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INDUSTRIAL AND TECHNOLOGICAL POLICY AND DEVELOPMENT

JOSÉ MATIAS PEREIRA

Professor of Department of Administration
Faculty of Economics, Administration,
Accountancy and Information Science
University of Brasilia – Brazil
matias@unb.br

ISAK KRUGLIANSKAS

Professor and Coordinator of the Program of Post Graduation in
Administration - Faculty of Economics, Administration,
Accountancy – FEA/USP
University of São Paulo – Brazil
ikruglia@usp.br

GILENO MARCELINO

Professor-research of the Program of
Post Graduation in Administration of the
University of Brasilia - Brazil
gmarcel@solar.com.br

CLANDIA MAFFINI GOMES

Professor of the University of
Santa Maria, Brazil and FEA/USP.
maffini@usp.br

Abstract: The objective of this paper is to enter deeper in the discussion about the unavoidable way Brazil has to go through in order to construct a modern industrial and technological policy, on the basis of the knowledge and the technological innovation, which will work as a stimulator of the economic development. The different theories about this subject (SCHUMPETER, 1961; PAVITT, 1998; FREEMAN, 1984; KRUGMAN, 1986; COUTINHO, 1990), so as the principles set by the Brazilian Development Ministry (“*Diretrizes de Política Industrial, Tecnológica e de Comércio Exterior*”), give the support in the search to define a new model of industrial, technological policy and foreign trade for the country. The strategic role of industrial policy seems to be very evident, if it assumes its co-ordination’s work involving those productive agents, which are responsible for crucial decisions, such as these relate with investments and/or innovation, in a context of great incertitude about the consequences of their decisions in the future. Finally, the conclusion arising from this discussion demonstrates that it is crucial for the country to define a modern industrial policy, which could be able to integrate the incentive to the innovation as well as to the exports, in order to serve as a tool to impulse the development. The paper argues also, that the feasibility to this policy depends on the ability of the Government to supply the agents with a favorable context, so as an adequate regulation, purchasing policy, availability on financing facilities and fiscal incentives.

Keywords: industrial policy, technological development, innovation, foreign trade, Brazil

1. Introduction

The debate about the need of providing countries with consistent industrial policies has intensively resurged along the last two decades, mainly in developing countries. The basic argument here is the priority in generating commercial balance surpluses, in order to reduce deficit in current transactions and, therefore, fragility in those countries' economy, subject to external shocks. We understand that industrial policy is capable of increasing exports and replacing imports. This paper is, then, aimed at reinforcing the relevance of a sound industrial policy to Brazil.

Hence, we advocate that currently the dynamics of capitalism economy working strongly depends on technological development. This is also applicable to industrial sectors and corporations, if considered isolated. On its turn, globalization-related impacts impose the need for implementing new public policies and entrepreneur strategies in industrial and technological sector of emerging countries, like Brazil.

The major target of an industrial policy is promoting efficient productive systems, capable of following-up the dynamics of international technical progress. One can observe in micro-economic theory that an industry is efficient when its configuration is sustainable, i.e., when the number of corporations set therein and their respective production branches allow for minimizing costs related to meeting existing demand. On its turn, sustainable configurations are typically oligopolies or monopolies, thus leading governments to use industrial promotion tools simultaneously to mechanisms in defense of public interest. Usually, industrial strategies restricted to the first goal tend to become hostages of major corporations' economic power, generating only monopolist incomes and inefficient markets. In this sense, due regulation of concentrated sectors depends on solving the issue of information asymmetry. Imposing virtuous behavior to industry demands governments to use mechanisms to compensate their ignorance in relation to technologies and costs structures in force, fully known exclusively to enterprises set therein.

Both developing and developed countries need to be supported by industrial policies based on technological development, oriented to foreign trade, aimed at accelerating competitiveness gains. Hence, we argue that Brazil needs an economic policy – oriented to reduce its economy external vulnerability – that requires for export-oriented and consistent industrial and

technological policy. Thus, industrial and technological policy, as well as foreign trade policy, plays crucial role as a tool to encourage and finance export. Consistent industrial policy based on technological development emerges as a factor for strengthening the country macro-economic policy (MATIAS-PEREIRA, 2002a). To make Brazilian products more competitive at international markets, it would be necessary to add value to them and consolidate Brazilian trademarks in those markets.

One can notice close relationship between progress reached by most developed nations and the use of knowledge and application of Science. In this sense, science and technology are related to progress through the broad range of human undertakings: educational, intellectual, medical, environmental, social, economic and cultural. Scientific and technological knowledge accrued and implemented by human kind represents an asset towards solving many different issues faced by humanity, such as the need for reducing poverty and environmental problems. Thus, we understand that benefits brought about by scientific research should flow to civil society as a whole and to economy in general, rather than just to executors or financiers of research activities (PAVITT, 1991; 1998).

Industrial and technological development must be supported by well-defined, competent and coherent policy, taking into consideration both efforts for executing research activities and transfer of results to civil society. This arrangement, duly articulating organizations, social institutions and mechanisms of implementation and assessment of scientific and technological development policies results, pursuing pre-established objectives, is what in Economic Theory many writers (FREEMAN, 1995; 1194. FREEMAN & SOETE, 1997; NELSON, 1993) use to call *national (regional) innovation systems*.

One can observe that access to advanced technology, through imports, is becoming unfeasible in face of current trends towards privatizing knowledge worldwide. This reality evidences that emerging countries, as Brazil, should define consistent industrial and technological policies. It is worth recalling that, since 1980, when Brazil abandoned developmental policies, growth rate dropped to 2.4% a year and the country fell from leadership to 93rd in the global ranking of expansion (IBGE, 2004). This drop was consequence, among others, of huge lack of Governmental attention to educational and industrial policies. Export-oriented industrial policies, used by several emerging countries as, for instance, the so-called Asiatic Tigers, were successful due to educational developments achieved in those countries. Brazilian

industrial policy, on its turn, from 1982 to 1994, gradually lost competitiveness since it was oriented to a closed economy. As of 1995, the Government, in a distorted view of development, adopted exchange and interests policies that jeopardized Brazilian growth. This reality leads us to approach the issue of economic development, trying to define the work question and hypothesis to the article.

On its turn, major objectives of S&T policies in most developed countries are focused on: a) quickly identifying important prospective opportunities; b) accelerating flow of information through the system; c) hastily disseminating new technologies; d) increasing connectivity of different parties making up S&T system, aiming at speeding learning process. These objectives have been pursued as a whole, especially by mobilizing innovation networks, which became the core objective of governmental policy in those countries over the last few years. By the end of the 1980's, 80% of Japanese Government budget to S&T was addressed to technological collaboration projects, while 60% of European Community research budget was disbursed to promote new generic technologies.

1.1 Industrial and technological policy based on knowledge and technological innovation

Extensive theoretical literature, since classic economists, evidences that recommendations towards industrial policy is not a novelty. One can observe that, even before Smith and Ricardo advocacy for free trade, mercantilist theses already prevailed in economic scenario in the 16th and 17th centuries. Proposals on definitions of legal rules to intervene in market and grant protection used to bring basically the same recommendations as current proposals, concerned with promotion of economic development.

When approaching “development”, we must make reference to some theorists in this field, as for example Schumpeter, who sustains specific thought about what he called development “fundamental phenomenon” in his book “*The Theory of Economic Development*” (1911). Trying to deviate from mere economic history and static part of theory, i.e., circular flow, Schumpeter related economic development process to endogenous and discontinuous changes in the production of goods and services. In his analysis, entrepreneur (or Schumpeterian entrepreneur) is outstanding as crucial agent to economic development process.

In this sense, economic development is not an issue of economic history, as it is usually considered, but of economic theory. Hence, emerges the need for creating economic development theory, based on economic theory. Economic theory, as known nowadays, studies circular flow – or general balance – besides continuous changes on this flow, and cannot comprise discontinuous changes or changes in the flow itself. Theory of circular flow is limited to studying the system trend towards balance and small continuous adjustment to the system itself. This theory is static and does not comprise the occurrence of productive revolutions and their consequences. One may say that economic development theory is on a different stage, because it studies discontinuous changes, or economic system jumps along time.

The specification of objectives and tools of an industrial policy with normative basis grounded on neo-Schumpeterian view on markets functioning is a task yet to be performed. In this sense, neo-Schumpeterian approach, by privileging dimension, reaffirms basic analysis unit as the endogenous of market structures and emphasizing local and tacit nature of learning and technological development, driving State intervention to the *systemic* scope. It is about promoting competitiveness in its systemic dimension, through actions over three kinds of factors: (i) factors that encourage the establishment of competitive environment, i.e., markets capable of performing their core duty under Schumpeterian light; (ii) factors that generate positive externalities to entrepreneur competitiveness, such as development of proper infrastructure and basic education; and (iii) political-institutional factors, such as macro-economic policies and other policies of horizontal nature (POSSAS, 1996).

Within this context, industrial policy is expected to induce cooperation among enterprises, both at horizontal scope – mainly in the field of R&D, and at vertical dimension, thus facilitating supplier/user relationship aiming at information exchange. In general, it concerns generating mechanisms to facilitate collective learning. On the other hand, this objective is not absolute, and should be conditioned to major role to be played by industrial policy within Schumpeterian context: “*strengthening a competitive environment, where the ranking of corporations leading the market is continuously argued and the set of enterprises is subject to continuous competitive pressure*” (POSSAS, 1996, p. 101). Furthermore, it should be highlighted that increasing competitive pressure is essential to allow competitive process, in order to induce development and dissemination of innovations to enhance economic efficiency.

In face of this reality, the following question comes about: *does Brazil need an industrial policy as a tool to support its economic development process?*

In this article, we assume that the issue of industrial policy as core tool to Brazilian economic development has been left aside. The fragility of this segment is negatively reflected on the volume of Brazilian exports. Increasing concern of leaders of the Ministries of Development and Foreign Trade and Foreign Affairs in encouraging national productive sector towards increasing exports volume points out the foreign trade intensification became an important strategy to promote economic growth and balance Brazilian foreign accounts, thus reducing its external vulnerability.

In this sense, we have formulated the following hypothesis: *retaking Brazilian economic development would demand contemporaneous industrial and technological policy to the country.*

It is worth mentioning, after these considerations, that our main goal herein is to deepen the debate on the need for Brazil to establish a contemporaneous industrial and technological policy, based on knowledge and technological innovation, here accepted as elements inducers of capitalist economic activity. This industrial and technological policy shall work as supportive tool, essential to the process of retaking Brazilian economic development.

2. Industrialization Process: Theories and Concepts

The lack of a unified theoretical referential to studies on industrial and technological issues, initially required for considerations of conceptual and methodological nature about the industrialization process, as well as to defining concepts. In general, industrialization process is a phenomenon that, up to these days, has not yet been totally dimensioned within a definite theoretical framework.

We could state that most of recent studies about economic development emphasize the relationship between economic growth dynamics and industrialization process. This led us to use as theoretical referential several theories dealing with the topic, as for example, the Incrementalist Theories; Innovation Theory; the New Theory of International Trade; Theory of Industrial Economy; Theory of Transaction Costs (Coase, Williamson); Theory of Firm

(Penrose), and studies oriented to technological strategies and new technological paradigms of production (Dosi, Nelson, Winter).

Industrial policy with neo-classic origin is aimed at correcting the so-called “market failures”, i.e., those situations where markets features, deviating from ideal model, do not allow prices to duly perform their duties of coordination and transmission of information, in a socially optimum way. Such failures are usually associated to the presence of: (i) externalities; (ii) existence of market power; and (iii) information asymmetry (LEDYARD, 1989). Therefore, when such failures exist, the market cannot generate optimum resources allocation, and State intervention *may* be economically efficient.

It is worth highlighting that orientations provided by international organizations in the 1990's, about basic features of Government intervention, emphasize the role performed by firms and markets as the major power generating long-term competitiveness and technological development (OECD, 1992) – supported by competitiveness defense policies – which should grant their due working, by acting over markets structure and firms behavior (KATZ and ORDOVER, 1990).

On its turn, one of the major debates within the field of innovation economy in the 1960's and 1970's, concerned surveying factors that induce innovative actions; the relative importance of several innovation sources and, therefore, role and priorities of S&T policy. In this sense, Moreira (1993, p.59) sustains that instability in economic growth, commercial balance, prices and public and external debt have hindered both growth and planning of state-owned enterprises, as well as estimates on inversions of capital goods enterprises. Coordinating such agents became impossible. External market was not converted into price reference due to economic closeness. Problems of scale and inflation hindered control over industrial costs. Thus, within an environment of inconsistent industrial policy and fragmented industrial structure, dominated by foreign capital and oriented to internal market, technological capacity of national enterprises could hardly be fomented.

Incrementalist theories emphasize gradual and continuous nature of technological changes, while advocating that most innovations would not come directly from R&D efforts, but from other parts of the company (engineering, production and quality control areas, for example),

other elements of productive chain (equipment manufacturers, inputs and services providers) or from consumers.

It should be highlighted that theorists of international trade are divided in two positions: those, like J. Brander, B. Spender, W. Branson, L. Thrurow, L. Tyson, among others, who advocate for strategic commercial policy, and those, as A. Dixit, Kyle, G. Grossman, J. Eaton, J. Bhagwati, among others, criticize this policy. The main positions of both groups have been gathered and edited by Krugman (1986).

This article, explicative concerning its purpose and essentially biographic concerning its means, is particularly supported on the following works and documents: Dosi (1988, 1997); Rosemberg (1990, 1996); Pavitt (1984, 1991, 1998); Freeman (1982, 1987, 1992, 1994, 1996); Farina (1997); Schumpeter (1961); Coutinho (1990); Schwartzman (2001); and on the *Diretrizes de Política Industrial, Tecnológica e de Comércio Exterior* (MDIC, 2004).

2.1 Concepts Used

The definition of industrial policy herein is generic. For Jordan and Teece (1992, p.12), industrial policy may be understood as the set of measures that directly or indirectly affect industrial performance, through their effects on micro-economic variables. Traditional industrial policy generally targets to maximize real average income (CORREA and VILLELA, 1995, p. 5), thus granting it a static nature. Under more heterodox and recent lights, industrial policy pursues increasing competitiveness to firms, sectors and the country, acquiring more systemic dimension. Nevertheless, it lacks a theoretical basis to justify it, under normative light (CASSIOLATO, 1996). One can notice, on its turn, that the major focus of new competitiveness policies, within the scope of their impacts on corporations' behavior, relies on the emphasis on cooperation among firms in high-technology industries, in order to reduce costs and uncertainties related to generation of innovations and exploitation of new technologies.

Productivity. Constant growth of productivity, in a pace faster than population growth at micro- and macro-economic levels, grants better living conditions to people, provided that income is fairly distributed, which demands effective fiscal policies. The search for greater productivity at organizations and countries depends on knowledge and, therefore, its

dissemination is pre-requisite for success. Competitiveness is compared valuation of productivity by two competing entities, whether countries, regions or organizations, which dispute the same markets. Kurgman (1994) sustains that countries do not compete one to another as trans-national corporations, since they do not leave market when they cease being competitive or fail in settling their debts. However, national competitiveness should be understood in generic and relative terms, comparing each country's capacity of discouraging economic activities, whether through actions or omission.

The expressions industrial policy and industrial competitiveness policy, although being typically used indiscriminately, are different. The first means efforts aiming at increasing density of industrial grid, by creating new sectors. The second refers to policies oriented to approximate productivity of existing sectors to best international levels (GASSMANN, 1994).

Brazilian Science and Technology System. It is understood here as an articulated set of policies, institutions and their agents, connecting knowledge activities to productive framework (DAHLMAN and FRISCHTAK, 1990). This network of relationships, interactions and articulations may be viewed as an extensive and sophisticated institutional system, which interconnects research institutes, universities, corporations, governmental agencies, financial institutions, completing the circuit of generation, implementation and dissemination of innovations. Activities responsible for interacting science and technique involve technological management, capacity-building to researchers and technical staff, financing to S&T activities, information and technology transfer.

Industrial Property. Rights resulting in exclusive replication or employment of given product (or service), in broad sense, is called intellectual property. In the field of intellectual property concerning interests of transformation, and commerce – such as rights concerning trademarks and patents – are called “industrial property”.

3. Industrial Policy and Development: Historical Models

One can observe that no developed country reached its current level of economic and social development without the support of science and technology (S&T), since the first (development) does not exist without the second (science and technology). Competitiveness among developed countries towards appropriation of information, knowledge and innovation

development nowadays points out that emerging countries – as Brazil – should undertake efforts for building up autonomous technological development model, which should take into consideration improving intellectual property system (MATIAS-PEREIRA, 2004).

It should be highlighted that Brazilian industrial sector, along the last three decades, has faced deep and radical changes in its environment (IEDI, 2003). The most feasible explanation for corporative survival and success is based on innovation and technological development processes. It reinforces the notion that innovative activity should be considered as genuine need, rather than as likely strategic alternative. Thus, the technological factor becomes crucial to corporations, and when properly managed, is indispensable for improving their quality and competitiveness. It is worth mentioning that there are evidences that grants over products innovations are usually essential for corporations to survive in market. Within this context, becomes crucial for Brazil to define strategies to the field of protection to intellectual property that allow for achieving this objective.

As greater the nation's productivity, as higher its population's living standard. Productivity growth induces economic growth and increases *per capita* income of a country (OCDE, 2001). At corporation level, productivity is one of the key-factors that encourage competitiveness (HMSO, 1994). According to Krugman (1994), productivity in economy is the key behind the notion of competitiveness. In this sense, better productivity levels contribute to the country's growth and to enhance civil society's living standards.

On its turn, the productivity level of Latin American countries is much lower than average of developed countries. Works on this topic, such as those prepared by ECLAC (2000), disclose the difficulty for overcoming this difference, resulting from several factors: insufficient capital, under-skilled labor force, and incapacity of reaching vanguard countries, such as the USA, in terms of innovation. It is well known that none of such deficiencies may be quickly corrected.

One can notice that the only way for enhancing competitiveness capacity, whether among countries or organizations, is through increased productivity level. Among three basic production inputs – work, capital and knowledge – the last is the most decisive. Achieving this objective would require for developing education enhancement policies – especially in directions that will impact productivity – which, in their turn, will allow using science and

technology as tools for generating welfare to society. *Knowledge* is to be understood as a decisive factor for increasing *productivity*. Without knowledge, no country succeeds in being consistently inserted into global market. Major challenge to be faced by Brazil, therefore, is to define strategies oriented to increasing productivity, since the country – which faces competitiveness problems in almost all sectors – must recover from its poor performance in the 1990's, when average growth rate to total productivity was negative (IDB, 2001). It is broadly acknowledged that Brazil, as can be observed from its poor performance of its macro socio-economic indicators (IBGE, 2004) should develop and have access to new technologies in order to reach this objective.

After aforementioned comments, we present a synthesis on historic models of industrial policy worldwide (Kupfer, 2004):

North-American model: federal action is almost neutral. However, trade policy is extraordinarily active, thus reflecting on North-American protectionism level, based on compensatory rights, quotas, etc. On its turn, industrial policy there is implemented by the States, with different programs, ranging from tax reduction to actions resulting in disputes between its own States.

French model: Supported on planning, identification strategic areas, concentration of public resources and support to development of leader companies (classified as champions policy), like in aero-spatial industry (Airbus).

Asiatic model (or Japanese): the State works as investments coordinator. Financial agents are the firms themselves, although under “protective overcoat”, since enterprises invest in segments granted by Government.

Brazilian model: Brazil, until late 1970's, was perceived as a country with aggressive industrial policy. The State worked in an active and verticalized way, and was more present than in remaining global models. Public action was proportional to industrial development. Brazilian industrial policy was mainly characterized by its orientation towards replacing imports. This model – with fiscal crisis – was over in the 1980's. As of that time, started a pragmatic protectionism, concerned only about generating commercial balances to face the payment balance crisis. The concern about generating incentives to industrial segment was

left aside. Macro-economic stability, in the 1990's, was perceived as a way to induce economic growth as a whole. And it did not happen.

4. Guidelines to Industrial, Technological and Foreign Trade Policy

The *guidelines* on “*Industrial, Technological and Foreign Trade Policy*”, coordinated by Brazilian Ministry of Development, Industry and Foreign Trade (MDIC, 2004), comprising 57 measures, some in force as of 2003, is intended to define a new model of industrial and foreign trade policy for Brazil, as will be further discussed.

Industrial Policy. Herein, industrial policy is defined as a coordinated set of actions, involving public and private sector, aiming at expanding industrial competitiveness. Its final objective is to induce economic growth and industrial sector employment. Thus, industrial policy is a component of the industry strengthening policy and crucial part of a development policy. Competitiveness promotion is the focus of industrial policy currently practiced in developed world, and in countries that pursue promoting development. Industrial policy, as policy to promote competitiveness, cannot be dissociated from competitiveness, technological updating and productivity increase, and is not targeted to crease and disseminate privileged and inefficient sectors and corporations, which survive thanks to protection and subsidies. Globalization and trade liberalization agreements being negotiated by Brazil (NAFTA, Mercosur/EU, new WTO round of liberalization) makes crucial permanently renewing competitiveness in industrial activities and economy as a whole. Therefore, industrial policy should also be permanent and continuously reviewed. Industrial policy is not an alternative or in opposition to executing policies and development in the remaining sectors of economy. Industrial development is an additional factor of incentive to developing agriculture, services and financial activities. Industrial policy and development are not incompatible to inflationary stability and control over public expenses, as evidenced by several countries with great industrial growth that practice active industrial policies, while preserving stability (MDIC, 2004, p.8).

Horizontal Policies. “Horizontal” measures (oriented to industrial activity in general, with no specification of sectors/chains), as describe in aforementioned document, shall be permanent and, in principle, the main measures for conceiving an industrial policy. Sectorial or

productive chain-related policies are complementary, typically transitory and with specific objectives, clearly stated.

The following should be absolute priorities as “horizontal” measures to industrial policy:

- a) Expanding investments in education, infrastructure and S&T;
- b) Reducing interests rates, developing capital market and adjusting existing financing sources;
- c) Tributary reform;
- d) Provide flexibility to labor market.

Due to significant delay in “horizontal” policies in Brazil, if successfully implemented, they would serve as powerful inducers not only to industrial competitiveness, but also to production and competitiveness in other economic sectors (MDIC, 2004, p. 10).

Objectives of Brazilian Industrial Policy. Additionally to its permanent objective of promoting competitiveness, industrial policy also pursues particular objectives, around which two kinds of actions – whether horizontal or vertical – should be coordinated. The objectives of an industrial policy to Brazil would be (MDIC, 2004, p. 11):

- a) Setting in Brazil production basis for high value-added products, for both domestic and foreign markets;
- b) Incentive to technological basis sectors, including their inputs and components chains, additionally to activities in Research and Development, where new technologies are built and developed;
- c) Regional industrial development, focusing on actions oriented to enhance regional vocations, provide agility to industrial employment in less developed regions or under industrial decadence.

Sectorial policies. The distinction between horizontal and sectorial policies may be extremely inflexible to some political objectives, such as the aforementioned, and may be unsuitable as exclusive parameter to an industrial policy. In opposition to competitiveness policies and “horizontal” actions, whenever sectorial policies are executed they must have clear specific objectives and, whenever possible, actions should be temporary (fixed-term actions).

Furthermore, eventual incentives granted, and their duration, should be clearly defined. This is the general model followed by several countries, and could and should be followed by Brazil.

Orientation to industrial sectorial policy:

- a) For those sectors where current industry competitiveness is greater. As these sectors also report greater international protectionism, here the industrial policy aims at broadening access to markets and the competitive advantage of national product, towards facing protectionism and winning foreign markets.
- b) With no damage to development of sectors where Brazil has already won international competitiveness, industrial policy should contemplate the development and/or implementation of industrial pools of products with higher added value and technological content. These products report greater dynamism in international market, and the pools that produce them generate high salaries and even better income distribution in productive chain.

An outstanding feature in high-technology products is their increasingly participation in other productive chains; therefore, their relevance is not only economic, but also strategic. Give up developing high-technology products in Brazil means put in risk future development of productive chains as, for example, electric-electronic chain that participates in automotive and office equipment pools, among others.

Industrial Policy and Foreign Sector. Foreign affairs bring huge challenges to industrial policy. Repeatedly, foreign sector of economy has imposed limitations to internal growth due to an excessive exposure of Brazilian economy to international financial flows. This hinders solving Brazilian serious economic and social issues: acute income concentration, unemployment and sub-employment, poverty and regional unbalances.

Industrial policy oriented to provide foreign sector with more soundness and remove restrictions to growth is intended to broaden exports and encourage competitive replacement of imports, in order to provide significant surpluses to Brazilian commercial balance and reduce the excessive external exposure of Brazilian economy.

In order to successfully reach this policy, the following conditions should be met: expand export of manufactured goods with higher added value and competitive replacement of imports for domestic production of goods meeting international competitiveness standards.

Increasing exports and internal competitive production of goods are requirements for Brazil to prevent regressions in its opening, and speed its foreign trade growth (exports plus imports), which is notably low for internal standards.

The lack of capital, besides its high cost in Brazil, recommends as core measures of this policy the reduction of capital cost, besides expansion of long-term financing terms and reduction of their costs for existing lines of financing, additionally to actions towards domestic and foreign investments intake. Such investments would be simultaneously oriented to expanding Brazilian exports basis and to the competitive replacement of imports.

Within the universe of so-called “emerging” economies is developed a stubborn competitiveness towards attracting investments that contribute to developing foreign sector and technologically updating the industries of these economies. Brazil, which does not participate in this process, could also execute domestic and foreign investment intake policies for exports fields, competitive replacement of imports and high-technology segments. This would be an outstanding point in Brazilian industrial policy (MDIC, 2004, p. 14).

Industrial Policy and International Negotiations. A relevant fact is that negotiations to establish NAFTA, Mercosur/EU agreement, as well as more comprehensive negotiations in the scope of WTO, should not imply in waiving aforementioned policy and industrial development objectives, in favor of greater industrial specialization of Brazilian economy, moreover because our current relative specialization concerns products with relatively low added value.

Due to broad scope of these negotiations and their deep impacts on the future of Brazilian economy and industry, it would be advisable to have Brazilian National Congress defining strategic points to which negotiations of international agreements would require previous approval by that National Congress, as condition to approve agreements as a whole. That would be Brazilian fast track, intended to grant that some issues considered whether as fundamental or strategy be safeguarded in negotiations. Under the industry view, international

agreements should serve to expand access of Brazilian products with high international competitiveness (as for example, additionally to agricultural products, agro-industry products and many other industrial segments) to foreign markets, and should not restrict Brazilian capacity of executing industrial development policy pursuant to aforementioned lines (MDIC, 2004, p. 18).

In brief, as defined herein, Brazilian industrial policy pursues:

- a) Promote industry competitiveness;
- b) Expand access to markets and sectorial competitiveness to traditional industrial segments;
- c) Foment the development of industrial pools of products with higher added value and technological content;
- d) Encourage R&D activities, creation and development of new technologies.
- e) Increase exports and induce competitive replacement of imports, in order to reduce excessive external exposure of Brazilian economy. Its final purposes are: diversify and strengthen industry, increase economic growth and employment, contribute towards reducing regional and income imbalances.

4.1 Transformation Measures in Support to Development

When reviewing measures proposed in Brazilian new industrial and technological policy, it is relevant to analyze the major measures for streamlining and supporting industrial and technological policy. Among these measure, are outstanding the promotion of entrepreneur re-grouping, further to the creation of BNDES lines of credit to competitive sectors operating at their maximum capacity and, therefore, require for investments, as happens with the sectors of semi-conductors, software, medication and capital goods. The following measures are outstanding in the proposal under analysis:

- a. Measures for streamlining and supporting industrial and technological policy: establishment of the National Council on Industrial Development; the Brazilian Agency on Industrial Development and the Products Certification Program.

- b. Financing to capital goods: creation (adaptation), through three programs – specially Modermaq – of financing line to purchase machinery and equipment, with subsidized interest rates and terms, besides exemption of IPI to the sector products.
- c. Information technology / semiconductors: Made up by a set of seven programs, among which definition of credit lines to industry of chips, incentive to establishment of the Excellence Center of Advanced Electronic Technology in the State of Rio Grande do Sul (Ceitec) and of the National Program on Micro Electronics.
- d. Information technology / software: Made up by nine programs, where are outstanding: the Program on Incentive to Free Software Development and the New Prosoft, a program for sectorial development that provides three BNDES financing lines: corporation, commercialization and export.
- e. Pharmaceutical products: Made up by five programs of incentive to national sector. Among them, are outstanding: creation of Profarma (BNDES financing line), implementation of public industry of blood byproducts, modernization of ten official laboratories and regulation of the Brazilian National Agency of Sanitary Surveillance (ANVISA).
- f. Industrial policy on nanotechnology: It is intended to encourage the segment related to manipulation of materials at molecular level, aiming at creating new materials, substances and products, in an atom-to-atom accuracy. Nanotechnology is emerging as the next technological revolution, with reflexes over all aspects of life.
- g. Industrial policy on biomass: It is aimed at supporting investments using materials of vegetal origin to produce renewable energy.
- h. Biotechnology: It targets equipping and strengthening the Amazonian Biotechnology Center and create the sector competitiveness forum.
- i. Small- and medium-size enterprises: Made up by a set of measures aimed at inducing Local Productive Arrangements (LAP), exports and promotion of domestic market.

- j. Strengthening Brazilian national innovation system: It is a set of three projects, oriented to: (i) incentive to corporation-university and research institutes partnerships; (ii) restructuring the Brazilian National Institute of Industrial Property (INPI); and (iii) National Program on Qualification and Modernization of Research Institutes and Centers.

Therefore, it is evident that Brazilian government, supported by a set of 57 broad and sophisticated measures – comprised by “Guidelines (MDIC, 2004)”- pursues leading the Country into a new industrial age, by defining new model of industrial and technological policy for Brazil. Its main purpose is to increase Brazilian industry competitiveness, based on technological innovation. That should allow for expanding Brazilian international insertion into global market – increasing participation of foreign trade in the Country GDP, from current 20% to 35% in 2007.

5. Conclusions

In face of this context, one could argue, supported by extensive international literature, that the new industrial, technological and foreign trade policy (PITCE) is an important tool towards expanding economic and social growth thresholds, additionally to Brazilian population’s quality of life. PITCE implementation, however, will not solve several problems faced by Brazil. It is one among several policies and strategies of Governmental action required to speed up economic and social development process in Brazil. Therefore, it should be added to a broad range of inter-related policies and actions, indispensable for maintaining macro-economic balance, income distribution, poverty reduction, social inclusion, among others.

1. PITCE definitions clearly states two different focuses: the first one, oriented to traditional definitions and actions, since it pursues gathering special lines of credit, encourage exploitation of existing opportunities, besides trying to meet demands by different organized sectors.

- i. The first focus of this new industrial and technological policy allows us to argue – supported by the analysis of proposed text – that it brings no innovation. Concerning the launching of additional measures to foment activities in aforementioned areas, we could state that PITCE first focus is a repetition of traditional industrial policies. There are 53 measures,

gathered in 11 programs. Out of the 53 measures defined, 23 are oriented to sectors selected by Government: pharmaceutical, software, capital goods and semiconductors. It is worth noticing that these are capital-intensive sectors, rather than labor force sectors. The use of incentive tools to industrial activity and exports, such as tax incentives and BNDES financing to above-mentioned sectors, converts this policy into a very selective one. Such selectiveness tends to be smoothed by the measures “horizontality” that, except for pharmaceutical sector is provided by these sectors to disseminating technological progress along the whole Brazilian economy.

It is also worth warning that, among the 53 measures, three contemplate tax benefits and four deal with credit mechanisms. The effort of gathering existing BNDES lines of credit, adjusting them to sectors with greater dynamism now, may be frustrated because these factual measures may fail in generating demands for those lines of credit. Here, it is important to consider aspirations of major trans-national corporations.

ii. PITCE second focus brings a future-oriented view, since it contains 20 measures for inducing technological innovation in Brazil. This second focus – typically left aside in Brazil, due to its spasmodic and fragmented nature – may be accepted as a significant development in terms of building modern policy in the field concerned herein. Concerns with technological innovation become relevant nowadays, since it seems clear that, in the future, Brazilian products will be led to compete with undifferentiated products, from countries that pay low wages and reduced taxes. In this sense, it is important to establish basic conditions for Brazilian enterprises to get prepared, by adding value to their products or services, providing them with better competitive conditions, both at domestic market and major global markets.

2. Another major challenge of PITCE is efficient coordination of Governmental entities involved, aiming at avoiding efforts dispersion and overlapping of existing initiatives. The establishment of the Brazilian Agency on Industrial Development, if granted due priority in terms of physical structure, financial and human resources, may support and contribute towards achieving this new policy.

3. PICTE should explicitly define coherent actions between industrial policy and Brazilian competitiveness, contemplating regional vocations. Therefore, it should encourage tourism sectors in the Northeast region, sustained use of environment in Amazon region, technological

diffusion in the Southeast, agriculture in Center-West and, in South, integration among Brazil and Mercosur country members.

4. Furthermore, we could observe strong obstacles to proper implementation of PITCE, both internally and externally. Existing barriers at internal level are related to increasing needs of reducing costs and increasing State revenues. External restrictions result from international agreements and negotiations, and are of juridical nature, since Brazil is subject to international trade agreements it has signed. The major trade agreement is with the World Trade Organization (WTO), which defines limitations for granting subsidies to exports of industrial goods, and forbids imposing some performance requirements to private investors or binding subsidies to compliance of said requirements.

5. PICTE should clearly define a production system to Brazil, like for example, great industries, clusters or productive chains. In this sense, considering serious problems of employment and income faced in Brazil, it should prefer industries that employ more people. If this alternative prevails, make-up industries would be the major beneficiaries, due to their capacity of generating large-scale employments.

The analyses of studies mentioned herein point out that an adequate industrial and technological policy should employ sectorial policies, public sector purchase policies, finances and incentives to production, investment and innovation in real economy. This statement is supported by several international experiences. Exchange and interest policies should be compatible with investments needs. Without that, even the sustainable development perspective is jeopardized. It is crucial to bind industrial policy to foreign sector, since Brazil should become competitive in exports. The policy of replacing imports and protecting emerging industry must be understood as exceptions, and no longer as guiders to industrial policy.

Based on these findings, one could claim that new industrial and technological policy proposed by the Government, despite the failures pointed out herein, represents an advance at institutional level and in relation to policies of incentive to innovation. Hence, one could conclude that production and technology developed in the Country are crucial to expand sales in domestic and foreign markets. Specifically for external sector, PITCE contribution is vital towards balancing values relationships at international commerce.

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