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FINANCING INNOVATION IN BRAZIL: EMPIRICAL EVIDENCE AND IMPLICIT S&T POLICY

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FINANCING INNOVATION IN BRAZIL: EMPIRICAL EVIDENCE AND IMPLICIT S&T POLICY

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SUMÁRIO

RESUMO

O financiamento da inovação ainda é um tema pouco explorado na abordagem neo-schumpeteriana, apesar do próprio Schumpeter (1982) ter enfatizado a relevância do sistema bancário no desenvolvimento econômico. Neste artigo se analisa o financiamento da inovação no Brasil através de evidências empíricas recentes da PINTEC. A política implícita de C&T também é analisada, uma vez que influencia a decisão de investimento das empresas. Um funcionamento integrado e articulado do Sistema Nacional de Inovação (SNI) baseia-se na definição de uma política de inovação que enfrenta os problemas de articular as diversas instituições envolvidas e, portanto, reduzir a incerteza inerente às contradições entre políticas implícitas e explicitas de inovação, construindo um ambiente de segurança para o investidor.

Palavras-Chave: financiamento, inovação, Brasil, PINTEC, política implícita.

ABSTRACT

Financing innovation is not emphasized by neo-schumpeterian approach, despite Schumpeter (1982), himself, already emphasized the relevance of the bank system in the economic development. So, in this article we analyze financing innovation in Brazil through recent empirical evidence from Brazilian Innovation Survey. Also the implicit S&T policy is highlighted as it influences firms' decision in investment. A integrated and articulated operation of NIS relies upon the definition of an innovation policy that faces the problems of articulation between institutions that comprise it, and, thus, reduces the uncertainty inherent to contradictions between implicit and explicit innovation policies, building a trustful institutional environment for investors.

Key-Words: financing innovation, innovation survey, Brazil, implicit policy

JEL: O31; O38

1. INTRODUCTION

The studies about National Innovation Systems are focused on the processes of interactive learning and knowledge generation within enterprises and institutions of human resources training and scientific research, as well as on how these organizations interact for constituting the innovation process. It is evident that a key factor which may either help or hinder this interaction is the role played by the State in formulation and implementation of policies for fostering innovation and, indirectly, of macroeconomic policies.

The Neo-Schumpeterian approach, responsible by the creation and dissemination of National Innovation System (NIS) concept, gave no emphasis to financial perspective in its researches. Freeman (1994) analyzed the roll of Neo-Schumpeterian researches, claiming that this topic had not taken a central position in such roll. As highlighted by Levine & Zervos (1998), this is a significant gap in that theory, once Schumpeter (1982), himself, already emphasized the relevance of the bank system in the economic development, underlining the circumstances in which the banks could actively encourage investments in innovation.

The significance of financing to investments in innovation has been pointed out as an important structural bottleneck that was yet be solved by private financial institutions[1]. If, on the one hand, the internationalization, deregulation and globalization of financial markets signalizing the possibility of resources at lower costs, on the other, the characteristics of investments in innovation such as the long term for development, the uncertainty and the risk, point to the need of setting national institutional arrangements (MELO, 1994). So, the creation of alternative innovation financing instruments implies governmental actions (CORDER& SALLES-FILHO, 2003).

In analyzing the relation between financial system and investments in innovation, it is necessary to take into account the nature of the innovation process, the competition within markets and the criteria for risk and credit analysis by financial institutions for conceding the financing.

In a very general sense, innovation concerns of learning and discovery about new products, new production processes and new forms of economic organization, about which, ex ante, economic actors often possess only rather unstructured beliefs on some unexploited opportunities, and which, ex post, are generally checked and selected, in product markets. However, in addition, and complementary, to product market competition, innovative efforts are shaped and selected also by rates and criteria by which financial markets and financial institutions (private and public), such as stock markets and banks, allocate to business enterprises. Irrespectively of whether resources are attributed to firms or individual projects, allocative criteria and rates of allocation should plausibly affect the amount of resources which the industry devotes to the innovative search, and also the directions in which the agents search (DOSI, 1990: 301).

Such characteristics of the innovation process lead banks and even markets to resist financing innovation, particularly in countries of late capitalism, which did not build financial systems able to evaluate intangible assets.

[1] A broad presentation of these mechanisms of financial support and fiscal incentives to innovation in Brazil can be found in Guimarães (2008).

For carrying out an analysis on the problem of financing to innovation, particularly in Brazil – one of the more developed countries of late capitalism – it is necessary to take into account some particular matters. The first one is the composition of investment in innovation within macroeconomic regimes of both high inflation rates and high interest rates. The second is the impact of the regime of imports liberalization and the flexible regime of exchanges on enterprises' technology. Third, to examine why the discussions on relations between policies aimed at fomenting investment in innovation and the macroeconomic policies – the problem of implicit and explicit technological policies – were abandoned since middle eighties and only reemerged in the beginning of the 21st century (ERBER, 1999). These questions conduct to the analysis of innovation investments as constitutive part of the firm's investment strategy and of how this strategy is affected by macroeconomic, technological and industrial policies. It raises the problem of firm's assets valuation and its financing. This has clearly not been a Neo-Schumpeterian issue. At this point, it will be necessary to resort to concepts derived from Keynes' works (1936), who formulated the concept of liquidity preference – or of money as an asset – as a central reference for the process of investment.

The analysis to be developed is based on neo-Schumpeterian theoretical assumptions such as the distinct characteristics of innovation projects, the technological heterogeneity of the economic sectors and the role of national innovation system. It will, furthermore, try to match these concepts with the Keynesian notion of monetary production economy.

Besides this introduction, the paper is organized in four other sections. The second presents the institutional set-up of financing innovation in Brazil and the third recent evidences from Brazilian Innovation Survey – PINTEC on this topic. The four part presents the impacts of macroeconomic policies, the implicit policies on financing for investments in innovation in Brazil in the 1980 and 1990 decades. The concluding remarks summarize what was presented in the paper and indicates the major future challenges for the system of financing investments in innovation.

2. FINANCING INNOVATION IN BRAZIL: INSTITUTIONAL SET-UP

The institutions for funding and support for scientific and technological development in Brazil started to be created in 1950 decade. The National Council for Scientific and Technological Development (CNPq) and the Commission on Qualification of Graduated Human Resources (CAPES) were both created in 1951 for building human resources capabilities in research and for financing scientific research projects. Later, the National Fund for Scientific and Technological Development - FNDCT was created for financing initiatives for building enterprises productive and technological capacities.

In this paper is stressed that the financing of innovation had two different periods. The first one, from 1967 to 1997, comprises the period of constitution of FNDCT and its financing through ordinary budget allocation. The second begins with the enactment of the new legislation on sectorial funds as new source of funds for FNDCT and has been in force up top now.

The creation of sectorial funds represented not only a change in funding sources for FNDCT, as also a change in the priorities defined for allocation of its resources through FINEP, its Executive Secretariat. These are the institutional reasons that grounded the periodization of the analysis.

The first important difference between the two periods resides in the macroeconomic context. The major change happened in the international policy during the 80s, with the hegemony of neoliberal thought directing economic policies towards greater trade liberalization, and liberalization of the account of capital of the balance of payments, flexible foreign currency exchange rates, fiscal adjustments and control of inflation. Most of these policies were opposed to the dominant policy of economic development that dominated the first period, characterized by what has been called imports substitution model. In Brazil, these policies began to be adopted during Collor Government and were kept by the following governments, particularly the guidelines of macroeconomic policy.

Obviously, those differences led to a change in the priorities for application and in the sources of funds from FNDCT and FINEP. The source of funds of FNDCT was, in its major part, the fiscal budget. FNDCT was a fund of free application; it transferred resources to FINEP for this latter to finance enterprises and, in some periods, it was complemented by external financings[2] (MELO, 1994). The evolution of the source of funds is showed in table 1, which presents data on the evolution of resources aimed at financing of innovation by FNDCT and FINEP, in the period from 1967 to 1997. The resources of FNDCT refer to financing of scientific development in research institutions, comprising non reimbursable finances. The resources of FINEP refer to funding for investment in innovation within enterprises, being reimbursable. The third line (FINEP + FNDCT) represents the sum of resources, the total amount of financing for the whole process of innovation.

[2] In 1984, the Brazilian government signed a contract with the World Bank for the Program in Support to Scientific and Technological Development (PADCT). The *funding* of this program would be comprised by a loan from World Bank and a counterpart of FNDCT. The impact of this program's resources was very low and did not reach the 5% of total resources managed by FINEP. Its major mark was the new model for managing its resources and applications , through the advisory committees, that would become the basis for the managerial model of the Sectorial Funds (BASTOS, 2003 and MILANEZ, 2007).

TABLE 1

Evolution of FINEP and FNDCT Outlays, 1967 – 1997
(Constant Millions US$ /Dec/2006)

Year	FNDCT	FINEP	FINEP+FNDCT
1967	----	25,5	25,5
1968	-----	47,3	47,3
1969	------	16,0	16,0
1970	71,8	6,8	78,6
1971	119,9	18,0	137,9
1972	211,1	22,2	233,3
1973	278,9	106,5	385,4
1974	423,1	157,6	580,7
1975	499,9	279,1	779,0
1976	513,6	418,1	931,7
1977	483,6	242,9	726,5
1978	675,6	321,3	996,8
1979	1.158,4	262,7	1.421,1
1980	478,0	134,1	612,2
1981	335,5	126,0	461,4
1982	316,5	129,1	445,6
1983	230,0	105,0	334,9
1984	172,1	53,9	226,0
1985	171,3	109,1	280,4
1986	268,0	130,8	398,9
1987	252,9	381,6	634,6
1988	232,5	173,4	405,9
1989	145,4	40,0	185,5
1990	100,5	9,8	110,3
1991	48,5	32,1	80,6
1992	71,4	207,1	278,5
1993	122,7	325,3	448,0
1994	274,6	247,9	522,5
1995	245,8	267,3	513,1
1996	287,2	278,2	565,4
1997	67,7	478,1	545,8
Total	8.256,4	5.152,8	13.409,2
Average	294,9	166,2	432,6

Source: FINEP, author`s elaboration.
Exchange Rate: US$ 1 = R$ 2,15 Source: Brazilian Central Bank

In the second period, the exclusivity for enterprises of national capital is withdrawn. FINEP loses almost its whole autonomy in the definition of the strategy for application of FNDCT resources through sectorial funds. Table 2 shows the evolution of the source to funds to financing innovation in this period.

TABLE 2

Financial Evolution of FNDCT, 1998 - 2006 (in Constant Millions US$ /Dec/2006)

Ano	FNDCT	FINEP	FINEP+FNDCT
1998	77,5	400,8	478,3
1999	89,9	185,3	275,2
2000	123,5	104,3	227,8
2001	276,2	65,6	341,8
2002	247,3	79,9	327,2
2003	288,9	77,9	366,8
2004	335,2	77,9	413,1
2005	373,3	150,8	524,1
2006	368,4	241,4	609,8
Total	2.180,2	1.384,0	3.564,2
Average	242,2	153,8	396,0

Source: FINEP, author's elaboration.
Exchange rate: 1US$ = R$ 2,1372 (BACEN (Central Bank): December, 2006).

Sectorial funds may be decisive to finance innovation since the barrier of the restrictive monetary and fiscal policy is overcome, with cessation of resources allocation to contingency reserves, and, thus, allowing for a greater financial availability for financing innovation. FNDCT's resources have increasingly been captured as contingency reserves, as it can be seen in table 3. There are currently more resources allocated to contingency reserves, than those allocated to FNDCT for financing innovation and S&T infrastructure. This is a major contradiction between the macroeconomic policy and the Industrial Policy of Technology and Foreign Trade – PITCE, policies which reveal objectives that are incompatible with each other.

TABLE 3

Financial Evolution of FNDCT, 1998 - 2006 (in Constant Millions US$ /Dec/2006)

Year	Applied Amounts	Raised Funds	Contingency Reserves
1998	77,5	77,5	0,0
1999	89,9	105,2	15,3
2000	123,5	212,3	88,8
2001	276,2	361,9	85,7
2002	247,3	635,5	388,2
2003	288,9	725,5	436,6
2004	335,2	726,0	390,8
2005	373,3	815,9	442,6
2006	368,4	865,8	497,4
Total	2.180,2	4.525,7	2.345,5

Source: FINEP, SIAFI and MCT, author's elaboration.
Exchange Rate: 1US$ = R$ 2,1372 (BACEN: Dec, 2006)

In table 4 it is presented the average of funding granted by FINEP and FNDCT in two studied periods. The first one presented an average amount of non reimbursable funding by FNDCT and of reimbursables by FINEP that was higher than those of the second period.

TABLE 4

Comparison Between the Average Disbursements by FNDCT and FINEP in the Two Periods

	Average 1967-1997 (FINEP) and 1970-1997 (FNDCT) (A)	Average 1998-2006 (B)	(A) / (B)
FNDCT	294,9	242,2	21,76%
FINEP	166,2	153,8	8,76%

Source: FINEP, author's elaboration.

3. THE INNOVATION ACTIVITY AND ITS FINANCING: EMPIRICAL EVIDENCE

The Brazilian Innovation Survey – PINTEC, applied by Brazilian Institute of Geography and Statistics – IBGE, gathers information on innovative activities[3] carried out by Brazilian manufacturing enterprises. The survey was structured with basis on the conception of innovation as an interactive process, comprising interdependence between various agents, and institutional and economic environment in which they are inserted. PINTEC is already in its third edition, of 2005, which presents data regarding the strategies adopted by enterprises between 2001 and 2003, and incorporates services sector (telecommunications, information technology and R&D). The other surveys were developed in the periods of 1998-200 (PINTEC 2000) and 2001-2003 (PINTEC 2003). This section is based on these PINTEC surveys.

Brazil, generally, and the manufacturing enterprises is particularized by extremely low levels of outlays in R&D. Hence, it is not surprising that outcomes from innovation efforts in Brazil are weak.

PINTEC (2005) data allow for ascertaining that among near 95 thousand enterprises covered, only near 33 thousand (little more than one third) introduced some kind of innovation during the period of three years between 2003 and 2005. Out of these firms, more than 30 thousand must be deemed as simply imitative firms. They declare having introduced innovations of product or process that are new to enterprise, but not to market were they operate. That is, only 3.8% of the Brazilian enterprises were able to introduce actual innovations.

The low intensity of expenditures with R&D on the part of the Brazilian private sector is illustrated by data from PINTEC Survey in 2000, 20003 and 2005. The outlays by private sector with Brazilian R&D represented 0.4% of GDP, whereas in most developed countries this percentage reached 2%. Only a small part of Brazilian enterprise can be deemed as innovators.

Data also reveal a high participation of outlays with acquisition of tangible assets (mainly machinery and equipment) in total expenditures with innovation in Brazil (nearly 50%). On the other hand, the expenditures with internal R&D activities, intangible assets, are low: 17% of the total. That is, most part of investments in innovation by Brazilian enterprises is directed to the acquisition of machinery and equipment.

[3] The survey comprises: (a) expenditures with innovative activities; (b) sources of financing innovation expenditures; (c) impact of innovations in enterprises' performance; (d) sources of information to innovation; (e) cooperative arrangements; (f) role of governmental incentives; (g) obstacles to innovation activities.

From the technological point of view, some of the main characteristics of Brazilian industry revealed by PINTEC (2000, 2003 and 2005) are:

- The use of foreign technology during the process of imports substitution was not, excepting for some few cases, accompanied by an internal technological effort further than adaptation of such technologies to local conditions and few technological improvements.
- There is an insufficient number of enterprises with formal R&D activities.
- Even among these enterprises, R&D expenditures tend to concentrate on payroll; consequently, R&D efforts, with few exceptions are limited to incremental improvements of process and product, thus do not reaching more radical innovations.
- The reduced effort of R&D makes enterprises to hold a limited and partial knowledge of their own production processes.
- The technical links external to firm are very faint; it is fact as much for the relations between enterprises as in what respects to relations between enterprises and universities and research institutions.
- The possibility of the establishment of technical relations between enterprises is hindered by the excessive technological heterogeneity of the industry.

Such technological deficiencies do not represent a significant hindrance to economic growth during the process of imports substitution. In more recent times, however, they constitute important bottleneck. Thus, Brazil in general and manufacturing enterprises in particular are characterized by extremely low levels of expenditures with innovation. It is not a surprise, therefore, that results from innovative efforts in Brazil are poor.

The enterprises of foreign equity capital innovate more than national ones, taking the domestic market as a reference. It does not necessarily imply own efforts of technological capability building. The higher rates may be reflect a strategy for internalization of new products or processes to Brazil, although developed in a foreign country.

The scarcity of appropriate sources of financing and the high costs of this latter appear as risk factors of greater relative weight to domestic enterprises than to foreign ones; a result that is consistent with the restricted access of national enterprises to the external sources of resources and financing.

The relations of cooperation with universities have reduced relevance. The strongest relations of cooperation are those established with clients and suppliers.

The larger enterprises of national equity capital (>500 employees) show a cooperation effort near to that of multinational companies present in Brazilian economy and three times greater than those of smaller sizes.

Table 5 presents the problems and hindrances pointed out by innovative firms. The percentages refer to the number of innovative enterprises that ascribed high importance to problems and hindrances, in relation to total number of innovative enterprises in each period. The main barriers to innovation in the three analyzed periods did not change, although it is observed a reduction in the degree of importance attributed by firms.

TABLE 5

Innovative Enterprises that Attributed "high" importance to Factor as Obstacle to Innovation

Obstacles to Innovation	1998-2000 (%)	2001- 2003 (%)	2003-2005 (%)
Excessive economic risks	**26,7**	**24,0**	**17,0**
High costs of innovation	**32,9**	**24,9**	**19,4**
Shortage of appropriate sources of financing	**25,9**	**20,9**	**16,2**
Organizational rigidity	3,4	2,6	3,5
Lack of qualified personnel	11,0	10,9	8,1
Lack of information about technology	6,7	6,9	4,2
Lack of information on markets	5,2	5,7	3,5
Scarce possibilities of cooperation with other enterprises/ institutions	8,8	7,5	4,8
Difficulties to adapt to patterns, norms and regulations	5,2	8,1	6,4
Weak response by consumers regarding new products	4,19	4,4	3,9
Shortage of adequate external technical services	5,64	5,2	5,3
Centralization of the innovative activity in other firm of the group	ND (1)	0,3	0,2

Source: Elaborated by the author based on data from PINTEC 2000, 2003 and 2005.
Note: (1) Not available.

The obstacles that had major frequency are: excessive economic risks, high costs of innovation and shortage of appropriate sources of financing. Therefore, the main obstacles identified are rather linked to economic field than concerning to aspects of technical and information character and /or internal to enterprises.

These data certainly reflect the various instruments and mechanisms of financing and promotion of innovation which have been created since 2000. Such instruments, besides providing varied financial resources for innovation process (reimbursable and non-reimbursable resources) are helping to reduce the innovation costs (fiscal incentives, scholarships for masters and doctors, researches in partnership with university). Nevertheless, the macroeconomic and market conditions still keep being the main reasons pointed out by enterprises for do not innovating. Such aspects have inclusive growing in relevance along the three surveys, being respectively in each period of 55.6%, 65.4% and 70.1%.

Table 6 presents total outlays in innovative activities and in R&D, as well as financing sources used by manufacturing Brazilian enterprises in the three years covered by PINTEC. It is worth highlighting that information regarding outlays with innovation activities and R&D refers only to the last year of reference period in each survey, that is, 2000, 2003 and 2005.

Between 2000 and 2005, a raise is observed in expenditures with internal R&D activities in comparison to total expenditures in innovation activities. This proportion, which was 16.7% in 2000, changed to 21.7% in 2003 and reached 25.2% in 2005. The other innovation activities comprise: acquisition of external knowledge, acquisition of software, acquisition of machinery and equipment, trainings, activities aimed at the introduction of technological innovations in the market, at industrial projects and technical innovations. It is also observed a raise in average expenditures with R&D by enterprise.

TABLE 6

Financing Sources of Innovation Activities, Brazil, 2000, 2003 and 2005
(US$ thousand of 2000)

Year	Firm's number	Expenses with innovation activities		Expenses with R&D activities		Financing sources (%)			
						R&D activities		Other innovation activities	
		Total	By firm	Total	By firm	Own	Third part	Own	Third part
2000	19.165	11.822.094,7	616,8	1.979.667,7	267,1	88	12	65	35
2003	20.599	9.322.348,1	452,6	2.029.652,4	410,8	90	10	78	22
2005	21.966	14.427.448,7	656,8	3.629.639,7	588,5	89	11	81	19

Source: PINTEC, 2000, 2003 and 2005, own elaboration. Average US$ of 2000, 2003, and 2005

As it can be seen in Table 6, great part of R&D activities is financed with own firms' resources (nearly 90% of the outlays). In the three editions of the survey, the percentage of R&D activities that was financed with resources from third parts was, respectively, of 12%, 11% and 10%. Half of the resources from third parts is from governmental sources. On the other hand, the participation of resources of third parts in financing of other innovation activities is more significant. In 2000, this amount represented 35% of the total; in 2003, it was of 22%; and in 2005, 19%. It was just in 2003 that governmental resources were higher than private of third parts in the financing to other innovation activities. It is observed a greater participation of private third part financing to other innovation activities than to activities of R&D. It results certainly from the fact that other innovative activities involve fewer risks than R&D activities.

Table 7 presents the percentage of expenditures with internal R&D activities on the total expenditure in innovative activities according to number of firm's employees. All enterprises present an increase in expenditures with internal R&D activities, with the only exception of firms with 30 to 49 employees. The greater raise in outlays with R&D activities in relation to the total innovation activities was observed in medium enterprises (from 100 to 249 employees). In all of the years, the major percentage of resources has been directed to the acquisition of machinery and equipments. In 2000, the outlays in this activity were higher than 50% of the total, in 2003 it was 50%, and in 2005 it was nearly 43%.

TABLE 7

Expenses with internal R&D activities over total expenses in innovative activities, by firm size, Brazil, 2000, 2003 and 2005 (in %)

Range of occupied personnel	2000	2003	2005
Total	16,7	21,8	25,2
From 10 to 29	9,1	11,1	13,6
From 30 to 49	10,8	18,0	8,2
From 50 to 99	10,8	10,5	17,8
From 100 to 249	10,2	11,7	22,4
From 250 to 499	13,4	14,3	19,3
With 500 and more	20,2	25,9	30,1

Source: PINTEC (2000, 2003 and 2005).

In terms of firm size, it is possible to observe that, in 2000 and 2003, the large enterprises (more than 500 employees) were the ones which used most part of the resources from third parts for accomplishing R&D activities (table 8). Furthermore, whereas in 2000 there was a major participation of governmental third part resources, in 2003 the main participation was of private third part resources. In 2005, the small (from 30 to 49 employees) and medium enterprises (from 250 to 499) were those which presented the major proportion of resources of third parts in financing of R&D activities, being respectively 21% and 22%. The other innovative activities, in their turn, count on a greater part of resources from third parts. In 2003, the major participation of public resources in other innovative activities was in small enterprises, whereas in 2005 it was in medium enterprises.

Next we analyze the public support received by enterprises which performed innovations either in product or in process in the three editions of PINTEC.

Tironi & Koeller (2006) investigated the relevance of public support, particularly the financing to innovative activities of enterprises in PINTEC (2000)[4]. A first find is that enterprises which received public financing are, in average, of larger size (considering occupied personnel, value of industrial transformation or net income). For the period from 1998 to 2000, out of the group of innovative enterprises, only 11.5% obtained public financing. Among the group which was granted with public financing, most part innovated in product and in process.

It was possible to observe a greater impact of public financing on the absorption of graduate personnel and on the propensity to cooperation on the part of enterprises. Data point still to an association between public financing and the accomplishment of internal activities of R&D, although a causal relation cannot be implied[5], but to a weak linkage between public financing and the importance attributed to external acquisition of R&D.

[4] In PINTEC 2000 the question was only if firms have access to any government program not asking about program's type.

[5] If the enterprises carried out internal R&D activities because they received public financing, or if in the sectors that carry out R&D activities public financing is more frequent.

TABLE 8

Sources of financing innovative activities by firm size, Brazil, 2000, 2003 and 2005

Year	Ranges of Occupied People	Financing Structure (%)							
		Of R&D Activities				Of Other Innovative activities			
		Own	Of Third Parts			Own	Of Third Parts		
			Total	Private	Public		Total	Private	Public
2000	Total	88	12	4	8	65	35	19	16
	From 10 to 29	97	3	1	2	46	54	48	6
	From 30 to 49	99	1	1	1	67	33	21	12
	From 50 to 99	98	2	1	1	56	44	27	17
	From 100 to 249	95	5	4	1	47	53	40	13
	From 250 to 499	96	4	2	2	68	32	16	16
	with 500 and over	86	14	4	10	72	28	10	18
2003	Total	90	10	5	5	78	22	8	13
	From 10 to 29	93	7	6	1	73	27	16	10
	From 30 to 49	97	3	-	3	67	33	15	17
	From 50 to 99	98	2	1	1	71	29	12	17
	From 100 to 249	91	9	2	7	66	34	21	13
	From 250 to 499	95	5	-	4	80	20	7	13
	with 500 and over	89	11	6	5	82	18	5	13
2005	Total	89	11	4	7	81	19	11	9
	From 10 to 29	93	7	6	1	84	16	9	8
	From 30 to 49	79	21	10	11	95	5	1	3
	From 50 to 99	97	3	1	2	71	29	21	8
	From 100 to 249	87	13	10	4	80	20	7	13
	From 250 to 499	78	22	7	15	80	20	7	13
	with 500 and over	90	10	3	7	82	18	9	9

Source: PINTEC, 2000, 2003 and 2005.

` Table 9 presents the classification by the number of occupied personnel and modality of support of Brazilian innovative manufacturing enterprises which received some support from the government. In 2003, 5.233 enterprises (18.7% of innovative enterprises) received some kind of support from the government. Out of this total, 443 (8.5%) received fiscal incentives (3.8% for R&D activities and 4.6% in the Law of Information Technology) and 4.346 (83%) received financing, being 75% for acquisition of machinery and equipment and 7.6% for projects in cooperation with universities and research institutes. In 2005, 6,169 enterprises (18.8% of innovative enterprises) received some kind of support from the government. Within this group, 680 (11%) received fiscal incentives (4% for R&D activities and 7% benefits of Law of Information Technology) and 4,333 (70%) received some kind of financing (being 62.9% for the acquisition of machinery and equipment and 7.3% for projects in cooperation with universities).

Thus, it is observed that there is constancy in public support in terms of the number of benefited enterprises. Between 2003 and 2005, a greater number of enterprises was granted by fiscal incentives, whereas the number of enterprises which received financing for projects in cooperation with universities and for acquisition of machinery and equipment has not changed significantly. On the other hand, the percentage of enterprises which received other kinds of support grew considerably, representing, in 2005, more than 1/3 of all enterprises. The other modalities of support comprise scholarships offered to researchers in enterprises, venture capital resources and other programs cited by enterprises.

Table 9 also presents the modalities of support from the government according to the number of people employed in enterprises. In 2003, the distribution of enterprises which received support from the government over the total number of innovative enterprises in each category was: 17,3% of enterprises with 10 to 29 employees; 19,6% of enterprises with 30 to 49 employees; 18% of enterprises with 50 to 99 employees; 19,5% of enterprises with 100 to 249 employees; 23% of enterprises with 250 to 499 employees and 34% enterprises with 500 and over employees.

Among the group of enterprises which received some kind of support from the government, the major participation was by micro and small enterprises (with up to 99 employees) which amounted 4,289 firms (81% of the total). It is observed that large enterprises, which represent only 4% of innovative firms, were beneficiaries of nearly 1/3 of fiscal incentives to activities of R&D. Micro and small firms, in their turn, were beneficiaries of 67% of incentives of Law of Information Technology. Regarding the financing of research projects in partnership with universities and research institutes, 60% of them were carried out by enterprises with 10 to 29 employees. The other modalities of support were used, with greater frequency, by enterprises with up to 49 employees.

TABLE 9

Innovative enterprises that received Some Support from the Government by firm size, Brazil, 2003 and 2005

Year	Ranges of employed people	Innovative Enterprises						
		Total	Which Received Support From the Government, By type of Program					
			Total	Fiscal incentives		Financing		Other supporting programs
				To R&D[1]	Law of Information technology[2]	Research projects in partnershipwith universities and IPs	R&D and acquisition of machinery and equipment	
2003	Total	28 036	5 233 (100,%)	204 (3,8%)	239 (4,6%)	399 (7,6%)	3 947 (75,4%)	1 149 (21,9%)
	De 10 a 29	16 776	2. 900	94	81	240	2 131	721
	De 30 a 49	4 118	809	7	38	36	650	155
	De 50 a 99	3 200	580	10	42	36	454	87
	De 100 a 249	2 140	418	8	25	12	335	84
	De 250 a 499	813	189	21	25	19	135	32
	Com 500 e mais	989	336	64	28	57	242	71
2005	Total	32 796	6 169 (100%)	249 (4,0%)	431 (7,0%)	450 (7,3%)	3 883 (62,9%)	2 129 (34,5%)
	De 10 a 29	18 651	2 968	38	160	137	1 703	1 278
	De 30 a 49	4 275	818	13	46	27	620	177
	De 50 a 99	4 239	815	23	56	47	506	273
	De 100 a 249	3 074	674	43	69	59	432	176
	De 250 a 499	1 254	368	34	51	51	250	98
	Com 500 e mais	1 304	525	99	49	130	372	128

Source: PINTEC 2003 and 2005.
Note: (1) Fiscal incentive to Research and Development (Law 8.661 and Law 10.332).
(2) Fiscal incentive of Law of Information Technology (Law 10.176 and Law 10.664).

In 2005, the proportion of enterprises which received governmental support in relation to the total number of innovative enterprises in each category was, respectively, 16%; 19,1%; 19,2%; 22%, 29% and 40%. Thus, we observe a relative increase in the number of innovative enterprises of medium and large sizes which received governmental support. These enterprises, altogether, receive 70% of fiscal incentives to R&D activities, being those of large size the beneficiaries of 40% of these incentives. The medium and large firms also increased their participation among enterprises which received financing for projects in cooperation with universities: they accounted for 22% of the total number of enterprises, in 2003, jumping to 53% in 2005. Micro and small enterprises, however, remained as the main beneficiaries of other supporting programs.

Therefore, in the period between 2003 and 2005, large enterprises received more fiscal incentives to R&D and participated more in programs of financing aimed at research projects in cooperation with universities and research institutions. In their turn, micro and small enterprises maintained their relative participation in incentives of Law on Information Technology, and reduced the participation in financings for acquisition of R&D and of machinery and equipment.

4. S&T&I IMPLICIT POLICY AND ITS INFLUENCE ON ENTREPRENEURIAL INVESTMENTS IN INNOVATIVE ACTIVITIES

In the present section, we will start from the impact of the implementation of Real Plan, which determine both the pattern of macroeconomic policy still prevailing and the main implicit industrial policy that Brazil has had: privatization. The Real Plan followed the basic method used to put an end to most of the great inflations of the 20th century: recovery of confidence in the national currency through the guarantee of its external value. The anchor was the stabilization of the nominal exchange rate, guaranteed by financing in foreign currency and, more recently, by a reserve amount able to discourage speculation against the exchange rate.

> "It was possible, thanks to the deflation of securities and real estate wealth observed since the end of 1989 in the global market. The American recession, which lasted until middle of 1992, and the burst of the Japanese speculative bubble were factors which required great weariness form the monetary policies. The purpose was making it possible the digestion of current unbalances and in financial position of companies, banks and families affected by the collapse of the exuberating burst of assets valuation that followed the redemptive intervention of 1987 (BELLUZZO, 2009).

The liberalization of foreign commercial and capital flows dates back to the beginning of the 1990s. The Collor government announced an image, and the society bought it, of a modernizing plan, adopting the Washington Consensus. Modernizing, here, means opening markets and capital flows without any safeguard, for an economic system which operated with strict controls of both capitals and imports. Furthermore, Brazilian economy underwent a serious recessive period which, in addition to the recession of the American economy, made it much more difficult the performance of national enterprises. It resulted in the transfer of control of several national enterprises, which

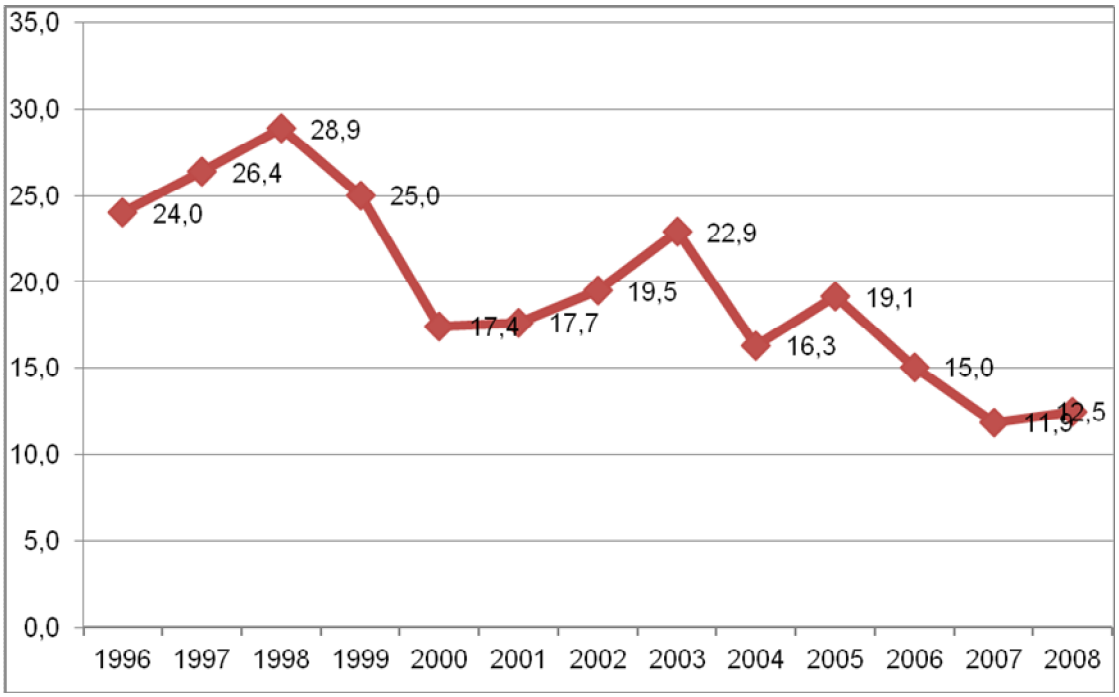
had been established at the time of the regime of import substitution, to foreign capital. These enterprises were, in their majority, the best qualified and those which used to make some kind of innovative effort along with the modernization of production.

When there is a greater freedom for capital flows, a financial market is created, which is much more agile and strong in both speculation and arbitrage, involving many kinds of financial innovations. In this global market, which incorporates both the commercial and the financial, the exchange rate becomes a financial asset whose price is instantly adjusted, irrespectively from the conditions of the commercial market. This is the reason why a divergence may occur between the commercial exchange rate, which accelerates economic growth and employment, and the global exchange rate. This latter obeys the interests of financial speculation and arbitrage, depending upon the profits it offers to the agents (NETTO, 2009).

Who, then, directs this financial movement and, therefore, the global supply? It is the expectations arising on the evolution of the economy and of the exchange rate itself, besides the differences between the real internal and external interest rates. The capital flow that either valuates or devaluates the exchange rate depends, obviously, on the differences of return that one dollar may obtain in the foreign financial market and, with the same risk, in the Brazilian financial market. In the last six months, our efficient Stock Exchange of Sao Paulo State – BOVESPA provided the foreign investor a return rate in dollars on the order of 5.5% per month, before the less than 2% per year in the US (Netto, ibid.)

GRAPH 1

Selic rate, 1996 to 2008



Source: www. bacen.gov.br.

The exchange rate anchor of the Real Plan started with US$1.00 (one dollar) corresponding to R$ 0.83 (eighty three cents). The appreciation of the real between 1995 and 1998 caused a deficit in the current account of US$ 106 billion. Between 1999 and 2002 we accumulated more than 81 billion dollars in deficits in current account. The exporting sector only recovered in 2003. Exports have grown at 3.2% per year between 1995 and 1998, and at 8% between 1999 and 2002. The surprising results of 2003 and 2004 were an outcome of the exchange rate devaluation of 2002, of the abundant supply of international credit and of the huge growth of world exports. Between 2002 and 2008, our exports grew 22% per year. This was a consequence of the rise in prices and quantities of agricultural and mineral products, which generate less employment than manufacturing industry and services (Netto, ibidem). For financing this deficit, the interest rate should be quite high (see chart 2) and, thus, it produced the very low average rate of GDP growth, of 2.6% per year. The gross formation of fixed capital has been very low for the same reasons above mentioned.

This implies that, in this economy, the economic incentive is directed to the production of commodities, products that in general have lower technological intensity, with low elasticity of income and of international demand. The domestic opening to foreign trade implies the existence of a strong demand for imports of products with greater technological content. Therefore, there is a structural trend towards deficits in current account.

The process of liberalization of productive, commercial and financial flows of Brazilian economy with other countries culminated with the privatizations in the sectors of raw materials, energy and telecommunications. This measure has modernized consumption in Brazilian economy, but broke apart the domestic production chains and the efforts for technological capabilities building developed in the previous decades, during the period of imports substitution.

Such movement of liberalization and privatization led to a reduction in the mechanisms for protection of the national enterprises and to less intervention by the state, raising the risks of their investments. The monetary policy, which benefited rentiers to the detriment of productive sectors, strengthened the formation of defensive expectations on the part of the national enterprises. Finally, the national innovation system, unstructured on the grounds of lacking an explicit policy for industrial innovation, remained at very low operational level. In fact, it must be highlighted that, in this period, the integration between the implicit policies, monetary and fiscal, and the industrial innovation policy, the privatization, was conducted in the opposite direction of the strengthening of national innovative enterprises. In this institutional context, national enterprises deepened the trend to invest in modernization instead of innovation.

It is worth to highlight that privatization in Brazil transferred assets from the state productive sector corresponding to 15% of the Gross Domestic Product mainly to multinational firms. This has been the major implicit industrial policy ever carried out in Brazilian history, with deep future impact on the balance of payments as shown by the data on payments of dividends, interests, royalties and profit transfers in 2008. The growth in transfers of profits and dividends is due to three main factors. First, the appreciation of the exchange rate observed until September of 2008, which made profits become higher when converted into foreign currency. Second, the good results obtained by the enterprises, until the crisis reach the country. Third, the branches established in Brazil sent more resources in order to cover losses of the headquarters in other countries, especially in the automotive

and financial segments (Ribeiro, 2009). All this exposes the extreme volatility of the external sector of Brazilian economy, with strong impacts in the formation of business sector expectations on the future of the productive investment

In 2004, the government launched the Technological Industrial and Foreign Trade Policy – PITCE. However, it kept the same framework of the implicit policies, the mix of appreciated exchange rate and high interest rates. The quite favorable international situation leads growth to accelerate, especially by the improvement in the external situation. Brazil will start having current account surpluses and will start to accumulate foreign currency reserves.

In 2008, a new industrial policy was launched. The Policy of Productive Development (PDP). The short interval between PITCE and the launch of PDP shows that the Brazilian government remains divided between liberals and developmentalists. The short interval between them exposes the absence of a long term strategy. Without even expecting a minimum period for evaluating PITCE, PDP was launched. What the enterprises can expect about stability with such erratic behavior of the government, even more if added of a still much restrictive macroeconomic policy? Defensive expectations can hardly be altered. The world economic crisis which bursts in the second half of 2008 is a new hard shock on them.

The positive aspect of the last years was the cessation of the privatization process, which allowed Brazil to enter its most important investment cycle since the end of the 'economic miracle' of the 1970 decade. Under the lead of Petrobras and Eletrobras, for instance, the country started again to expand public investments which, supported by state banks, incited the private sector to expand production and employment. However, the success of an industrial policy relies on the pertinence of its internal coherence, on the adequacy between strategy and the organization of the means for reaching the determined objectives, what affords it essence. It depends on the compatibility and convergence with the macroeconomic policy, which affords the dynamism derived from positive expectations of returns of investments. And, lastly but not less important, on its institutions, which allow the prevalence of a state of trust, the basis for improvement and adaptation before the several situations of economic changes that arise intermittently.

What rests from the exposed is that Brazil is not yet fully released from the rentism subsided by significantly high real interest rates. The mistakes of the macroeconomic policies involve not only the most recent stage of appreciation of exchange rates, but principally the persistence of the logic of the fictitious valuation of wealth over the investment in production and innovation.

5. CONCLUSION

The Brazilian industrialization process, led by multinationals and by the State, which pulled, in its expansion, complementary and subordinate investments by national capital in the industrial, agro-industrial and civil construction sectors, exhausted in the eighties. This depletion left exposed all the contradictions which comprise the framework of structural heterogeneity of Brazilian capitalism, constituted by several asymmetries, two out of which concern directly to the present work[6]:

> The first one, the financial asymmetry, exposes the lack of interaction between banks and the national manufacturing enterprises, as well as the humble dimension of these latter in international terms, with the few exceptions of Petrobras, Vale do Rio Doce and Embraer. It is worth noting that all these either were or still are State companies.

The financial asymmetry is responsible for the inexistence of large private national groups, of international magnitude, with financial capacity and capability to productive conglomeration, able to face competition at the international market in equal conditions as the large groups from developed countries and even from other emerging countries as South Korea and China.

The second, the technological asymmetry, results from the problems of international insertion subordinated to the Brazilian economy. The first is the lack of leadership by Brazilian enterprises in the dynamic sectors, what prevents the complete internalization of industrial innovation, causing a rupture between the capacity for generating knowledge, forming human resources for R&D and the effective introduction in the productive innovation system. The issue is not solved, therefore, only with the increase in resources for innovation. They are important and necessary, but do not solve the central question – the separation of R&D produced outside the country by multinational companies, leaders in the dynamic sectors, and introduced in the country without the need of an internal effort of innovation.

Thus, the national system of innovation undergoes a congenital defect, the weak economic and technological competence of Brazilian enterprises that should be their central and strongest element.

The central problem that must be considered by the innovation policy is not the support to sectors, but technologies that are pervasive to all sectors and firms, as information technology, biotechnology, and nanotechnology. These technologies have a pervasive effect in the economy as a whole, permeating the networks constituted between the enterprises for sharing and using knowledge in production. Thus, the question is how to set a national scale which would allow for the use of these technologies by national enterprises.

Developing countries, characterized by scarcity of capital, particularly for long term investments, cannot count solely on the action of private businessmen or on the invisible hand of the market for a sustainable economic development. The institutional infrastructure built by the State represents, unequivocally, a positive externality for private enterprises.

[6] Teixeira (1993: 200-203).

The intervention and participation, in startup industrialization period, were fundamental in the face of capital scarcity and of natural resistance by private entrepreneurs to adventure in high risk and low return investments. In the new historical phase of development of countries of recent industrialization, the support of the public Power becomes, once more, essential for promoting the national technological capacity and for providing better stability to the private enterprise.

The specific analysis of innovation financing allows for establishing some differences between the periods defined in this work. The first important difference between the two periods resides in the international context. The major change happened in the international policy during the 80s, with the hegemony of neoliberal thought directing the economic policies towards greater trade liberalization, and liberalization of the account of capital of the balance of payments, flexible foreign currency exchange rates, fiscal adjustments and control of inflation. Most of these policies were opposed to the dominant policy of economic development almost all along the first period characterized by what has been called model of imports substitution. In Brazil, these policies began to be adopted during Collor Government and were kept by the following governments, particularly in the guidelines of the macroeconomic policy[7].

Obviously, this difference in the international context, although not only this, led to a change in the priorities for application and in the sources of funds from FNDCT and FINEP. In the first period there was an explicit concern about the support to national enterprises (the majority of ownership of Brazilian capital), as well as a about a greater coordination between the application of FNDCT and FINEP resources.

The funds source of FNDCT was, in its major part, the fiscal budget. FNDCT was a fund of free application; it transferred resources to FINEP for this latter to finance the enterprises and, in some periods, it was complemented by external financings (Melo, 1988 and 1994).

In the second period, the exclusivity for enterprises of national capital is withdrawn. FINEP loses almost its whole autonomy in the definition of the strategy for application of the resources of FNDCT through sectorial funds. Currently, each sectorial fund has a managing committee and there is a general managing committee of FNDCT, in which FINEP is minor. The strategy is much more in the hands of MCT than in those of FINEP.

Nevertheless, some advances were accomplished with the creation of the sectorial funds. Firstly, with a change in the direction of a macroeconomic policy more favorable to the economic growth, with lesser fiscal restriction and less amounts of the resources directed to contingency reserves, there will be a jump in the availability of resources for sectorial funds.

In this purpose, sectorial funds may be decisive, since the barrier of the restrictive monetary and fiscal policy is overcome, with cessation of resources allocation to contingency reserves, and, thus, allowing for a greater financial availability for financing innovation. However, if the objective is advancing in the constitution of financial instruments aimed at the evaluation of intangible assets and to the formation of national innovative enterprises, it will be fundamental to advance in defining an

[7] A broad discussion on the changes in the world context, which covers the whole period under analysis, may be found in Fiori, J.L. (2004). In what respects to changes in the economic policy and the comparison in the performance of the countries that adopted liberalizing policies and those which resisted to them, see, Rodrik (2007).

insurance for credit guarantee and for liquidity guarantee for investments in innovation. The first one, for guaranteeing the financing risk; the second, for guaranteeing the investment in participation, the ownership of the assets and the securitization of debts. The securitization increases competition for resources between institutions of the financial system, reduces the power of banks, cut down the exorbitant spreads and strengthens the capital market and enhances the availability of credit.

In brief, the raise in resources for the financial allocation, participation, equalization, subvention and guarantee of credit and liquidity, with the respective reduction and elimination in resources allocated to contingency reserves, are important. FINEP will need to build its capacity for operating all forms of participation in the risk of innovative enterprises. Now, it is almost exclusively limited to the participation in funds of venture capital for startup technology-based enterprises. It is an indirect form, perhaps less risky, but that does not compatible with the strategic institutional role that a public financial institution may play in the creation of these enterprises and in sharing the risks of investment in innovation.

Finally, the integrated and articulated operation of NIS relies upon the definition of an innovation policy that faces the problems of articulation between institutions that comprise it, that integrates its subsystems and, thus, reduces the uncertainty inherent to contradictions between implicit and explicit innovation policies, building a trustful institutional environment for investors.

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