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A Mission-Oriented Policy Proposal

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The Brazilian Innovation System:
A Mission-Oriented Policy Proposal

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Executive Summary

Introduction

Countries around the world are seeking to achieve economic growth that is smart (innovation-led), inclusive, and sustainable. Such a goal requires a rethinking of the role of government and public policy in the economy. In particular, it requires a new justification of government intervention that goes beyond the usual one of simply fixing market failures.

In this context, innovation policy is about identifying and articulating new *missions* that can galvanize production, distribution, and consumption patterns across sectors. Mission-oriented policies can be defined as systemic public policies that draw on frontier knowledge to attain specific goals or 'big science deployed to meet big problems'.Tackling innovation missions – whether traveling to the moon or battling climate change – requires investments by both private and public actors. The role of the public sector will be particularly important in the early, capital-intensive high-risk areas that the private sector tends to shy away from. But more generally, there is a catalytic role for Government in *creating and shaping markets* through dynamic public private partnerships.

For Brazil, this new *mission-oriented* approach means developing, implementing and monitoring a strategic innovation policy program that draws on the strengths of its innovation system to overcome the country's weaknesses and address its challenges, seizing the opportunities offered by such a vast and richly endowed country. It requires putting innovation at the heart of economic growth policy—bringing more coherence between the Finance Ministry and the Ministry for Science and Technology (MCTI).

Currently, it also means challenging austere economic policies so that fiscal restraints do not damage long-run growth. Public investments in R&D and innovation are *productivity-enhancing*, creating well-paid jobs and with higher multiplier effects than other governmental expenditures. Such investments can therefore help rebalance the public budget in the longer term by increasing future revenues. Such dynamic effects are often neglected in fiscal adjustment programs.

The main goal of this study is to suggest policy initiatives that will enable the Brazilian national innovation system (NIS) to become more mission-oriented through purposeful policies promoted by the state in direct partnership with the

private sector. This report proposes *a process by which Brazil can identify its missions from the bottom up.*

In this executive summary, we highlight key theoretical concepts used to analyze the Brazilian national system of innovation (NSI). Our analysis drew on our accumulated knowledge on international policy experiences and focused on the evaluation of policy documents and the review of specialized academic literature, which was complemented with interviews we conducted with 35 representatives from the public sector, private sector institutions, and quasi-governmental institutions. Based on our analysis of the Brazilian NSI and of the interview findings, we develop policy recommendations that we also summarize here.

A mission-oriented policy framework: key concepts

Our approach to formulating a new mission-oriented innovation policy is based on seven key principles, conforming our policy framework:

1. Innovation policy must build on the key characteristics of how innovation comes about: it is uncertain; cumulative; and collective. Uncertainty means that agents concerned with innovation cannot calculate in advance the odds of success or failure – that is, results are unknown – and therefore in order to succeed will have also to accept occasional failures and detours from planned routes. Cumulative means that agents need to be patient and act strategically to accumulate competences and capabilities (learn) with a view to the long run. Collective means that all agents need to work together and thus bear certain degrees of risk; they are therefore entitled to also share the rewards.

2. Policies based on a mission-oriented perspective are systemic, employing but going beyond science-push instruments and horizontal instruments. Mission-oriented policies employ the array of financial and non-financial instruments to promote the accomplishment of a mission across many different sectors, setting concrete directions for the economy, and deploying the necessary network of relevant public and private agents.

3. A *broad perspective* on the national system of innovation identifies four subsystems: (i) public policy and public funding; (ii) research and education; (ii) production and innovation; and (iv) private finance and private funding. While all subsystems are theoretically of strategic importance, the subsystem of public policy and funding has traditionally led the process of socio-economic development and technical change.

4. In order to stimulate the innovation process by shaping and creating technologies, sectors, and markets, new relationships must be developed and more trust must be created. The state must galvanize the interests of relevant actors and organize itself so that it has the 'intelligence' to think big and formulate bold policies that also create a sense of ownership amongst diverse public, private, and academic stakeholders. It is also crucial to be able to implement the policies by coordinating the efforts of this network of stakeholders through the state's convening power, brokering of trust relationships, and the use of targeted policy instruments.

5. Systemic mission-oriented policies must be based on a sound and clear diagnosis and prognosis (foresight). This requires not only the identification of missing links, failures and bottlenecks – the weaknesses or challenges of a national system of innovation – but also identification of the system's strengths. Foresight is necessary in order to scrutinize future opportunities and also identify how strengths may be used to overcome weaknesses. This diagnosis should be used in devising concrete strategies, new institutions and new linkages in the innovation system. It may also be necessary to 'tilt' the playing field in the direction of the mission being pursued rather than 'leveling' it through such means as technologically neutral policies.

6. To fulfill a mission, a country requires an entrepreneurial state. This concept encapsulates the risk-taking role the state has played in the few countries that have managed to achieve innovation-led growth. It is through mission-oriented policy initiatives and investments across the entire innovation process – from basic research to early-stage seed financing of companies – that the state is able to have a greater impact on economic development.

7. The state must be able to learn from experience in mission-oriented innovation policy. In a market failure framework, *ex-ante* analysis aims to estimate benefits and costs (including those associated with government failures) and *ex-post* analysis seeks to verify whether the estimates were correct and the market failure successfully addressed. A mission-oriented framework requires continuous and dynamic monitoring and evaluation throughout the innovation policy process.

Building a mission-oriented policy agenda for Brazil

Brazil's current political and economic situation poses a huge challenge in a country whose socio-economic development is still incomplete. Corruption

scandals seem to have frozen the agenda in Congress, preventing the passage of bills that are important for innovation and economic development, such as reform of the tax code or changes to procurement legislation to allow the strategic use of public procurement for innovation.

In addition, the federal government has decided to implement an austere macroeconomic policy program, despite evidence that such pro-cyclical policies have not succeeded in other countries (IMF, 2012 [1]). Therefore, policy recommendations will need to consider the limitations imposed by the political context, including a limited public budget for public investments.

Notwithstanding these obstacles, it *is* possible for Brazil to establish a positive long-term agenda for development and sow the seeds for transforming its national innovation system to be more mission-oriented. To do so, policies should aim to address the weaknesses of Brazil's NSI and build on its strengths. The interviews we conducted, along with our own analysis of the Brazilian NSI, identified key strengths and weakness of the system.

The Brazilian innovation system has the following **STRENGTHS**:

- The presence of all the elements of a developed system of innovation (that is, key institutions exists in all subsystems: subsystem of education and research, subsystem of production and innovation, subsystem of public and private funding, subsystem of policies and regulation);
- A subsystem of scientific research that has substantially improved in the last few decades and is producing frontier knowledge in some key areas, with 'islands of productive excellence' in sectors such as oil and gas, aviation, agriculture, health, and, to a lesser extent, banking automation;
- Strategic natural assets (e.g. mineral and water resources, plus biodiversity of Brazil's six land biomes and its maritime biome) that in the long run will be increasingly demanded as the process of economic inclusion goes forward in emerging economies;
- A multifaceted state apparatus of agencies devoted to the promotion and execution of science, technology, and innovation policies, including a full toolbox of supply- and demand-side instruments;
- A strong domestic market for mass consumption, which has grown as a result of socio-inclusion policies;

[1] IMF (2012) 'Coping with High Debt and Sluggish Growth'. *World Economic Outlook*, October. Available at: http://www.imf.org/external/pubs/ft/weo/2012/02/pdf/text.pdf (Accessed: 21/10/2015).

- Public financial resources for R&D and innovation that (in principle) are not affected by budgetary fluctuations or cuts, such as the sectoral funds and the funding from BNDES that does not come from the Treasury;
- Positive examples of systemic 'mission-oriented' policy initiatives, explicitly or implicitly focused on innovation, that lead to positive interactions between the state, the business sector, and academia. These include the *Inova* program, health policies, and, to a lesser extent, initiatives spearheaded by Embrapa and Petrobras.
- Existing complementary policies that may work as enablers of mission-oriented policy programs in national defense and security, and in climate, environment, and energy.

As regards **WEAKNESSES**, the Brazilian innovation system:

- lacks a consistent long-term strategic agenda (a vision) that gives coherence to public policies carried out by the different public institutions and gives direction to scientific research and to private agents in their innovation efforts;
- displays fragmentation (even antagonism) between the subsystem of education and research and the subsystem of production and innovation, due to the self-orientation of scientific research, and a lack of demand from business for the knowledge produced in academia;
- displays a low propensity to innovate in the subsystem of production and innovation - business expenditure on R&D (BERD) is very low, reaching just 0.50 percent of GDP in 2013;
- suffers from inefficiencies in the subsystem of policy and regulation, specifically: overlapping responsibilities, competition for and non-strategic use of resources, discontinuity of investments and programs, excessive bureaucracy, and control (auditing) of innovation policies and programs, including procurement, in the same way as for other programs;
- requires important institutional reforms in the taxation and regulation of business; and
- is constantly negatively affected by the implicit policies represented by the macroeconomic agenda.

Many of these strengths and weaknesses have long been the focus of public policies, either to build on the strengths or to address the weaknesses. Our analysis of Brazil's *explicit* innovation policies (that is, those led by MCTI and encapsulated in science, technology and innovation policy plans) suggests that previous policies have failed due to being based on a restrictive market failure perspective. This led to *ad hoc* and non-systemic projects (many of which had a

science-push bias), with the notable exception of the *Inova program* and innovation policies for the health sector. So far, however, science–push policies (like the establishment of technological parks) have had little positive impact on the structure of production or the propensity of firms to innovate.

The study also analyzes the *implicit* innovation policies that are represented by Brazil's macroeconomic regime, and *complementary/enabling* policies, namely: health, defense, socio-economic inclusion, education, climate, environment, and energy:

- Brazil's macroeconomic policy framework of inflation targeting, exchange rate fluctuation, primary surpluses, and expenditure cuts (austerity policies) tends to impair the effectiveness of explicit industrial and innovation policies. This does not mean that innovation policy attempts will necessarily be in vain, but it does mean that public resources for R&D and innovation and innovation policy instruments need to be used strategically.
- Brazil's health strategy is a well-developed state-led policy that has been able to mobilize a range of public and private actors to develop science- and technology-based innovations. Unlike other sectors, the health sector has been able to foster partnerships between government, business and academia. It can be seen as a systemic mission-oriented strategy, with the use of regulation and public procurement complementing public investments and public-private partnerships in health innovation.
- While the National Defense Strategy represents an enabling framework for the establishment of mission-oriented programs, the effectiveness of these programs requires public policy measures to be fine-tuned to the industrial and technological challenges of the Brazilian defense sector and its spillovers to other sectors.
- There is great potential in the association of socio-economic inclusion and education policies with the policies to promote entrepreneurship and microcredit within the scope of local productive arrangement (APL) and regional development policies. The inclusion of social classes with lower income and the focus on the domestic market has yielded positive outcomes, resulting in the inclusion of vast portions of the Brazilian population and greatly increasing the potential market for consumer goods – and innovation.
- While they do not yet have a systemic design, Brazil's National Policy on Climate Change (NPCC) and associated environmental and energy policies are an enabling legislation for the establishment of mission-oriented innovation programs to address environmental challenges.

One strength and one weakness identified in our report point to a possible strategy that can help address the key barriers for the Brazilian system of innovation to thrive. These are the existence of positive cases of what can be regarded as mission-oriented policy programs and the need for a consistent long-term strategic agenda that gives coherence to public policies and a direction to research and innovation. Well-defined missions provide a sense of *direction* to guide the evolution of all parts of the innovation system in responding to societal demands.

Looking at the two examples of relatively successful mission-oriented policies in Brazil – the policies for the health sector and the *Inova* program – we can ascribe the success of these programs to the presence of six crucial characteristics:

i. **Scientific-technological capacity:** an appropriate scientific and technological knowledge base in the subsystem of education and research;
ii. **Demand capacity:** latent or effective (public or private) market demand, in terms of both purchasing power and need;
iii. **Productive capacity:** an appropriate business base (for example, existing firms or entrepreneurs willing to take risks to establish an innovative firm) in the subsystem of production and innovation;
iv. **State capacity:** appropriate knowledge inside the public organizations formulating and executing the policies about the problem and solution being targeted and/or knowledge about who-knows-what-and-how;
v. **Policy capacity**: appropriate supply-side and demand-side policy instruments (strategically deployed), supported by complementary policies;
vi. **Foresight capacity:** a fine-tuned diagnosis of the problem and solution, including an analysis of the current situation and future prospects for targeted technologies and sectors, formulated in terms of a well-defined mission and vision.

Successful mission-oriented policy experiments in Brazil (e.g. health policies and the PAISS program) had all six factors in place whereas in less successful areas (e.g. *Inova Petro*, *Inova Defesa*, *Inova Energia* and *Inova Sustentabilidade*), at least one of the six capabilities was lacking. Three mechanisms (more or less present in the successful *Inova* sub-programs and in the Brazilian health policies) facilitate the creation of capacities during the mission-oriented policy process itself. These are (1) mechanisms promoting cooperation, amongst, for example, research labs, research and business,

business consortia; (2) mechanisms for competition, for example, the open 'call for project proposals' of the *Inova* program; and (3) mechanisms for evaluation and accountability, which prevent deviations from program and, more crucially, allow for learning and knowledge accumulation.

Recommendations

Based on our analysis, we make the following recommendations for an alternative agenda to the policies currently in place in Brazil:

1. Macroeconomic policies and complementary policies could be made more supportive of explicit innovation policy programs.

2. There are some inefficiencies in the subsystem of policy and regulation that require legislative action – such as reforming the complex Brazilian tax system or removing the barriers to implementing public procurement for innovation.

3. Mechanisms for competition, cooperation, and accountability should be established and reinforced in mission-oriented policy programs, in order to help balance the relative roles of state, business sector, and academia.

4. In the light of the findings from this report, a detailed (re)evaluation of Brazilian 'mission-oriented' policy experiments should be carried out, as these experiments represent rich opportunities for institutional learning by the public agencies concerned.

5. Successful features of learning organizations should be emulated in other public agencies, taking account of context, capabilities, competences and constraints, by creating mission-oriented networks and partnerships.

6. The missions chosen should reflect best practice, as set out in this report. They should be feasible, draw on existing public and private resources, be amenable to existing policy instruments, and command broad and continuous political support. Missions should create a long-term state agenda for innovation policies, address a societal demand or need, and draw on the high potential of the Brazilian science and technology system to develop innovations.

7. As well as continuing, improving and expanding successful ongoing mission-oriented initiatives – health policies and the *Inova* program – we recommend that detailed diagnoses and prognoses – with the identification of existing

capacities and of those that will need to be created – be prepared for other potential missions (*Urban, suburban and interurban infrastructure*; *Public service and public infrastructure*; *Agribusiness and familiar agriculture*; *Energy and the environment*; and *National security*).

8. Missions should, where feasible, be designed in a way that contributes to tackling inequality. Some will do this directly, others indirectly. In some cases, complementary investment in infrastructure and skills will be required if innovation policies are to be effective in addressing inequality.

A mission-oriented policy agenda based on these recommendations would increase the effectiveness of innovation policy in Brazil. It would also have the potential to help rebalance public finances, not by cutting expenditures – as in the prevailing austerity agenda – but by increasing strategic investments and future revenues. By engaging in a mission-oriented policy effort, Brazil should again be able to define the direction and ambition of its own development trajectory

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