Science, technology and innovation systems: approaching the roles and challenges of state research support agencies in Brazil[1]

(PLEASE DO NOT QUOTE BEFORE SEPTEMBER 21, 2019)

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September 2019

1. Introduction

This article addresses some key institutional aspects of the history of state research support foundations in Brazil (state FAPs, in the national acronym). It also assesses relevant possibilities linked to their subnational system – a structure that emerged in the past three decades –, considering the current dilemmas that result from the lack of a more proactive strategy in the field. I will identify possible paths to strengthen the state FAPs system. This is an exploratory research based on a triangulation-methodology that combines the literature on the field, a review of official documents, data production and my reflections as former president of the Federal District's Research Support Foundation (FAPDF in 2016-17).

This contribution is not focused on the current aspects and challenges of science and research in the country – a field undergoing an acute funding crisis and facing the threat of serious disruptions. Instead, it examines the trends and societal changes pointed out by the recent literature. It is a reflection on the country's responses to these challenges in recent years and a discussion of perceptions on what may take place in the near future, obtained from interviews with representatives of key subnational actors in the field. This is an effort to conceive an agenda which, nonetheless, will only be feasible with a change in the country's current political context.

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[1] This article summarises my research project "**Science, technology and innovation: approaching the role of state research support foundations in Brazil in light of the UN 2030 Agenda"**, funded by the National School of Public Administration (ENAP, Brazil) via Public Notice 05-2018 (Cátedras Brasil). An expanded version of this article was delivered to ENAP on September 1st, 2019 – the same date when this abridged version was delivered to Winir.

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2. Overall context

A reflection on Brazil's current potentialities initially calls for two analyses about the overall context of global transformations that are (re)configuring contemporary societies.

The first of these analyses is a reinterpretation of the changes that have been already perceived, measured and examined. The second, in turn, leads us to a prospective reading of the large-scale trends that may have an impact on the ongoing processes of change.

In both exercises, it is necessary to identify the country's behaviour in the recent past, with its mistakes and successes, in addition to the challenges and impasses for its near future. In the first case, Castells (2011) proposes a structure of thought for discussing the contours of contemporary society, as a result of a longstanding and extensive empirical and theoretical research. After nearly two decades of his academic and political orientation – and the concept of network-society –, Castells revives the importance of grasping theory and investigation itself in the dimension of usefulness, which seeks to identify a meaning for the observed themes. Thus, the value of social investigation is not only linked to coherence, but also to its relevance. In short, it is not a discourse but, essentially, an investigation.

According to him, the contemporary technological revolution played a decisive role for the end of the East-West conflict – and, consequently, in the dismantling of the real-Socialism experience in former Soviet Union and Eastern Europe (this process is discussed in detail in Volume III of his work, chapter 1: "The crisis of industrial statism and the collapse of the Soviet Union"; and chapter 2: "The rise of the fourth world: informational capitalism, poverty and social exclusion", and was consolidated as a key variable of the network-society, which is challenging the political institutions and the construction of sociability-spaces.

Castells shows that two fields of such technological transformation are acting in an interrelated way to produce deep transformations in the material foundations of our lives, namely communication based on microelectronics and genetic engineering. Based as it is on technology, the network society radically intensified the globalisation process, which, in turn, encompasses a diversity that reaches beyond its hegemonic financial aspect. Instead of a space of places – as Bauman (2001) also affirms –, the dominant reality is one of a space of flows, which serves the spatial architecture of megacities. Thus, while people are still seeking to experience meanings in places, they also create networks based on the logic of flows. Facing such reality in the discussion of policies and agendas for a national or local territory is currently not a choice, but an imperative.

All these changes are unleashing huge challenges for today's national societies, which require planned, coordinated and shared responses under a minimum project of nation. This is obviously not something new, since the successive changes in productive processes and in the labour world have been a constant in recent decades. But despite not being new, they are radical changes with a highly disruptive potential that generates risks – especially for societies with high inequality levels and low educational profiles, such as Brazil. In this regard the prospects in relation to the labour market and governance are quite concerning. Gaetani

& Almeida (2019) present numerous examples of such challenges and an account of what is being done in some countries that one does not find in Brazil. The key issue, in their study, is that the productive restructuring which has taken place in developed economies and in two big developing economies (China and India) found Brazil unprepared, in a state of political turmoil and lacking a reasonable consensus as regards a minimum idea of national project.

Yet, Brazil's ability and preparedness to face the radical transformations in progress is a matter of responsibility for all stakeholders willing to enable a new development project capable of at least raising the country in the medium term from the secondary space it now occupies in the international division of labour, and of facing its increasing dependency on the prices of commodities. This scenario analysis surely must not entail an acritical and naïve adherence to the dominant logic imposed by the system's core. What it means, instead, is first the acceptance that the system of production and exchange of goods is a hegemonic fact of reality, [3] even though key actors such as China and Russia are both inside and outside it. They are outside it in a broader political sense, since they have amassed enough economic (China) and military (Russia) power to withstand the natural pressure from the wealthiest and most developed countries.

In Brazil, in turn, the imposed end of the process of accumulation after the national-developmentist experience of industrialisation via substitution of imports was not capable of leading to well-coordinated policies in the past three decades, which could be capable of ensuring adequate planning and expanding the country's productive capacity with modern infrastructure and the development of new competitive advantages (SAAD FILHO; MORAES, 2018). The ability to change such pattern is also an essential task that must be carried out in order to reintegrate the Brazilian field of science and technology into a long-term strategy.

With the political pact of its 1988 Constitution, Brazil opted for the construction of a democratic and open society, and has since then sought to consolidate it at great pains. The Brazilian institutional challenge is complex and requires the strengthening of powerful ideas in order to tackle the risks that are intrinsic to innovation. Rodrik (2015, 2016), for instance, points that it is necessary to avoid concentrating innovation in only a few technology-intensive sectors that absorb the best trained professionals, but represent a small portion of the Brazilian GDP. Reversing such trend means disseminating innovation for the larger part of the economy, since its positive impacts on productivity, employment and equity depend on how it is disseminated in the market of labour, products and services. Even in Europe, with one of the world's most advanced economies in terms of technology and innovation, strong concerns were expressed in relation to this risk, which has been recently faced with strategies to disseminate open innovation and involve as many productive, public and social sectors as possible (EUROPEAN, 2016).

The open innovation premise in this European policy consists in the effort to conceive innovation as a living set of interactions among all actors involved in the knowledge-process. Promoting the circulation of knowledge is a crucial element for the creation of new products

[3] However, other forms of production and distribution live on in non-hegemonic communities and societies. And numerous counter-hegemonic productive initiatives are now active within the hegemonic system itself, especially in terms of food production systems with a focus on sustainability.

and the dissemination of what is currently defined as an entrepreneurial culture. This notion requires two-way transfers of knowledge, skills and funds among research institutions and companies, calling for a change of paradigm: from a linear and bilateral idea of collaboration to a new, more dynamic level of interactions focused on networks and multi-collaborative innovation ecosystems.

This new dynamic is incompatible with the notion of predefined results and isolated innovation strategies aimed at patent-filing and trade in connection with them; results now would emerge from a more complex, co-creative process in which knowledge is a product of the circulation of ideas and proposals in the economic and social environment. According to this strategy, the key to ensure the transition from a linear model of knowledge transfers while establishing links with open science requires the creation and support of innovation ecosystems capable of disseminating knowledge as a social value, shared by the society as a whole.

3. The case of Brazil: policies without a strategy

Even a limited comparative analysis – in this case, looking only at the general features of this European strategy – can help us understand Brazil's current problems. The inherent tensions of democracy must not prevent a level of cooperation through which Brazilians may minimally define a strategic project for their country.

In this regard, the biggest mistake is the belief in ready-made recipes that could be adapted to all situations. Such recipes are simply not available, as Rodrik (2011) shows with admirable clarity in his examples of differentiated strategies in response to the paradoxes of globalisation. Rodrik (2016) shows that despite the some relevant innovation cases in well-managed companies and vanguard sectors, the recent Latin American economic experience is largely characterised by stagnation. Such contradiction is explained by the fact that the rapid productivity-increase in some innovation niches was overridden by the migration of workers from more to less productive sectors. Despite the fact that innovation is a crucial element of contemporary economies, it does not raise by itself the living standards of a society, since it may also tend to be restricted to pockets of technology and coexist with low productivity levels. On their turn, positive results will always depend on far-reaching impacts for the entire set of the economy. This is the heart of today's challenge.

Thus, it is extremely relevant to insist in the discussions about possible institutional arrangements so that a minimum strategy may be implemented in Brazil. Strictly speaking, it cannot be said that a strategy for this field in the country is or was in execution in the recent past. But important efforts were made, especially in terms of designing proposals – which, in turn, can be used as a starting point – and drawing from the experience of previous attempts and designs. In this regard, the National Science, Technology and Innovation Strategy (ENCTI) was launched in 2016 to promote consensus among the parties responsible for dialoguing on

this theme at the overarching level, including Executive and Legislative representatives from many levels (ministries, regulatory agencies, state and municipal secretariats, the National Congress and state assemblies), scientific institutions, the entrepreneur sector, funding agencies, universities, and federal and state institutes of science and technology.

The existence or not of a strategy in this field makes a great difference in the change of positions vis-à-vis the ongoing processes of technological and economic reconfiguration. Brazilians must now face the challenge of finding a new standing place in the world, based on a reasonable level of consensus regarding the interests of the country, which is too big to bind its destiny to a specific economic bloc or world power. Increasing the research potential and radically raising the current educational levels are essential conditions so Brazilians may speak about a decent future.

A new wave seems to be taking shape in the economics of knowledge and inverting the logic of previous decades, when transnational companies built their factories around the world in search of cheap labour, as Lund, Manyika & Spence (2019) describe. This new wave is another consequence of the complex and modern production of goods increasingly based on research and planning. Trade is now more and more concentrated in some regions, particularly Europe and Asia, in addition to the USA; and companies are concentrating their productive parks closer to these markets. The expansion of technologies based on Internet connectedness and artificial intelligence, especially since the increase of production via the Internet of Things, will progressively set these companies free from the need to have on-site access to cheap labour in poorer countries. China had the strategic capacity to anticipate this process by building a transition from the model of importing raw materials and assembling export products, to a new model based on the production of sophisticated goods. Moreover, China now is starting to prioritise its gigantic internal consumption market.

After analysing the promotion of science in Brazil in the past decade, Luna Pedrosa & Chaimovich (2015) show that despite some relevant attempts of public policies with impacts in the field (for instance, the National Education Plan, 2011-2020) and the search for new STI governance models (with changes in the legislation and the creation of social organisations to simplify management), the effect of these attempts was weak in terms of moving beyond some longstanding impasses inherited from previous decades. One of the studied indicators was productivity at work, which still remains stagnated since the 1980s. Brazil followed the predominant logic of Latin America, where increases in social expenditures did not improve productivity levels at work – except for Chile, where productivity doubled between 2018 and 2010. As a matter of fact, a general decrease was experienced in productivity:

> *Not even the boom of commodities in 2004-2010 made a difference. Part of the explanation for Brazil's low levels, even during that growth cycle, lies in the fact that most of the economic growth in these years took place in the industry of services; since this sector requires lower training levels, the average productivity of workers actually fell* (LUNA PEDROSA;CHAIMOVICH, 2015, p. 40).

There is no consensus regarding the causes of such stagnation, which had the effect of condemning Brazil to a strategic paralysis after the import substitutions' cycle. The 'ends' somehow did not 'meet' in the political and institutional fields, and the successive policies implemented in the course of time did not lead to optimised results.

Such scene was not the result of a lack of intellectual production and quality studies, especially by the country's highly trained State employees. For instance, before the ENCTI was launched, a document issued by the Secretariat of Strategic Affairs of the Presidency of the Republic under the coordination of Mangabeira Unger presented a detailed diagnosis of the dilemmas of Brazil's productive sector and suggested paths to foster a new insertion of Brazilian companies in the global productive and commercial chains as a form of 'vanguard entrepreneurship'. After depicting the productive situation of the country as primitive, this document stated that big national companies were mostly behind the times in technological terms, whereas small companies were completely behind the times and swung between informality and illegality. To overcome such situation, the document listed an ambitious set of institutional changes with a focus on policies aimed at generating a network of advanced medium-sized companies as a means to attain new comparative advantages in the global economy (PRESIDÊNCIA, 2015).

Brazil's 1988 Constitution opened the path for the establishment of state systems in support of science and technology. Two articles of the Constitution (218 and 219) address this field, stressing the role of the State as a promoter and backer of scientific development, research and technological training. These constitutional provisions propelled several initiatives of the scientific community in constitutional processes at state level after the enactment of the federal Constitution in October 1988. At that point began the structuring of most state research support foundations nationwide. Some states already had agencies with similar functions, including foundations, but their budget was not earmarked.[4]

The Research Support Foundation of Rio Grande do Sul (FAPERGS) was created in 1964. On its turn, the Research Support Foundation of the State of Rio de Janeiro (FAPERJ) was established in 1980 from the merging of the Rio de Janeiro Institute of Economic and Scientific Development (FIDERJ) and the Centre for Human Resource Development (CDRH). But FAPERJ was not immediately active in terms of research funding. Up to 1987, it had not yet provided resources for projects and scholarships (FAPERJ, 2019).

The state of São Paulo, on the other hand, had a previous and more consolidated institution – which became a benchmark for the foundations established in other states and the source of contents discussed in the constitutional sessions on the theme. The Research Support Foundation of the State of São Paulo (FAPESP) was conceived and laid down in the State Constitution of 1947. It was then formally established in 1960 and effectively began its activities in 1962 with 0.5% of the state's revenue. This percentage was increased to 1% in

[4] Except for the state of São Paulo, where FAPESP's budget was earmarked since the 1960s.

1989 by São Paulo's new state constitution (FAPESP, 2018).

But the overall standard of research funding continued to be unsatisfactory. Such situation was not due to a lack of initiatives; there were attempts to produce changes and tread new paths in many directions – for instance, by successively modelling the sector's funding, which was based on the Sectoral Funds for Science and Technology.

The first Sectoral Fund appeared in 1999 to stimulate innovation in the productive chain of petroleum and natural gas. It was followed by other legal provisions, including the enactment of the Innovation Law (Act 10,973/2004) and of a specific law on tax incentives to innovation and exports (Act 11,196/2005). In 2009, Presidential Decree 6,938 regulated the National Fund for Scientific and Technological Development (FNDCT). Those initiatives to modify the legal structure and the concrete project development scene played an important role of transition.

The Brazilian legal landmark underwent a new and radical change with Act 13,243, of January 11, 2016. This normative instrument significantly modified the Innovation Law and clearly institutionalised shared responsibilities among Brazil's federative entities in regard to the promotion of innovation in companies, including a modality of economic subsidies to capital. Support foundations strongly led the advocacy and legislative transit of this agenda via the work of the National Council for State Research Support Foundations (CONFAP).[5]

Act 13,243 was the formal foundation that enabled a possible change in the country's historical dissociation between the academia, research centres and the private sector, since new instruments could now be developed to coordinate funding policies and facilitate the approximation of basic and applied research. Companies – especially small ones – could now get closer to the research world to add value and improve their products and services. But the issue at hand today is: knowing whether these instruments will be effectively used with positive impacts capable of changing the stagnation-trend identified by Luna Pedrosa & Chaimovich, to create a new logic in the field of science, technology and innovation in Brazil.

It is certainly not possible to give an *a priori* answer to this question, but the history of the recent decades indicates the need to overcome some huge difficulties. Brazil still lacks a consistent strategy, which can only be successful if it is clearly understood and shared by a representative set of relevant institutional, social and political actors. To attain this aim, it will be necessary to break through the insularities that characterise science and research in the country, and to infuse the recognition of the strategic nature of this field into the public sphere. This unavoidable strategy will necessarily resume the debate on the role of the State and of other actors in search of the most advantageous institutional arrangement.

In this regard, it is always imperative to make decisions. The criticism of Rodrik (2011) to the idea of complete openness under a hyperglobalisation-logic seems to be an adequate roadmap for thinking about what can be done in Brazil in the coming years, considering the

[5] CONFAP was established in 2006 as a hub of 26 research support foundations. It is the institutional space for coordinating these foundations, thus enabling their horizontal cooperation within this subnational system of science and technology.

scenario presented by the 2030 Agenda in regard to research and innovation. Rodrik' studies deconstruct with quality evidence some myths linked to the market's ability to steer isolated alternatives of transition toward higher levels of development and insertion in the global productive chains. In so doing, Rodrik sets himself apart from the liberals who uncritically defend the advantages of total market openness and the deregulation of economies, and also from analysts who fail to recognise the gains of some regions amidst the globalisation of recent decades, in the context of capitalist economics. He does so by following the trajectory of the post-war economic order under the Bretton Woods arrangement, which paved the way for over three decades of spaces of relative autonomy for some Nation States, so they could opt – considering their specific conditions – for building distinct types of Welfare State experiences. This process took place more intensely in central capitalist economies, but it was also present in a more limited way in some developing countries that experienced processes of industrialisation and growth.

Starting in the 1980s, the expansion of a new globalisation trend – the hegemony of financial capital with increasingly new technologies – set in motion a deregulation process conceptually backed by multilateral organisations, which radically affected most countries. Globalisation then intensified to attain higher levels both of wealth and inequalities.

Examining two cases of 'winner' countries in this process – China and India –, Rodrik points that none of them opted for deregulation as prescribed by the hegemonic trends of this new stage of globalisation, and both continued operating and winning under the Bretton Woods' rules. Another frequently mentioned case in Asia – which, however, is remembered in a more simple way – is Korea. It is always pointed that Korea overcame backwardness by strongly investing in education starting in the 1960s. This is true, but it does not fully make sense outside a geopolitical approach. Korea and Japan owe much of their economic success to their ability to attain internal political cohesion and make strategic decisions without the interference of (particularly, agrarian) elites;[6] and, moreover, to US political and economic support, so they could be firmly established as relevant regional actors and allies.

Rodrik points that in the 1990s, Latin American countries uncritically embraced the prescriptions of total liberalisation and became victims of their own initial success. In the discussion of priorities in a context of alternatives to globalisation, he stresses the absence of a one-size-fits-all approach. But at least two simple lessons can be learned from the many examples of the past decades, both in relation to central capitalist countries and nations that successfully broke through their hindrances and became key economic players, particularly in Asia.

The first lesson of this institutional approach is that neither the market is a substitute for the State, nor the opposite. And markets operate best in countries where the State is strong. Many arrangements are possible in this regard, and they will always hinge on the

[6] This aspect pointed by Rodrik – the absence of retrograde agrarian elites – is generally not emphasised in the literature on capitalist development in the region, but it is a key variable of the process. This reasoning finds consistent evidence in the recent work of Scheidel (2017), which approaches agrarian reform experiences levelled and encouraged by the war context and foreign occupation in both countries after World War II.

individual needs of each country.

The second lesson learned from historical experience is that capitalism is never based on a single model. As a structurally unequal system, it enables more or less favourable institutional arrangements in terms of labour, finances, corporate governance, and welfare, among other areas, according to each context.

Understanding and harnessing these two lessons are greatly relevant for thinking about new possible arrangements between globalisation and democracy, since the balance between governance and markets will always be delicate. Written before the recent wave of nationalism and unease in reaction to globalisation, Rodrik's analysis suggests a "trilemma" based on an obvious finding, which is generally disregarded by advocates of a naïve opening to economic internationalisation: there is not a consolidated global governance framework, and it does not seem that such governance will be in place in the near future.

One the one hand, it would be anachronistic and truly unfeasible to think about self-reliant alternatives similar to the 'national-developmentist' approach that characterised Brazil and Latin America for decades (justifiable in its previous historical context); on the other, one cannot conceive the feasibility of automatically integrating to the global chains and relinquishing national strategies based on the logic of a nation for the design, planning and execution of policies. Rodrik's "trilemma" exposes the impossibility of seeking and attaining a deeper democracy – a crucial issue for Brazil –, national interests and adherence to economic globalisation without a strategy:

> *If we want to push globalization further, we have to give up either the nation state or democratic politics. If we want to maintain and deepen democracy, we have to choose between the nation state and international economic integration. And if we want to keep the nation state and self-determination, we have to choose between deepening democracy and deepening globalization. Our troubles have their roots in our reluctance to face up to these ineluctable choices* (RODRIK, 2011, pp. 7-8).

His criticism is not aimed at globalisation itself – this would be a useless endeavour, considering the inexorability of globalisation –, but at the financialisation of economics and hyperglobalisation. It is also a direct warning to the countries that have been 'falling by the wayside' in the game.

In order to make these choices described in Rodrik's "trilemma", Brazil must initially escape an even more far-reaching dilemma described by Arbix (2009; 2017): it must achieve the capacity to enter the game before the available windows of opportunity for developing countries close. Arbix shows how this process is accelerating with the recent changes in the productive environment. They have clear negative impacts on the labour market, with an increase in competitiveness among workers that deepens inequalities among those with more and less training. These threats can become even more acute in the coming years if the Brazilian economy does not respond as a whole or at least in most sectors to the challenges

imposed by the pace of the productive dynamic.

Brazil continues to experience a long deindustrialisation and stagnation period, even though it also implemented relevant welfare policies in the past two decades. But it must still find a sustainable path in order to reindustrialise its productive sector on a new competitive basis both for national and multinational companies on its territory – which are operating with outdated industrial parks (BRESSER-PEREIRA, 2018) –, lest its competitiveness should become limited to the commodities' sector.

4. The perceptions of actors from Brazil' subnational (state) system

In dialogues with key actors, with the aim of exploring possible paths to bolster the role of state support foundations (FAPs) and reinforce research and innovation systems, while addressing the themes of the 2030 Agenda, I set out to identify and describe the key features of the field and carry out a comparative assessment in two dimensions. The first dimension consisted in a sequential analysis (MAHONEY et al., 2003) of the results of pro-FAP processes from the outset of the system's expansion after the 1988 Constitution to the recent institutional actions aimed at reordering the legal framework on FAPs. And the second dimension comprised the identification of relevant processes that may enable direct case comparisons (TILLY, 1984): for instance, the density of academic and research activities in the territories covered by them and their features vis-à-vis the institutional arrangements of other countries.

This methodological approach was also supported by the updated field literature and secondary data, which guided the dialogues. Three initial in-depth interviews were carried out with key actors of the institutional milieu until 2018: Santana (2018),[7] Turchi (2018)[8] and Pacheco (2018).[9] These interviews dealt with issues such as funding, the convergence of universities and companies, social technologies, institutionalisation and international cooperation, following the initial findings of the empirical survey, as suggested by Layder (1993). After an analysis of the context and specialised literature, two additional in-depth interviews were carried out with actors occupying key positions in the system – Gargioni (2019)[10] and Vilela (2019)[11] – with the aim of exploring their perceptions about the three

[7] Jose Ricardo de Santana, Director of Institutional Cooperation of the National Council for Scientific and Technological Development (CNPq).

[8] Maria Zaira Turchi, President of the Research Support Foundation of the State of Goiás (FAPEG) and of the National Council of State Research Support Foundations (CONFAP).

[9] Carlos Américo Pacheco, Director-President of the São Paulo State Research Support Foundation (FAPESP).

[10] Sérgio Luiz Gargioni, former President of the Foundation for Research and Innovation Support of the State of Santa Catarina (FAPESC) and CONFAP President until 2017.

[11] Evaldo Fereira Vilela, President of the Research Support Foundation of the State of Minas Gerais (FAPEMIG) and current CONFAP President.

previous CONFAP administrations.[12]

A difficulty can be clearly perceived when surveying the data and systematising the experience of Brazilian state foundations: CONFAP itself has not yet systematised the recent aggregate information on the funds allotted to FAPs. The latest available data dates back to the previous decade (CONFAP, 2009). In 2018, an auspicious project was implemented to involve federal agencies and state FAPs, in order to create an integrated web portal with nationwide data on science, technology and innovation. This web portal would definitely perform a relevant role for science in Brazil.

In addition to the in-depth interviews with these key actors, this research drew some data from a previous work in which I participated,[13] which is partly described in the tables below. A relevant theme was found in the funding priorities of FAPs, with a strong emphasis on vocational training, as Table 1 shows. Innovation is a far-reaching theme that covers the dimensions linked to products, processes and governance in the public and private domains. In Schumpeterian terms, its *locus* is found in the companies, whereas in STI terms, it is more diffusely found (with a predominant role in the production of knowledge), and its existence is more strictly linked to economic performance. In the latter case, innovation also pervades procedures and the introduction of new public management tools, thus reaching beyond the Schumpeterian sphere. In the specific case of this research, this is an important remark for understanding the high percentages observed in the answers to the interviews (CGEE, 2019).

[12] Regarding CONFAP, see footnote 7 above.

[13] CGEE, (2019). This study was commissioned by Brazil's Management and Strategic Studies Centre (CGEE) under project "Diagnosis of the Current State of Human Sciences, Applied Social Sciences, Linguistics and Arts. Its research and survey were carried out in partnership with Moisés Balestro.

Table 1: Relevant funding themes (*multiple answers*)

Theme	% of answers
Innovation	31
Investment in vocational training	24,1
Others	13,8
Social policies	10,3
Environment and climate change	10,3
Increases in productivity	6,9
Quality of public institutions	3,6
Total	**100**

Source: CGEE (2019), survey with representatives of state FAPs.

Regarding funding, two issues emerged from the interviews with the representatives of state FAPs and from the recent literature (DE NEGRI, 2017) in connection with the impacts of the policies implemented in recent years. These issues are the need for new policies with significant funding and a focus on projects that help solving key problems of the society, and specific dilemmas linked to regional policies. Such funds (currently unavailable in satisfactory amounts) would also raise an important coordination issue. When asked about these themes, FAP representatives provided the answers described in Table 2 below, which reveal some inconsistencies as regards complementary and overlapping funds. The median of 2 for unaddressed needs indicates disagreements, more than agreement. The median of 4, in turn, points at considerable complementarities among national agencies and state FAPs in terms of research funding and priorities, so the themes and problems of each state or region can be addressed.

Table 2: Perceptions on funding

Following the Likert Scale, in which 1 = “Strongly disagree” and 5 = “Strongly agree”.

Item	Median (1 to 5)
There are overlapping themes and fields of knowledge in the public notices of research funding issued by state and national FAPs.	3,5
The funding provided by my state’s FAP seeks to identify the demands unaddressed by the public notices of national FAP.	2
There is a complementarity of research funding between my state’s FAP and national FAPs.	4
The funding provided by my state’s FAP prioritises research projects linked to regional themes and problems.	4

Source: CGEE (2019). Survey with representatives of state FAPs.

On its turn, Table 3 points at a high level of agreement of purposes, with a median of 2 for the decreasing role of human sciences and of 5 for interdisciplinary approaches. On the

other hand, a median of 3 (neither agreement, nor disagreement) was found for researches aimed at solving specific problems, which may indicate a state of indifference.

Table 3: Perceptions on the linkages between research and public policies

Following the Likert Scale, in which 1 = "Strongly disagree" and 5 = "Strongly agree".

Item	Median (1 to 5)
Social behaviour is essential for the success of public policies.	5
Difficulties of urban mobility compromise the labour and educational insertion of the youth.	5
Youth employment support programs in my state contribute to the professional enhancement and social mobility of the youth.	5
The Brazilian society does not appreciate the value of technological development and innovation, because it does not perceive the role of innovation and technology in their lives.	4
Human sciences face huge difficulties in terms of providing answers to practical problems of the society.	2
The loss of cultural and linguistic training in society decreases our collective intelligence.	5
FAP support should be preferably aimed at solving problems.	3
FAP support should encourage the integration of different fields of knowledge, considering that problems almost always require an interdisciplinary approach.	5

Source: CGEE(2019). Survey with representatives of state FAPs.

In the in-depth dialogues, the perceptions of interviewees converged in regard to the key problems of this area, particularly in relation to its insularities, which point at an inadequate knowledge level of the society about its potential and strategic relevance for the development of the country. This is a growing concern inside FAPs, and many of them have launched strategies to popularise science as a way of reaching out for the society. FAP representatives expressed a recognition of the appreciation of their legal and institutional framework; in other words, the very existence of this system is seen as an achievement with a potential contribution in terms of raising the country' scientific and technological levels. And some successful experiences, in contrast to the overall indicators – which point at a measure of stagnation –, are showing that this is possible. For instance, in the state of Santa Catarina, a successful experience following the consolidation of an innovative ecosystem changed the economic profile of its capital Florianópolis, based on the establishment of companies with a focus on technology. This was a strong partnership between the academia, the private sector and support bodies, including Santa Catarina' state FAP.

State FAPs are currently inseparable from the national science and technology system in Brazil. Asymmetries are obviously huge, both vis-à-vis the national FAPs (except for the case

of FAPESP) and among distinct state FAPs. The national agencies rely on these subnational entities in order to implement their policies. With differences in scale, practically all state FAPs are committed to training high level human resources for research activities, notably via scholarships that help PhD holders establish themselves in their regions. This regional outlook based on strategic themes is essential for training and expanding research networks in such a diverse and vast country as Brazil.

5. Final remarks

With its continental dimensions and a huge diversity of regional problems, Brazil sought to establish a subnational system in support of research, science, technology and innovation for the past three decades. Its benchmark was the case of its wealthiest and most industrialised state, namely São Paulo, which experienced a strong and successful path for over 50 years through FAPESP. An initial study of the trajectory of state FAPs after the 1988 Constitution – which requires further in-depth quantitative and qualitative inputs – shows many points to be improved, but also some rewarding and encouraging experiences.

Most state FAPs perceptibly have difficulties in order to operate more proactively in the analysis and management of funding projects. They also lack political autonomy and a more professional staff with increased management capacity. The experience of FAPESP and other foundations that made progress in terms of their structure shows that they can only move forward based on the search for solutions via researches that address the problems and the potential of each locality or region. Only this focus can increase scientific density, which will feed back into the entire institutional environment. Despite their difficulties, the previous experiences of state FAPs have also produced a promising trajectory that can be harnessed as institutional capital. These FAPs carried out many actions in the recent years in themes such as scientific dissemination, support to graduate programs, scientific initiation, academic mobility in connection with the internationalisation of universities, training, policy research and innovation in productive settings.

This model must be strategically seized if Brazil wishes to solve its biggest dilemma and produce new policies in the field, in order to break free from its diagnosed stagnation. As De Negri (2017) suggests, these policies, among other elements, must mobilise significant funds and facilitate new institutions and cutting-edge infrastructure, which can be open and available for collaborative use, while concentrating their focus on the solutions of problems and priority themes.

6. Bibliography

ARBIX, Glauco. Dilemas da inovação no Brasil. In: TURCHI, Lenita M.; MORAES, José Mauro de (orgs). Políticas de apoio à inovação tecnológica no Brasil – avanços recentes, limitações e propostas de ações. Brasília, Ipea, 2017, pp 47-80.

ARBIX, G. et al (Org). Estratégias de inovação em sete países: EUA, Canadá, Irlanda, França, Reino Unido, Finlândia e Japão. Brasília, ABDI, 2009.

BAUMAN, Zygmunt. Modernidade líquida. Rio de Janeiro, Zahar, 2001.

BRESSER-PEREIRA, Luiz C. Em busca do desenvolvimento perdido: um projeto novo-desenvolvimentista para o Brasil. Rio de Janeiro, FGV Editora, 2018.

CASTELLS, Manuel. A era da informação: economia, sociedade e cultura. Volume I (A sociedade em rede), II(O poder da identidade) e III(O fim do milênio). Lisboa, Fundação Calouste Gulbenkian, 2011.

CGEE. **Financiamento estadual à pesquisa acadêmica nas áreas de Ciências Humanas; Sociais Aplicadas; Linguística; Letras e Artes**. Relatório de Pesquisa. Brasília: Centro de Gestão e Estudos Estratégicos , 2019

CONFAP. Fundações Estaduais de Amparo à Pesquisa – orçamento executado 2007-2009. Brasília, 2009 (PDF disponibilizado ao autor).

DE NEGRI, Fernanda. Por uma nova geração de políticas de inovação no Brasil. In: TURCHI, Lenita M.; MORAES, José Mauro de (orgs). Políticas de apoio à inovação tecnológica no Brasil – avanços recentes, limitações e propostas de ações. Brasília, Ipea, 2017, pp 25-46.

EUROPEAN Comission. Open innovation, open Science, open to the World – a vision for Europe. Brussels, 2016.

FAPERJ. *Memórias da FAPERJ A trajetória da agência de fomento à ciência e tecnologia do Estado do Rio de Janeiro (1980-2013*), 2019. www.faperj.br Acesso em 21.06.2019.

FAPESP. Histórico, 2018. Disponível em http://www.fapesp.br/28

GAETANI, Francisco; ALMEIDA, Virgilio. O avanço digital e a natureza do trabalho em mutação. Jornal Valor Econômico, 07.02.2019. http://www.valor.com.br

GARGIONI, Sergio Luiz**.** Interview, 15.07.2019

LAYDER, Derek. New Strategies in Social Research: An Introduction and Guide. Cambridge, Polity Press, 1993.

LUNA PEDROSA; Renato Hyuda de.; CHAIMOVICH, Hernan. Relatório Brasil. In: Relatório de Ciência da Unesco – Rumo a 2030. Visão geral e cenário brasileiro. Brasília, Unesco, 2015.

LUND Susan; MANYIKA, James; SPENCE, Michael. The Global Economy's Next Winners. Foreign Affairs, July-August, 2019, pp. 121-130.

MAHONEY, James et al. *Comparative historical analysis in the social sciences.* New York, Cambridge University Press, 2003.

PRESIDÊNCIA da república. Secretaria de Assuntos Estratégicos. Produtivismo includente: empreendedorismo de vanguarda. Brasília, 2015.

PACHECO, Carlos Américo. Interview, 13.12.2018.

RODRIK, Dani. The globalization paradox - why global markets, states, and democracy Can't coexist. Oxford, Oxford University Press, 2011.

RODRIK, Dani. Economics Rules: The Rights and Wrongs of the Dismal Science. New York, W.W Norton &, Company, Inc.,2015.

RODRIK, Dani. "Só inovação não basta". Jornal Valor Econômico, pág. A15, 10 de junho de 2016.

SAAD FILHO, Alfredo; MORAIS, Lecio. Brasil - neoliberalismo versus democracia. São Paulo, Boitempo, 2018.

SANTANA, Jose Ricardo de. Interview, 16.11.2018.

SCHEIDEL, Walter. A violência e a história da desigualdade – da idade da pedra ao século XXI. Lisboa, Almedina, 2017.

TILLY, C. Big structures, large processes, huge comparisons. New York, Russel Sage, 1984.

TURCHI, Maria Zaira. Interview, 20.12.2018.

VILELA, Evaldo Fereira. Interview, 17.07.2019