

# Brazil

## Innovation and Development



PROVOCATIONS

by Glauco Arbix  
Demétrio G. C. de Toledo  
Rafael G. Felizardo

Observatory for Innovation and  
Competitiveness, Institute of  
Advanced Studies  
University of São Paulo, Brazil

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by Glauco Arbix<sup>1</sup>  
Demétrio G. C. de Toledo<sup>2</sup>  
Rafael G. Felizardo<sup>3 4</sup>

Observatory for Innovation and  
Competitiveness, Institute of  
Advanced Studies  
University of São Paulo, Brazil

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<sup>1</sup> Professor of Sociology at the University of São Paulo (USP), President of the Brazilian Innovation Agency (FINEP) and co-ordinator of the Observatory for Innovation and Competitiveness in the Institute of Advanced Studies at the University of São Paulo (OIGIEA).

<sup>2</sup> Researcher, Observatory for Innovation and Competitiveness in the Institute of Advanced Studies at the University of São Paulo (OIGIEA).

<sup>3</sup> Researcher, Observatory for Innovation and Competitiveness in the Institute of Advanced Studies at the University of São Paulo (OIGIEA).

<sup>4</sup> Our thanks to Flávio Amaral and Diego Silva for their research assistance.



## ACRONYMS AND ABBREVIATIONS

<b>ABDI</b>	Brazilian Agency for Industrial Development
<b>ADTEN</b>	Programme for Support for Technological Development of National Companies
<b>BNDES</b>	Brazilian Development Bank
<b>CAPES</b>	Federal Agency of Support and Evaluation of Postgraduate Education
<b>CNPq</b>	National Council for Scientific and Technological Development
<b>FINEP</b>	Research and Projects Financing, also known as the Brazilian Innovation Agency
<b>FNDCT</b>	National Fund for Scientific and Technological Development
<b>GDP</b>	Gross domestic product
<b>IBGE</b>	Brazilian Institute of Geography and Statistics
<b>IPEA</b>	Institute for Applied Economic Research
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OIC-IEA</b>	Observatory for Innovation and Competitiveness in the Institute of Advanced Studies at the University of São Paulo
<b>PINTEC</b>	Survey of Technological Innovation
<b>PITCE</b>	Policy of Industrial, Technological and Foreign Trade
<b>PPP</b>	Purchasing power parity
<b>RAIS</b>	Relação Anual de Informações Sociais
<b>R&amp;D</b>	Research and development
<b>S&amp;T</b>	Science and technology
<b>ST&amp;I</b>	Science, technology and innovation
<b>USP</b>	University of São Paulo

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## ABOUT THE *PROVOCATIONS* SERIES

**Provoke** | *to stimulate, incite, stir up, challenge, irk, exasperate, vex*

The Gauteng City-Region Observatory's *Provocations* is an on-going series of think pieces that give a platform to cutting edge thinking on current issues of the day, written and presented in a non-academic style and format. Each provocation is offered by an academic or practitioner for reading by a wide audience, with the hope of shedding light on key topics relevant to researchers, policy-makers, business people, activists and members of the public.

The series aims to challenge conventional understandings, stimulate new thinking, stir up debate and incite readers to respond with interpretations of their own. At times, the thoughts offered will exasperate, perhaps even anger. Each piece goes through rigorous editing, but the analysis, views and opinions presented are solely those of the author.

## FOREWORD

*Professor David Everatt, Executive Director, GCRO*

Brazil is rightly regarded as one of the key economic success stories of the new economic order, in which it, China and India are global economic forces, are rapidly being re-classified as Middle Income Countries, and are developing the economic might to make them the next generation of superpowers. South Africa has joined them in the BRICS group, but we are dwarfed by their spatial extent, sheer demographic size, and economic power. We can however learn a great deal from them in many areas, and in particular from Brazil, which uniquely among the BRICS is both growing its economy *and* lowering inequality – the kind of innovation-driven economic growth that post-apartheid South Africa so desperately needs.

In this second in our *Provocations* series, Professor Glauco Arbix, with his colleagues Demetrio de Toledo and Rafael Felizardo, walk us through the state of the Brazilian economy as it left behind its own gloomy past and sought inclusive and competitive growth. They highlight the embedded cultural challenges within the business sector, within the political system and elsewhere – and how they sought to go about challenging and changing the *status quo*.

We offer this *Provocation* in the hope that it helps us better understand the Brazilian success story, but not idealise it – the authors are bluntly honest about where they think Brazil has got it right, and where it is still getting it wrong and where they simply don't have easy answers. We hope that the booklet stimulates debate and argumentation here in the Gauteng City-Region – the purpose of the series – but, ultimately, that it helps concretise an agenda for change that can be used in the Gauteng City-Region. The authors give examples of how to turn around ailing sectors, kick-start new ones, and how to tackle the problems of an inherited 'way of doing things' that are outmoded and need to be pulled or pushed into the present and future, again something from which we can – and should – learn.

Our thanks, from the Gauteng City-Region Observatory, to Glauco and his colleagues, for finding the time to write this for us, and doing so in English due to our linguistic challenges, in the midst of running one of the biggest innovation funding agencies in the world – which, significantly, is looking to forge partnerships here in Gauteng. We hope that their local counterparts will read the booklet, engage with the debates it seeks to trigger, but also see where and how they can partner with the Brazilian Observatory for Innovation and Competitiveness, which is open for business with South Africa Inc.



## ABSTRACT

This essay discusses recent developments in Brazil's innovation policies. These policies are part of a long-term developmental process and the current search for a new national configuration of policies and instruments capable of steering Brazil in the midst of globalisation and economic systems that have knowledge as their backbone. Industrialisation became the main source of inspiration as a means of attaining social evolution in countries like Brazil, South Africa, India, Mexico, Argentina and South Korea, to name a few; and in a sense this remains true today. These roots have marked state institutions and underscore the *modus operandi* of government planners. Brazil's prospects for overcoming poverty, inequality and the burden of late development can be described as a process of attaining a better balance between earlier achievements and the current process of institution-building aimed at providing Brazil with the policies and instruments to support innovation as a means of achieving social and economic development.



## INTRODUCTION

In clear contrast with the instruments available at the end of the period of developmentalism in Brazilian history (this is the period of heavy industrialisation in Brazil and elsewhere in late industrialising countries that spans roughly from the 1950s to the 1980s), Brazilian companies now have access to:

- innovative tax incentives for research and development (R&D), similar to those of advanced countries, that are automatic and considerably reduce bureaucratic procedures,
- a system of subsidies for projects aimed at technological development,
- subsidies to place researchers in companies,
- funding programmes for innovation venture capital, and
- a legal framework more conducive to the interaction between universities and companies.

Instruments such as the Sector Funds created in the late 1990s, the Law of Goods (Lei de Bem, no. 11.196/2005) and the Innovation Law (no. 10.973/2004) adopted in the wake of the Policy of Industrial, Technological and Foreign Trade (PITCE – 2004) play an important role in building an environment that encourages innovation.

When compared with the past, progress in the terms of establishing and facilitating links between the generation and accumulation of knowledge and innovation is clear and obvious. In terms of the future, there is still a long way to go, both with regard to creating new instruments and improving existing ones to support innovative activities, and in laying the foundations for a corporate culture of innovation to be adopted by public institutions and universities by conducting systematic searches for interactions and synergies with role-players in the economy.

Modern economies aim to have an innovation-friendly environment. This kind of environment is marked by the confluence of knowledge, the exchange of skills and a diversity of sources both public and private. To release an enterprise's potential, the process of planning, while important, only partially accounts for success. Reflection on the innovation agenda, therefore, points to the search for new syntheses between the



public and private sectors in Brazil, far from the protectionist “statism” and market fundamentalism that has often previously marked Brazilian history.

In light of the above this article explores the following: recent changes in the development agenda in Brazil, innovation, basic and company research, new challenges, and the transition to an economy based on innovation.

## NEW DIRECTIONS IN BRAZIL

Traditionally, Brazilian literature on the subject of innovation was strongly associated with technological development, which was seen as one of the pillars of a country's competitiveness. Only more recently has technological potential begun to be considered in relation to companies, their investments and competitive strategies.<sup>1</sup>

It is important to remember that after a cycle of industrialisation and accelerated growth of nearly forty years, Brazil experienced a long period of macroeconomic instability, which significantly influenced the agenda of government, academia and business. At the same time, the lack of accurate information about the innovative activities of enterprises in this period also limited the research done that may have suggested how innovation could be a generator of new dynamics in the economy.

However, a change of perspective occurred in 2003 and 2004 with the announcement of the federal government's PITCE, structured around innovation. The emergence of PITCE stressed the need for rapid advancements in constructing a long-term view on the limits and development of Brazilian industry.

Several studies<sup>2</sup> have begun to show that the sustainability of Brazilian economic growth in the medium- and long-term is closely linked to the generation and utilisation of knowledge, as well as the ability to transform knowledge into technological innovation.

It is true that part of the technological innovation of firms in developing countries will be achieved through the purchase of capital goods, often imported from developed countries. However, such a generalization may mask real business progress and specific features of the dynamics of technological absorption in Brazil.

Research has shown that investment in R&D generates increased investment in physical capital and the accelerated growth of firms.<sup>3</sup> This is a key issue for countries like Brazil that want to migrate to more advanced positions of economic and social development.

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<sup>1</sup> Arbix, G. (2007).

<sup>2</sup> De Negri, J. A. and Salerno, M. S. (2005).

<sup>3</sup> De Negri, J. A. and Salerno, M. S. (2005).



Several estimates<sup>4</sup> have revealed that in Brazil, investment in firms' R&D generates a higher investment rate in fixed assets, a clear reversal of the traditional causality. From the standpoint of public policies, proving this hypothesis is important because it signals to governments that the incentive to innovate in enterprises, to invest in R&D, in product differentiation and processes, and in diversification of organisational strategies and business parts are essential for increasing overall investment in the economy.

Why does investment in innovation and in R&D in companies lead to an increase in physical capital at these firms? What would support this casual relation? The trajectory can be described as follows:

- Firms invest in innovation and generate new products, services and processes for market;
- Manufacturing activities and structuring and marketing of goods and services would need to be reordered to bring the entire company in line with their new strategies and innovations;
- The adjustment and restructuring would be made possible by new investments in physical capital needed for expansion, organisational changes, new models of assembly and logistics – not to mention habits and culture;
- These new investments act to propel the growth of the company.

This differentiated view of the technological dynamics of Brazilian companies, and particularly the attempt to establish causal relationship between the growth of companies and their innovative strategies, encouraged visions of the heroic lone inventor or innovator, supposedly characterised by his genius.

It is true that invention and innovation are connected by a continuum. In advanced areas, inventions and innovations occur so frequently and quickly that it is not always easy to distinguish one from the other, as in nanotechnology and biotechnology laboratories. But beyond the laboratories, innovation refers to the first commercialisation of an idea or project, therefore, its privileged location is the company, capable of fine-tuning production and marketing. The invention, on the other hand, has a different orientation. It occurs in another sphere, in different spaces such as laboratories, universities, research centers and in firms.

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<sup>4</sup> De Negri, J. A., Esteves, L. and Freitas, F (2007).

Certainly there are bridges and links between invention and innovation. What is clear is that understanding the transformation of an invention into innovation does not always happen quickly and requires different types of knowledge, ability, skill and resources. In this sense, the qualities of innovator and the inventor tend to be different, despite the threads of practical and theoretical knowledge that can link one to another.

In the turbulent process of the diffusion of technologies, virtually all the improvements and enhancements that represent points of inflection in the trajectory of an invention have been implemented even before its full commercialisation.<sup>5</sup>

In a seminal study from the 1980s, Kline and Rosenberg explain the systematisation and continuity of this process of innovation:

**“The fact is that the majority of the most relevant innovations undergo drastic changes throughout their lives - changes that can completely transform their economic significance. The improvements that an invention receives after reaching the market may be much more significant, from an economic standpoint, than the invention itself in its first form.”<sup>6</sup>**

From this perspective, a successful invention is always part of a historical trajectory without which understanding would be difficult. Each invention always shows in its genetic code a long-term process, responsible for its maturation after (and even before) entry into the market place.<sup>7</sup> In this sense, innovation should not be defined by the exact moment of entry into the marketplace. The central issue, on the one hand, is that the major innovations come to the world in very primitive conditions that makes immediate marketing impossible. It is the start of competition between firms, mainly based on small changes, additions, and copies, which allows for the evolution into a viable object for the marketplace. Under these conditions, the process of innovation is the result of extensive processes of improvement and redesign, which may involve technology, basic research or applied research. That is, all processes, discoveries, new products or services – whether high-tech, low-tech or no-tech – that add economic

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<sup>5</sup> Rogers, E. (1995).

<sup>6</sup> Kline, S. and Rosenberg, N. (1986).

<sup>7</sup> Mowery, D. and Rosenberg, N. (2005).



value to the company are understood as innovations. On the other hand, the evolution and convergence of new technologies may lead to a new way of looking at an invention that lies dormant, seemingly with no future. Time, in this case, can act as a cradle for developing new applications and technical possibilities, and is essential.

In Brazil and abroad the debate about the meaning and potential of innovative practice still suffers from conceptual confusion. Many adherents of 'the heroic vision' closely link invention and innovation processes and understand innovative advances to be related to high technology. As a result, they lose sight of subtle mechanisms, seemingly minor and unimportant, as well as the evolution of other technologies in parallel or different spheres which may be the real engines of the economy.

It is not easy, however, to visualise the full breadth of the innovative processes. This is not only because it is difficult to predict the different uses and appropriations of the original plans for the object by users and other companies, but also because, in general, innovation goes beyond the horizon of business and develops through an extensive network of employees, and its commercial aspect is only one of its many faces. Thus, the web that innovation weaves involves companies, entrepreneurs, researchers, distributors, research institutions and consumers, in a scheme that creates a highly diverse and complex ecosystem. It's therefore no wonder that management textbooks, related consultancies and innovation guides, with rare exceptions, can only provide general information.

In fact, there is no standard recipe for guidance in this environment that, despite research advancements, still resembles a labyrinth. But generally, positive environmental considerations include a high quality of human resources, an ongoing flow of ideas and information and, above all, a foundation conducive to entrepreneurship which can translate into innovation. This means that innovation always occurs in an environment of uncertainty (be it economic, market, political or ideological uncertainty), which is a source of pressure on companies.

The further the knowledge of the entire ecosystem of innovation is advanced, the more associated uncertainty and risks can be minimised. As always, it is not easy to convince organisations focused on the short-term to value the learning processes that are a fundamental component of experimentation.

Precisely for this reason, institutions and companies that are open to innovation occupy a prominent place in the dialogue between departments and tolerance for novelty. The constant interaction between technicians, engineers, designers and planners to facilitate connections and interpersonal and interdepartmental synergies, constitute the most precious raw materials of modern organisations.



## THE SLOW ROAD

Concern about innovation and knowledge is new in Brazil, a country more traditionally concerned with support and encouragement of scientific research.

Brazil is a country that industrialised late and also delayed the deployment of a system of science and technology (S&T). It began a process of strengthening S&T in the 1970s through the first public effort to support the sciences with the creation of graduate studies with support from the National Council for Scientific and Technological Development (CNPq), Research and Projects Financing, also known as the Brazilian Innovation Agency (FINEP), and the Federal Agency of Support and Evaluation of Postgraduate Education (CAPES). This was followed by strengthening competitive funding mechanisms for scientific research in universities and research institutions (CNPq, FINEP and Foundations for Research Support). In their conception, however, a robust system for financing and encouraging technological development and innovation in enterprises was lacking. When the generation of scientific knowledge was explicitly linked to development projects, this system was then shown to be essential for training of companies and construction of strategic national sectors. It made the system to support the aerospace industry at Embraer possible, as well as the refining and extraction at Petrobras, agricultural training at Embrapa and, more recently, support for the China-Brazil satellite programme. In all these projects, the presence of the state was fundamental and continues to be so, although in different ways.

Since the 1980s Brazil has sought new paths after exhausting the developmental cycle. The new realities for an open economy where the degree of protectionism is significantly smaller, added to the difficulties of state funding, have pushed the Brazilian economy, especially the business sector, to compete for innovation. Despite the steps taken in this direction, the enduring low level of innovation that exists in the economy and in the majority of Brazilian companies is cause for great concern, especially when observing that China and India, direct competitors of Brazil in international trade, are making faster and wider strides in this direction.

It is true that Brazil has increased its expenditure on R&D – today around 1% of gross domestic product (GDP) – but since 2005 China has moved to third place in investment rankings as measured in purchasing power parity (PPP), with a growth



rate of 18% per year between 2000 and 2005.<sup>8</sup> At the same time – and this is one of the great weaknesses of the Brazilian economy – the private sector still accounts for the smallest share of this investment (46,3%, with government providing 51,6% of total R&D funding in 2009), unlike the average for the Organisation for Economic Co-operation and Development (OECD) countries (53% by the private sector and 47% by the government), and very different compared with India and China.

However, Brazil does stand out because it has a large consumer market and a relatively large industry with about 90,000 industrial firms with more than ten employees, employing more than six million workers and investing about USD 3 billion a year in R&D. These indicators set Brazil apart when compared with the average in developing countries.

It is evident that the technological innovation indicators in Brazil are far from those of developed countries and even some emerging countries of Asia. In Brazil about 30% of companies are innovators. In European Union countries the average is 50%. About 6,000 Brazilian companies spent money on R&D. Brazilian companies have invested 0.6% of revenue into R&D. In Germany this percentage is 2.7% and in France it is 2.5%. Less than 3% of Brazilian industrial firms brought some product innovation to the market and less than two hundred innovate for the international market.

Unquestionably, the biggest dilemma is in the private sector, because Brazil's economy is still far from developed and lags behind countries such as South Korea and in some aspects even behind India and China. National and international research<sup>9</sup> show that innovation policies in Brazil also remain strongly oriented towards basic research, are general and do not take into account the different characteristics of companies that have greater potential for innovation.

Studies clearly show that despite the recent institutional improvements the innovation system has not successfully transformed the knowledge generated in research centres and universities into technology, products and services that impact on the economy. All efforts of the public sector, through an open dialogue with the private sector, are aimed at enabling a strong synergy between the research base and the need to give the economy a quantum leap in innovation processes.

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<sup>8</sup> OECD (2008).

<sup>9</sup> Rodriguez, A., Dahlmann, C. and Salmi, J. (2008); OCED (2008) and Mobit (2007).



## INNOVATION, BASIC AND BUSINESS RESEARCH

There is no doubt that Brazil has made substantial advances in the relationship between companies and those doing basic research. The importance of the creation of Sector Funds in 2001 for the financing of science, technology and innovation (ST&I) in Brazil cannot be emphasised enough. The need for stable sources of funds for financing S&T activities in Brazil was one of the factors that led to the emergence of the Sector Funds that today sustains the National Fund for Scientific and Technological Development (FNDCT).

The direction of these resources for knowledge generation connected to technological innovation is a key concern of public institutions. However, the number of researchers working on technological innovation remains low and they still seek closer relations between universities and companies.

Some preliminary evidence on this subject has been found in recent studies that linked the PhDs connected to groups of research grants and the co-ordinators of the projects approved in the Sector Funds.<sup>10</sup> There are 24,645 research groups registered in the CNPq Directory.

Among these groups, 2,922 reported interactions with 4,483 companies and 1,137 companies in the services sector (excluding education) and industry. Among the Sector Funds<sup>11</sup>, 13,435 projects were supported between 2002 and 2008. Of these funds, 20.1% were disbursed from Sector Funds, that is, approximately USD 600 million was allocated to project managers, PhDs linked to research groups in the CNPq which relate to business services sector and industry. This is a relevant indicator of the university-industry link and for evaluation the mechanisms of the funding system for ST&I in Brazil, providing evidence of Brazil's latest accomplishments in the area.

The difficulties of this connection become even more evident when examining the sources of R&D companies. According to the findings of the Survey of Technological

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<sup>10</sup> De Negri, J.A. and Lemos, M.B. (2009).

<sup>11</sup> This includes all projects that had at least 20% of its planned resources disbursed. The total value of these projects was R\$ 4.49 billion, with about R\$ 3 billion executed.

Innovation (PINTEC)<sup>12</sup> (IBGE)<sup>13</sup>, companies that invest in R&D in Brazil do so make this effort with more than 90% of their own resources. So, although the State is responsible for more than 50% of expenditure on R&D efforts, R&D in companies is mostly done without adequate sources of financing. In developed countries the government funds R&D largely by non-recoverable or zero interest, that is, under much more favourable terms than in Brazil.

The investment of public resources in R&D in companies is extremely positive for the development of the country. Several studies demonstrated that between 1996 and 2005 the Programme for Support for Technological Development of National Companies (ADTEN) and FNDCT Co-FINEP had a highly positive impact on the productivity of companies and their spending on R&D.<sup>14</sup> When compared with similar companies that did not have public support, studies have shown that public programmes have induced significant changes within companies' performance, either in quality of wages. In addition, there was an "additionality effect" as companies supported by ADTEN invested 54% more in R&D from their own resources than similar companies that did not receive public support. Those supported by the Co-operative FNDCT invested even more of their own resources in R&D: 104%. The increase in private spending on R&D shows that there is not, in the Brazilian case, substitution of less expensive public resources for private ones. On the contrary, there is an addition of private resources. In other words, businesses that received public resources invested more of their own resources. Although these results are largely positive for Brazilian development, the scope of current programmes is still very limited in terms of the number of companies assisted.

Data from PINTEC, collected by IBGE, translate some of these weaknesses into numbers:

- Brazilian industry innovates much less than developed countries do. The degree of innovation (understood to be when companies begin marketing a product and/or new processes or improvement) in the three years preceding the survey, was around 35% in 2005. Although linear comparisons cannot be

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<sup>12</sup> *Survey of Technological Innovation (PINTEC)* conducted by the Instituto Brasileiro de Geografia e Estatística / Brazilian Institute of Geography and Statistics (IBGE).

<sup>13</sup> Brazilian Institute of Geography and Statistics.

<sup>14</sup> De Negri, J.A., Lemos, M.B. and De Negri, F. (2008a).; and De Negri, J. A., Lemos, M.B. and De Negri, F. (2008b).



made because of methodological differences, in seven countries surveyed by the Observatory for Innovation at the Brazilian Agency for Industrial Development (ABDI) (the United States, Canada, France, United Kingdom, Ireland, Finland and Japan), the average for the same year was about 60%.<sup>15</sup>

- Despite expenditure on innovation in Brazilian industry being relatively high, this spending is mainly directed at purchasing new equipment and not for R&D performed within the company. Just focussing on expenditure on R&D performed by companies directly (as a percentage of its revenues), Brazilian indicators, despite the wide range of incentives, exemptions and special programmes run by public institutions, have remained virtually unchanged over the past fifteen years (around 0.6% in the last three PINTECs).
- The Venture Capital market is still in its infancy in Brazil despite recent efforts by the Brazilian Development Bank (BNDES).<sup>16</sup> In the most innovative countries, venture capital funds are a determining factor in inducing entrepreneurship.

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<sup>15</sup> Strategies of Innovation in Seven Countries: USA, Canada, France, UK, Finland, Ireland, and Japan (MOBIT).

<sup>16</sup> Brazilian Development Bank

## ACCELERATION IS NEEDED

The advances made possible by PITCE in 2004 and by the adoption of the Innovation Law and the Law of Goods, combined with a number of other instruments and legal, tax and institutional factors, have significantly improved the economic environment for innovation in the country. The subsidies, historically over-valued, combine to present a more balanced approach with new instruments of direct incentive to R&D and tax relief to the most depressed sectors (such as those linked to information technology and communication). This also includes special programmes for the production of drugs and medicines, as well as reinforcing and strengthening the relationship between universities and companies in providing funding for collaborative research.

The evaluation of recent initiatives related to tax exemptions also shows that tax incentives induce investment in R&D of Brazilian companies.<sup>17</sup> It is estimated that tax incentive programmes for R&D in Brazil generate increased spending in participating R&D in 90% of cases. Tax incentives are widely used by developed countries to boost spending on R&D.

R&D funding in companies is universally used to induce development. Several countries have mixed funding under special agreements, such as South Korea, Finland, France and Japan. Many countries make intensive use of government purchasing power, as in the United States. New legal instruments are increasingly broadening the scope of funding programmes for R&D in Brazil. With the new legal instruments (especially the Innovation Law and Law of Goods), and with the increase in the implementation of Sector Funds, FINEP supported 923 companies in four years. With the Programme Grant (2008), FINEP financed 1,132 enterprises in four years.<sup>18</sup> This is an enormous amount compared to past assistance in Brazil, and is a great deal for FINEP, but small compared with the standard in advanced countries.

Even in critical areas where faster progress is required and where there is still much to be done, such as the process of patenting, there is a positive effort to spread a new culture that will allow Brazil to increasingly participate in the globalisation of the value chain. In the Brazilian case it is key that a portion of the business community has realised the significance and necessity of innovation.

<sup>17</sup> Avelar A.P.(2008)

<sup>18</sup> Dates from January 2005 to October 2008.



Studies have identified<sup>19</sup> a number of companies that differ from the historical trend and performance usually displayed by Brazilian industry. These companies adopt new strategies in relation to exports and labour based on a more durable innovation process. This is even true of small companies, 1.7% of industrial enterprises of national capital, e.g. about 1,200 companies from different sectors. However, despite their small number, these companies have performed significantly since they account for more than 25% of sales in the industrial sector. According to data submitted by the Institute for Applied Economic Research (IPEA), a state institution under the Secretary of Strategic Affairs of the Presidency, the new enterprise group distinguishes itself by:

- obtaining a special price on the international market compared to other Brazilian exporters,
- being productive,
- investing more in R&D and paying better wages to employees,
- investing more in training and capacity building, and
- growing faster than other Brazilian companies.

The pace of technological innovation in Brazil is still conducive to generating employment, income, and better paid and more stable jobs. Approximately 30% of Brazilian industrial companies make a product or process innovation every two years. According to information from RAIS (Ministry of Labor), industrial companies that innovate and differentiate their products pay 80.5% more to their workers than the average wages of workers employed in the industry. The jobs generated in companies that innovate and differentiate products require 20.9% more workers that are better-educated. The average length of service of workers in these industries is 30.4% longer than the average. Firms that innovate and differentiate their products will pay a 23% wage premium for workers who have the same level of education and the same occupation in the same industrial sector.<sup>20</sup>

Many of these companies, besides having incorporated export into their growth strategies, began to internationalise their activities, investing outside of Brazil, building systems of production and services abroad, and thereby forming a select group of Brazilian multinationals.

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<sup>19</sup> De Negri, J.A. and Salerno, M.S. (2005).

<sup>20</sup> Bahia, L. and Arbache, J.S. (2005).

The data reveal that the Brazilian productive structure is undergoing transformation. This recent development adds to the responsibilities of managers and policymakers who need to be aware of the diversity and different skills of the Brazilian economy. Under these conditions, innovation appears to be the only way to lift and support the level of competitiveness required and the Brazilian economy as a whole. Precisely for this reason all incentives to do so must be intensified. Without this dimension the entire development agenda will be crippled.



## NEW CHALLENGES

If the challenges to Brazil were never small, then today they have become gigantic, going beyond general policies to spread in private and public areas a new culture for permanent differentiation in the domestic and international market. This began with changes to the power of the trade unions, because it was a time when it was possible for the government to put the engines of economic development to work. This is not to identify the state as a villain to be neutralised, but to recognise that the state, despite its weight and importance, cannot afford to think, formulate, implement and evaluate new development policies without consultation, co-operation and interaction with business and civil society.

The Brazilian state no longer has the ability to act as a substitute for business (as was believed in the past), or in place of a society that does not want or need to be replaced. The social, political and economic foundation of the old policy of “developmentalism” has all changed. The “rules of the game” established in the 1940s to 1980s aged and lost their effectiveness.<sup>21</sup> To face the challenges of the twenty-first century, the institutions generated by the developmentalist state must be revised, restructured and resized in order to make way for a society aligned with the times.

Not infrequently and throughout the 1990s, the short-term view prevailed in politics, business and in large part, in organs of state. It generated illusions and false dichotomies, such as an opposition (not always reasonable) between market and state. Fortunately, this debate has reached a new level. Although still controversial, the topic can evolve towards the recognition that the private and public sectors need a new commitment towards the country, mainly because Brazil needs new syntheses, more aggregation and less polarisation. Examples of development pacts that changed the face of many countries are abundant.

One of the key challenges for public policy in Brazil is to integrate the instruments to promote technological innovation in various institutions of the Brazilian state. This is only possible if the state has a strategic innovation policy. Boldness in future business strategies is also dependent on the widespread entrenchment of this future vision.

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<sup>21</sup> North, D. (1990).



## TO CONSTRUCT AN INNOVATION FRIENDLY ECONOMY

Real changes are known to occur in unstable environments and do not generally tend to follow rules or obey manuals. Therefore, it is naïve for public managers, entrepreneurs or researchers to imagine that an eventual return to the interventionist state of the 1950s, 1960s and 1970s will create higher levels of economic and social development and provide the instruments to overcome the chronic failures of the Brazilian economy.

The developmentalist period, characterised by import substitution industrialisation, state-run companies and hyper-centralisation of the economy, moved the state and drove Brazilian industrialisation. However, it is also true that it suffocated much of the Brazilian productive system, broke the momentum of competitive industry and has been at the root of a series of crises that have eroded the country over the past thirty years.

One of these crises is related to the loss of flexibility of state action, the result of the inflexibility of an institutional architecture that has become inadequate and insists on providing examples of ongoing aversion to change. More relevant than the many deficits that the economy has faced, Brazil is experiencing an institutional deficit that became clear with the need to rethink development.

What is at issue here is a process of searching for a new national configuration of policies and instruments capable of steering Brazil in the midst of globalisation and economic systems that have knowledge as their backbone. It is therefore much more than an appeal for a rigorous narrative of Brazilian history. Industrialization became the main inspiration of social evolution in countries like Brazil, and in a sense this is still true. These roots have marked state institutions and are the *modus operandi* of government planners. The Brazilian economy has come to be seen as divided into industrial sectors which need only to be inserted into the supply chains of developed countries. According to this view, the institutions of state were repeatedly organised to meet and encourage these sectors, which left deep traces in the formation of values, attitudes and behaviour in the public and the business world.

Only recently have public institutions started to rethink their policies and actions to modify the structure of production and services in the country. The emphasis on innovation comes from that very recognition of a need to diversify the economy, to



expand exports, to increase the technological density of what the country must do in order to increase productivity and competitiveness. Innovation policies have earned a place in the framework of transformation of the system of industry, in agriculture and services.

More is needed if the country does not, once again, want to miss the opportunity to take a leap forward in its development. A level playing field between the public and private sectors is needed to construct an effective innovation-based economy. There are strong signs that Brazil's productive structure is significantly changing. In the past, in face of the slightest signs of economic downturn, Brazilian companies would postpone or even abandon their investment plans concerning innovation and technology. Nowadays, in the face of strong constraints in the global economy and even in the face of measures taken by the government to contain inflation, Brazilian companies are significantly enhancing their investments in innovation. In government agencies and state banks dedicated to supporting and promoting innovation, demand for funding has quintupled since the beginning of 2011. Brazilian companies, especially in the industrial sector, are taking huge steps to incorporate the development of technology into their growth strategies. They are a sign of the times, of a new Brazil and a new economy.

## REFERENCES

- Acs, Z.J. and D. B. Audretsch, 1988: Innovation in large and small firms: an empirical analysis. In: *American Economic Review*, 78 (4).
- Arbix, G., 2007: *Inovar ou Inovar. A indústria brasileira entre o passado e o futuro*. São Paulo (Brazil): Edizione Sociologia-USP-Papagaio.
- Arbix, G., Salerno, M., Toledco, D., Miranda, Z., Alvarez, R. 2010. *Innovation Strategies in Seven Countries* [Inovação: Estratégias de sete países]. Brasília: ABDI.
- Arrow, K., 1962: Economic Welfare and the Allocation of Resources for Invention. In R. Nelson (ed.), *The Rate and Direction of Inventive Activity*. Princeton, NJ, Princeton University Press.
- Audrescht, D.B., 1995: *Innovation and Industry Evolution*. Cambridge, MA: MIT Press.Acs, Z.J./D.B.
- Audretsch, (eds.), 1993: *Small Firms and Entrepreneurship: an East-West Perspective*. Cambridge: Cambridge UniversityPress.
- Audretsch, D.B. and R. Thurik, 2001: What's new about the new economy? Sources of growth in the managed and entrepreneurial economies. In: *Industrial and Corporate Change*, 10 (1).
- Audretsch, D.B. and R. Thurik, 2001: What's new about the new economy? Sources of growth in the managed and entrepreneurial economies. In: *Industrial and Corporate Change*, 10 (1)
- Avelar, A. P., 2008: Avaliação de Impacto do PDTI sobre o gasto em atividades de inovação e em P&D das Empresas Industriais. In: J.A. DeNegri and L. Kubota, *Políticas de Inovação Tecnológica no Brasil*. IPEA.
- Bahia, L. and Arbache, J.S. 2005: Diferenciação Salarial Segundo Critério De Desempenho das Firms Industriais Brasileiras. In: J.A.De Negri/M.S. Salerno, *Inovações, Padrões Tecnológicos e Desempenho das Firms Industriais Brasileiras*. IPEA.



- Bielschowsky, R., 1996: *Pensamento Econômico Brasileiro. O ciclo ideológico do desenvolvimentismo: 1930-1964*. Contraponto: Rio de Janeiro.
- Cohen, W.M. and D. Levinthal, 1989: Innovation and learning: the two faces of R&D. In: *Economic Journal*, 99 (3).
- De Negri and M.B.Lemos, 2009: *Avaliação das Políticas de Incentivo à P&D e Inovação Tecnológica no Brasil*. Mimeo – Nota Técnica do IPEA para o Conselho Nacional de Ciência e Tecnologia/MCT.
- De Negri, J. A, M.B. Lemos and F. De Negri, 2008b: O Impacto do Programa FNDCT Sobre O Desempenho e o Esforço Tecnológico das Empresas Industriais Brasileiras, In: J. A. De Negri and L. Kubota: *Políticas de Inovação Tecnológica no Brasil*. IPEA.
- De Negri, J. A. and M. S. Salerno, 2005: *Inovações, Padrões Tecnológicos e Desempenho das Firms Industriais Brasileiras*. Brasília: IPEA.
- De Negri, J. A., L. Esteves and F. Freitas, 2007: Knowledge Production and Firm Growth in Brazil. First MEIDE Conference, Maastricht.
- De Negri, J. A., M.B. Lemos and F. De Negri, 2008a: O Impacto do Programa ADTEN Sobre O Desempenho e o Esforço Tecnológico das Empresas Industriais Brasileiras, In: J.A. De Negri and L. Kubota, *Políticas de Inovação Tecnológica no Brasil*. IPEA.
- Kline, S. J. and Rosenberg, N. 1986. An overview of innovation, In Landau, R. and Rosenberg, N. (eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth*. Washington: National Academy Press.
- Griliches, Z., 1979: Issues in assessing the contribution of R&D to productivity growth. In: *Journal of Econometrics*.
- Kleinknecht, A., B. Verspagen, 1989: R&D and market structure: the impact of measurement and aggregation problems. In: *Small Business Economics*, 1 (4).
- Kleinknecht, A., T.E. Poot and J.O.N. Reijnen, 1991: Technical performance and firm size: survey results from the Netherlands. In: Z. J. Acs and D. B. Audretsch (eds), *Innovation and Technological Change: an International Comparison*. Ann Arbor, MI: University of Michigan Press. Kline, S./N.

- MOBIT, 2007: Relatório Brasil. Brasília: ABDI-Observatório da Inovação do IEA/USP-Cebrap.]
- Mowery, D., Rosenberg, N., 2005. *Paths of Innovation* [Trajetórias da inovação]. Campinas: Editora da Unicamp.
- North, D. 1990: *Institutions, Institutional Change, and Economic Performance*. Cambridge: Cambridge University Press.
- OECD, 2008: Science, Technology and Industry Outlook.
- Rodriguez, A., C. Dahlman and J. Salmi, 2008: *Knowledge and Innovation and Competitiveness in Brazil*. Washington (DC): World Bank.
- Rogers, E. 1995: *Diffusion of Innovations*. New York: Free Press.
- Romer, P., 1986: Increasing returns and long-run growth. In: *Journal of Political Economy*, 94 (5)
- Rosenberg, 1986: An overview of innovation, In: R. Landau, e N. Rosenberg (eds.), *The Positive sum strategy: harnessing technology for economic growth*. Washington: NationalAcademy Press, 283-284.
- Solow, R., 1956: A contribution to theory of economic growth. In: *Quarterly Journal of Economics*, 70 (1).

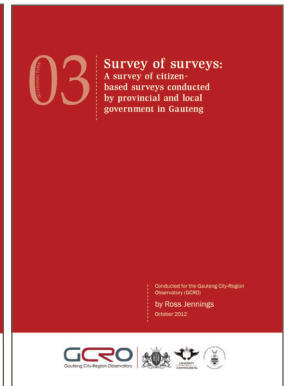
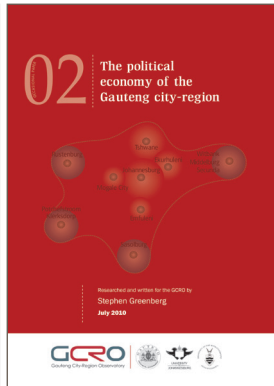
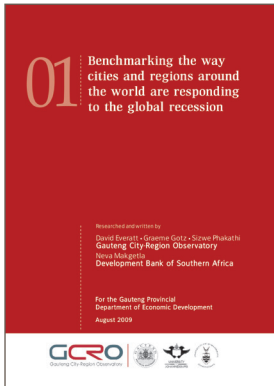


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