, research and technological development activities will be considered as those carried out in the Country, comprising basic research, applied research, experimental development, non-routine engineering, basic industrial technology and technical support services necessary*

to meet the objectives of the programmes, to be defined by the Ministry of Science and Technology (BRASIL, 1998).

One can observe that this is a list of hybrid categories, combining scientific knowledge production activities with industrial production activities, which is consistent with the proposal to finance research of interest to the industry. We will see below that the use of lists to produce this type of combination would become a keynote of the Sectoral Funds. In addition, it is worth highlighting the absence of the category innovation, which had not appeared as a component of the policy under construction.

In 1999, the MCT formalized the creation of the first Sectoral Fund, the Oil and Gas Sectoral Fund, known as CT-Petro. At the time, it was an isolated initiative. The fund was not conceived as a pilot project for a larger policy; the idea to replicate it in other areas of production and creating similar funds that met the demand for scientific and technological research in general was matured in the MCT throughout 1999, as Carlos Américo Pacheco, Executive Secretary of the MCT at the time, clarifies (PACHECO, 2007). According to him, at the end of that year, the MCT met with the President of Brazil and handed him a document proposing the creation of the Sectoral Funds. The document specified the justification, characteristics, objectives, strategies and other aspects of the programme, and its analysis was fundamental for this article.

The scheme proposed in the document involves a triad: science and technology, higher education, and economic development, with the need of an articulation of the first two items to promote a new conception on the latter. According to the author, this scheme was based on the perception that knowledge (in particular, scientific) was the main way to add value to economic production. Therefore, there was an urgent need to restructure the S&T field in the country, revitalize it institutionally, and recover its main components, such as universities, research institutes, etc. This necessarily went through retrieving the budget of the sector. Thus, the Sectoral Funds, with their complex fundraising system, would have this primary as their primary purpose.

However, the document stated that, despite the budget crisis, the biggest problem of Brazilian science was not the lack of resources, but rather the difficulty in promoting its application in social life and, mainly, its economic use. That is why three tasks were urgent in S&T policy. The first was the implementation of strategic development programmes defined in the multiannual plan of the period,

namely "Innovation and Competitiveness"; "Information Society & Internet II"; "Biotechnology – Genome"; and "Meteorology and Weather".

The second task was to "reinstate a broad incentive system for corporate technological development (tax incentives, human resources, credit, etc.)" (PACHECO, 2007, p. 204), i.e., foster the technological development of the productive sectors. At this point, the document is emphatic in stating that this task should also be addressed in the context of economic policy.

The authors explained that the proposal to support the technological development of national companies had been conceived at the beginning of the privatization process of infrastructure sectors in the mid-1990s. The initial idea was to apply the resources derived from the sales of state-owned companies in S&T, specifically in programmes of technological training and productive modernization. However, for several reasons, including the fiscal crisis, the proposal was not carried out.

The problem, according to the document, is that by privatizing companies such as Eletrobrás, Telebrás and Petrobras itself (which was not privatized, but had its monopoly broken), the government disposed of something more valuable than the companies themselves, because they did not produce only goods and services, but also knowledge. Each of them had a Research and Development (R&D) centre connected to it – Research and Development Centre in Telecommunications(CPqD), Electrical Energy Research Centre (Cepel) and Leopoldo Américo Miguez de Mello Research Centre (Cenpes) – and these centres constituted an important component of the National System of Science and Technology, providing the scientific and technological background of these state-owned enterprises.

With the privatizations, large international corporations brought not only their capital into the country, but also their technologies, their scientific know-how, etc. With this, the economic role played by these research centres and the S&T sector of the country as a whole was dismantled. According to the document, the Sectoral Funds constituted an opportunity to rewrite this role, reconnecting Brazilian science with the economic agenda, which was necessary to resume the national economic development and growth.

Consequently, the third task of S&T policies would be to build a "new funding standard", that is, new management mechanisms that would favour this purpose. Here again came the Sectoral Funds, because, according to the authors, the CT-Petro experience showed that it was possible to create a national-reaching financing system that expanded the science and technology sector, but focused on strategic sectors, supported the generation of technologies, met the demands of the industry, and enabled the economic use of scientific knowledge.

Finally, addressing the topic of higher education, the document proposed a guideline that would become fundamental for the Sectoral Funds and innovation policies in general, namely, the stimulus to cooperation between universities and companies in R&D projects and the generation of technologies and innovations. Here, for the first time, the category innovation is introduced in the Sectoral Funds strategy, being conceived as a crucial element to promote the articulation between scientific and economic activities.

The text posed an important caveat, nevertheless: one should not expect that the stimulus to these collaborations replaced the budget that the government allocates to universities. Even in countries such as Japan and the United States, where university-industry relationship is extremely intense, it provides less than 7% of the university budget. Thus, according to the authors, it is necessary to be clear as to the fact that the main stakeholders in the engagement of universities in the economic agenda are the companies themselves. They conclude, "one cannot demand from the University the innovation that the private sector does not do." (PACHECO, 2007, p. 211).

In fact, the document argues that the role of the university should be understood broadly and beyond its economic engagement. Therefore, in parallel with the establishment of funds for the technological development of strategic sectors, it would be necessary to recover the "previous role of the FNDCT" (PACHECO, 2007, p. 220), that is, funding for scientific research in a broad sense and in all areas of knowledge.

In the beginning of 2000, the year after the proposal to create the Sectoral Funds was approved, the Infrastructure Sectoral Fund (CT-Infra) was created, first by provisional measure, then by law, both determining that 20% of the resources of the FNDCT and of "funds constituted or that are to be constituted with a view to financially supporting the scientific and technological development of specific economic sectors" (i.e., the Sectoral Funds to be created) would be reserved for CT-Infra and intended for "implementation and recovery of research infrastructure in public institutions of higher education and research" (BRASIL, 2001d). It is to be noted that CT-Infra is one of the exceptions in relation to the general rationale of the program, as it does not finance a specific sector of production, but rather the recovery of research infrastructure in public institutions, in all areas of knowledge.

Also in 2000, Laws n. 9,991 (BRASIL, 2000a), 9,992 (BRASIL, 2000b), 9,993 (BRAZIL, 2000c) and 9,994 (BRASIL, 2000d) were signed, creating the Sectoral Funds of energy (CT-Energ), transportation (CT-Transporte), water (CT-Hidro)

and mineral resources (CT-Mineral), and the space sector (CT-Space). These funds reproduce the standard mechanism of the programme: they are directed to financing scientific and technological research in their respective sectors, and their resources come from contributions paid by companies in these sectors.

Subsequently, a decree was signed for each of these laws, governing over the details of the funds. For the objectives of this article, the most important detail is the definition of scientific and technological research that should inform the application of resources. Regarding this point, the text is strictly the same in all decrees. The use of lists in these texts should be noted again. For example, Decree No. 4,324/2002, which regulated CT-Transporte, says:

> *For the purpose of the provisions of this Decree, programmes and projects of scientific research and technological development are understood as:*
> *I - scientific and technological research projects;*
> *II - experimental technological development;*
> *III - development of basic industrial technology;*
> *IV - implementation of infrastructure for research activities;*
> *V - training and capacitation of human resources; and*
> *VI - dissemination of scientific and technological knowledge (BRASIL, 2002).*

As has been said, one of the purposes of the Sectoral Funds was to strengthen the ties between universities and companies. That is why one of the funds was intended exclusively to finance cooperation between them in innovation projects. It is the Programme to Foster University-Industry Relationship for Innovation Support, known as the Fundo Verde-Amarelo (FVA), established through Law n. 10,168/2000. Together with CT-Infra, this is the other fund that is not sectoral, that is, it supports projects in any area of knowledge. The FVA inaugurated the use of the term innovation in the legislation of the Sectoral Funds. Not by chance, this fund would be the most analysed by experts (ARAÚJO *et al.*, 2012; DE NEGRI; DE NEGRI; LEMOS, 2008; MELO, 2009; MILANEZ, 2007). The regulation of this law was given by Decree No. 3,949/2001 (BRASIL, 2001c). As in the regulatory decrees of the other funds, it defined the activities to be financed by the FVA:

> *For the purpose of the provisions of this Decree, the Programme to Foster University-Industry Relationship for Innovation Support will comprise the following activities:*
> *I - scientific and technological research projects;*
> *II - experimental technological development;*

III - development of basic industrial technology;
IV - implementation of infrastructure for research and innovation activities;
V - capacitation of human resources for research and innovation;
VI - dissemination of scientific and technological knowledge;
VII - education for innovation;
VIII - training in technological management and intellectual property;
IX - actions to foster new initiatives;
X - actions to foster the development of technology-based companies;
XI - promotion of technological innovation in micro and small enterprises;
XII - support for the emergence and consolidation of technological incubators and parks;
XIII - support for the organization and consolidation of local productive clusters;
XIV - processes of innovation, value aggregation and increased competitiveness of the business sector (BRASIL, 2001c).

Of course, it is a different definition from the one that appears in the text, cited above, of the decrees on the other funds, because it is not about defining scientific and technological research, but innovation projects to be carried out by universities and companies in collaboration. In the next section, this difference will be analysed thoroughly.

In the beginning of 2001, Law n. 10,176 was instituted, creating the Sectoral Funds of informatics (CT-Info) and the Amazon (CT-Amazônia) (BRASIL, 2001d).

In relation to the first, the law basically modified Law n. 8,248/1991, which granted incentives to companies in the computer sector, and instead demanded, as a counterpart, the investment of at least 5% of their gross annual revenue in R&D. Out of these 5%, 0.5 would have to be deposited in the FNDCT account, constituting CT-Info. Note that a new category appears here: it is not about supporting either scientific and technological research (as in other funds), or innovation (as in the FVA), neither it is about the recovery of research infrastructure (as in CT-Infra), but rather R&D activities. Decree n. 3,800/2001 regulated this law, defining, among other things, what should be understood by R&D activities under the legislation:

> *Art. 8th. For the purposes of the provisions of Article 1st of this Decree, research and development activities in information technology are considered as:*
> *I - theoretical or experimental work carried out systematically to acquire new knowledge, aiming to achieve a specific objective, discover new applications or obtain broad and accurate understanding of the fundamentals underlying the phenomena and facts observed, without prior definition of the practical use of results;*

> *II - systematic work using the knowledge acquired in research or practical experience, to develop new materials, products, devices or computer programs, to implement new processes, systems or services or to improve those already produced or deployed, incorporating innovative characteristics;*
> *III - medium- and high-level professional training and capacitation in information technologies; and*
> *IV - scientific and technological service of counselling, consulting, studies, essays, metrology, standardization, technological management, fostering invention and innovation, management and control of intellectual property generated within research activities, and implementation and operation of technology-based incubators in information technology (BRASIL, 2001d).*

The first item is what we could call basic research, emphasizing the systematic character, the absence, in principle, of practical use, the focus on underlying phenomena, etc. The second approaches the idea of applied research. The third addresses the issue of human resources, compounding professional training and capacitation. The fourth item features a list (within the list) of activities regarding information technology services.

The last important moment of this initial process of creation of the Sectoral Funds was the institution of Law n. 10,332/2001, which created the Funds of agribusiness, health, biotechnology and the aeronautical sector, in addition to the Programme Innovation for Competitiveness (PIC). These funds are not fundraisers, i.e., they have no specific sources of revenue. They were created through the redistribution of CIDE, which began to allocate 17.5% to the Sectoral Funds of agribusiness and health; 7.5% for the Funds of genome and aeronautics; and 10% for PIC (BRASIL, 2001f).

The latter, in particular, complemented the FVA, creating new mechanisms to support innovation in companies, such as equalization of financial burdens, minority share of public agencies in the capital of micro and small enterprises, economic subsidy, constitution of technical reserve, among others.

The material presented here does not exhaust the legal-normative structure of the Sectoral Funds. Year after year, this structure continued to be increased, and there would be no room here to proceed with that description. Nevertheless, the assembled material comprises the initial cycle of the process of construction of the programme, established in accordance with the proposal formalized in 1999. In this sense, it is sufficient to sustain the following analyses.

4. Lists, blends and mediations: the articulation between science and economic activity in the Sectoral Funds

The analysis of the document published by Pacheco (2007) reveals that the S&T policies implemented through the Sectoral Funds pursued a dual agenda: on the one hand, the recovery of the sector as a whole, in its various components and aspects; on the other, its articulation with the economic agenda, through a focus on areas of knowledge considered strategic and fostering convergence with the productive sectors. More precisely, the idea was to recover the S&T sector while putting it at the service of the economic agenda. In fact, the promotion of innovation appears in the document as one of the strategies to achieve one of the proposed objectives, and not as a primary and defining task of the Sectoral Funds, as part of the bibliography leads us to conclude (ARAÚJO *et al.*, 2012; MILANEZ, 2007).

Moreover, as has been said, it is necessary to understand in detail how this articulation between science and economic activity is proposed, because it does not occur automatically and immediately, nor does it constitute an inherent characteristic of science, requiring the agency of various mediators. In the legal texts presented above, it is possible to identify four mechanisms that arrange or mediate this articulation.

The first is the use of lists to define what should be understood, in the context of legislation, by scientific and technological research. As mentioned, early in the decree that regulated CT-Petro there was a concern with this definition, displayed via a list of hybrid categories, blending scientific and economic/industrial activities. Subsequently, the same procedure was adopted in the decrees regulating the Sectoral Funds of energy, transport, water resources, etc. (BRASIL, 2002). Although a different list was built, it also blended scientific knowledge research/production activities with technology production, specifically for the industry. In part, this blend owes to the hybrid nature of some items, such as "experimental technological development" and "basic industrial technology development", which in themselves imply the articulation, on some level, of technoscientific expertise with the increase in productive forces (BRASIL, 2002). In addition, this blend occurs as an effect of the list itself, that is, of the fact that it gathers and overlaps categories that it intends to blend. Thus, terms such as "scientific and technological research projects" and "training and capacitation of human resources", which could designate strictly academic activities elsewhere, seem, because they are on this list, to refer to research and training of human resources for the industry.

The second mechanism was the concept of innovation. As mentioned, this concept appears initially in the drafting of Law n. 10,168/2000, which created the FVA. However, the first article of this law states that the main objective of the programme is to "foster Brazilian technological development through scientific and technological research programmes" (BRASIL, 2000e). Throughout the text, the terms "innovation", "technological development", and "scientific research" are constantly interchanged, almost as if they were synonyms, configuring a view of science that is literally confused with those of technological development and innovation.

This confusion/blending of categories would be clearer in the regulation, given by Decree n. 3,949/2001. In this case, the activities were naturally less academic/scientific and more economic/productive, because they consisted not of scientific and technological research, but innovation projects, to be carried out by companies in partnership with universities. An interesting exercise is to compare this definition with that of scientific and technological research given by the other decrees, which regulated the other funds. The first three items are strictly the same. The first difference is in item IV: instead of "implementation of infrastructure for research activities", there is "implementation of infrastructure for research and innovation activities". The addition of the term "innovation" implies that the infrastructure constituted with resources from the FVA would not be intended simply for research, but rather research for innovation generation. Therefore, although only a term had been added, the change made the object more specific and, thus, more restricted.

The second difference is in the 5th item. Instead of "training and capacitation of human resources", there is only "capacitation", and the binomial conformed in the previous item is added: "for research and innovation". With this, it is suggested that, when interacting, universities and companies should not invest in a broad training of human resources, but in their capacitation for the realization of research and innovation projects. The third difference, of course, is in the addition of seven more items, which encompass virtually any activity related to the generation of technologies and innovations. Later, we will see that the introduction of strictly economic categories is another mechanism of articulation between science and economic activity.

Therefore, the activities financed by the FVA have indeed a much more pronounced economic bias compared to those financed by the other funds. In it, fostering productive/industrial activity is much more at stake than stimulating the activity of scientific knowledge production, even if both appear enmeshed. In part, this bias is due to the fact that the articulation of scientific and economic activities occurs not only by overlapping categories in a list, but also by the introduction

of the category innovation. This category, being of a hybrid nature itself (both scientific and economic) and being employed alternatively to "scientific research", brings science and productive activity closer together. In Bruno Latour's (2012) terminology, the concept of innovation functions as a mediator of the articulation between these terms.

The third mechanism appears in Decree n. 3,800/2001, which regulated the Informatics Sectoral Fund. In this case, the articulation between scientific and economic activities is not only due to overlapping categories or the mediation of the concept of innovation, but owes to the mediation of the concept of R&D. It designates the research activity that aims to generate or increase productive products or processes. It is one of the main ways of boosting the innovation process, although experts point out that it is not the only one, since this process, because it is systemic, does not necessarily derive linearly from research and technical knowledge. In this sense, although R&D is also a hybrid category like that of innovation, it is defined more by the scientific component than the economic one. That is why, in fact, the emphasis of innovation policies in supporting R&D would become the target of much criticism from those who are particularly concerned about the economic agenda (VIOTTI, 2008).

Therefore, R&D and innovation are different mediators, which articulate science and economic activity differently, varying, above all, the proportion of what makes up each blend.

The last mechanism used to promote this articulation appeared initially in the FVA and was consolidated in the Programme Innovation for Competitiveness. As has been said, the latter complemented the first, creating new mechanisms to support companies, mainly related to access to credit. Thus, the focus on supporting economic activity, which had been already pronounced in the FVA, became even more conspicuous. In the FVA, the definition of financeable projects, given by Decree n. 3,949/2001, already articulated science and economic activity not only through the concept of innovation, but also through the introduction of strictly economic categories, related to productive/industrial activity. This expedient was increased in the PIC. Thus, both amplify the economic dimension of the projects to be supported, emphasizing their investment character and circumscribing them to the dynamics of the productive sectors, more than of the academic sectors. If the idea was to bring the economic agenda into S&T policies, the use of economic categories to define activities financeable with resources of these policies emerges as a crucial strategy.

Therefore, the regulatory structure of the Sectoral Funds articulates science and economic activity through (i) the definition of scientific and technological research in lists that blend scientific and economic categories; (ii) the employment of mediators, such as innovation and (iii) R&D, which, by their hybrid nature, produce this articulation; and (iv) through the introduction of strictly economic categories in the definition of activities financeable by the funds. In this sense, although producing an articulation, a hybridization, of scientific and economic activities is at stake in all Sectoral Funds, the results are not always the same: they are different hybrids, which vary in the way they are produced and in the proportion of what goes into their composition.

Thus, in theoretical terms, more important than proclaiming the disappearance of the boundaries between scientific and economic activities, is to describe how this happens, through which mediators, and what results from this disappearance; more important than to see the proliferation of hybrids, is to show what constitutes them and in what proportion (GIBBONS, 1994; BONACCORSI, 2008; LATOUR, 1994, 2012).

By formulating the concept of mediators, Latour (2012) differentiates them from what he calls intermediaries, basically because the former not only connect, but also transform the terms they mediate. In fact, mediators take part in their own process of producing what they mediate. Therefore, considering innovation and other mechanisms as mediators of the articulation science/economic activity means assuming that, in this process, these terms become transformed. Economic theory already recognizes that innovative activity has a different nature from conventional economic activity. We must now identify the transformation that this mediation promotes in science.

In fact, as has been mentioned, the Sectoral Funds brought with them not only a normative structure, but also a particular discourse on science, a discourse which today is widespread in Brazilian society and that the Funds helped to consolidate. Marked precisely by this need for articulation with economic activity, this discourse emphasizes the importance of applied/corporate research and hard and natural sciences and engineering, privileging the science that generates products, technologies and innovations, as well as the scientist who becomes an R&D professional. Consequently, humanities and basic research tend to be shunned, since science is defined and valued not only as a knowledge generation activity – as in the STS field – but mostly as an extraordinarily effective means of responding to the demands of the "public interest", almost always encapsulated by the economic agenda (SCHWARTZMAN, 2002).

Obviously, the Sectoral Funds did not invent the economic employment of science. All developed or developing countries have been seeking to foster this use of science for decades. Even in the Brazilian historical experience, this articulation began long before the 1990s. But these funds have certainly rewritten this story, introducing new elements (such as the concept of innovation itself, which emerged as the central category of S&T policies at the time), responding to the specific demands of their context and intensifying (and modifying) the effects such articulation produces on science.

I have termed the Sectoral Funds and the innovation policies in Brazil epistemic policies because, as they conform a specific view on science, they deal not only with the legal and institutional framework of S&T, but with the process of knowledge production itself, that is, the "ways we know what we know" (KNORR-CETINA, 1999). In fact, the mediations and articulations proposed in these policies and the strength of the discourse they convey have the potential to influence the scientific practice and to change the dynamics of science in knowledge production sites, such as universities and laboratories, resulting in effectively epistemic transformations – what Latour has called the "content" of science (LATOUR; WOOGAR, 1997; LATOUR, 2001).

Naturally, concrete effects of this nature are complex and must be learned empirically, not by theoretical induction, the more so because the connection of this legislation with the practices of science is based on a complex and heterogeneous network of actors and institutions, which may include, for example, the whole process of decision-making and management, whose analysis is beyond the scope of this article. It seems to me that it is acceptable to assume that, throughout this network, the discourses and mediations built on the regulatory structure are traversed, modified and even mitigated by other discourses and mediations. Experts have shown, for example, that the attempt to articulate science and economic activity via the Sectoral Funds has paradoxically resulted in an increase in academic/university activity (SCHWARTZMAN, 2002; DAGNINO, 2007; PEREIRA, 2005).

Nevertheless, this does not diminish the strength and importance of the objects discussed here, as this paradox only shows that the Brazilian S&T policies are not homogeneous and dominated by hegemonic discourses; on the contrary, they are affected by diverse discourses, which contradict each other and are permanently in conflict. And if this network is heterogeneous, our analysis must contemplate the particularities of the many actors that are part of it.

5. Conclusion

The construction of the normative structure of the Sectoral Funds went through several stages: first came CT-Petro, inaugurating new mechanisms of collection and management of resources for S&T. Then, the MCT proposed the generalization of these mechanisms to other sectors of production, transforming them into a national policy of science, technology and innovation. Finally, several legislative acts faithfully materialized this proposal, yielding praise from Carlos Américo Pacheco, who highlighted the quickness with which these rules were implemented (PACHECO, 2007).

This coherence does not mean that there were no discontinuities in the process. There were many, and the main one was the introduction of the concept of innovation, which does not appear in the legislation on CT-Petro but turned out to be a key element of the Sectoral Funds, acting as an important mediator of the proposed articulation between science and economic activity. Thus, if science has become the main way of adding value to economic production, as Pacheco said (2007), innovation has become the main way by which science performs this role. Without innovation, the author suggests, science runs the risk of remaining without practical application, unable to benefit society and the public interest.

However, in the legislation on the Sectoral Funds, innovation appears only in Law No. 10,168/2000, which created the Fundo Verde-Amarelo, and in Law n. 10,332/2001, which created, among others, the Programme Innovation for Competitiveness. The other funds were not created specifically to finance innovation, but rather scientific and technological research, whose link with economic activity would be established through diverse mediators, such as the concept of R&D, among others.

In this sense, although the Sectoral Funds were part of the process of creating innovation policies in Brazil, it does not seem appropriate to assess them only by their ability to stimulate innovation, as is usual in the literature about them. In the legal structure that initially set up these funds, innovation appears as an important strategy to achieve one of the objectives, but not as the ultimate and defining purpose of the programme.

In addition, it is necessary to analyse the Sectoral Funds also for their other objective, which is to restructure the Brazilian S&T sector as a whole. This article did not intend to gauge the appropriateness of the programme for this purpose, but rather to show that this project of reorganisation of science resulted in a

project of redefinition of science itself, that is to say, a project of epistemological change, which is characterized by the circumscription of knowledge to its role in the economic agenda, emphasising, hence, specific regimes of knowledge production (applied research, creation of technologies and innovations), and in specific areas of scientific research (natural sciences, engineering, etc.).

Although such project was not carried out to its fullest, the form it assumes in the legal structure of the Sectoral Funds cannot be minimized in its importance, because it was part of a process to strengthen this specific discourse on science. In turn, this discourse plays, without doubt, a central role in the public debate on the subject in the country.

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