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**Eco-Innovation in Brazil
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Policy Framework

- Apart from recent initiatives on climate change issues. eco-innovation in itself is not a goal in official innovation and technology policies
- The Brazilian government is mainly committed to increase the country's competitiveness through innovation and technology efforts
- Nevertheless, concept of environmental conservation and clean technology is easily identified in the agenda.
- Economic reforms in the nineties towards export-oriented goals, privatization and trade and exchange rate liberalization prompted Brazilian firms to achieve substantial productivity gains

National Policy on Industry, Technology and Trade (PITCE)

2004 policy framework: the National Policy on Industry, Technology and Trade (PITCE) consisting of a set of 53 programs and instruments replacing a mix of programs and actions to deal with sectors lagging competitiveness

Main objective is to increase competitiveness leading to growth and job creation by improving its technological performance and presence in global markets

Regarding environmental issues, the PITCE explicitly gives emphasis to four areas:

- (i) creation of a center for biotechnology research in the Amazon region;
- (ii) development of norms for certified forestry;
- (iii) development of biodiesel; and
- (iv) innovation in environmentally sound technologies

Other Instruments

Together with PITCE other laws create economic incentives for R&D, such as:

- The Innovation Law that create fiscal advantages and subventions for the financing of partnerships between private sector agents and between them and universities and research centers, including governmental ones (Law 10973/2004)
- The Asset Law that create favorable fiscal incentives and depreciation schemes for R&D investments (Law 11196/2005)
- The Productive Development Policy launched in 2008 aiming to enhance Brazilian exports financing fixed capital and R&D, particularly in medium and small enterprises, offering annual credit incentives of about 40 billion dollars until 2010

Main instrument: Sectoral Funds representing almost 15% of total R&D federal expenditures mainly focused on strategic development areas but cover environment-related areas, such as, the Amazon region, water resources, biofuels and biotechnology

PITCE Results

Results are found already in the three first areas but not much on innovation on clean technologies, as follows:

- The Amazon Center for Biotechnology is already functioning
- Brazilian forestry certification has been recognized by international bodies
- Mixing of biodiesel with regular diesel has been accelerated

Institutional Arrangements

- Brazil has a solid and centralized system on Science&Technology under the Ministry of Science and Technology (MCT).
- Low public funding share in OECD terms: 37% federal funds, 15% state funds and 48% private.
- Expenditures to researchers and research centers capture 25% of federal public expenditures and almost 60% of state ones.
- Today about US\$ 22 billion or 1.5% GDP (less than 1% in Defense) much lower than OECD and emerging economies
- MCT acts and spends its budget mainly based on two major institutions (FINEP and CNPq, both created on the seventies) that finance a wide range of institutions and organizations.

Major Institutions

CNPq

- Funding priorities are on researchers and research centers through scholarship and grants based on academic merits and fostering institutional capacity

FINEP

- Funds directed to firms through financing schemes to foster technology adoption and innovation in strategic sectors and areas and also to enhance the natural resource basis of the country.
- Specific funding schemes for biofuels and other renewable energies, biodiversity, water resources, fishery, semi-arid areas and tropical forest

Both institutions manage funds on project basis to mitigate risks using fiscal and credit incentives with no power mechanisms

Other Institutions and Programs

- ❑ EMBRAPA: agricultural research institution promoting productivity in rural sector focusing also on environmental matters, such as, genetic development (major contributor to biomass productivity gains), organic practices, residues minimization and forest conservation.
- ❑ PROCEL: special federal program on energy conservation since 1986 with annual investments of US\$ 62 million and estimated saving of 28.5 billion of kw
- ❑ PROINFA: specific federal program on renewable energies financing the production of 3 299 MW (50% from wind, 30% from small hydro plants and 20% from biomass) or about 3% of national production to be delivered with long-term contracts valuing US\$ 6 billion.
- ❑ The Aeronautical Technical Center (CTA), the Large Scale Program on Biosphere and Atmosphere in the Amazon Forest (LBA) and Climate Change initiatives will be later discussed

General Indicators

Main source: Ministry of Science and Technology, Indicators
at

<http://www.mct.gov.br/index.php/content/view/740.html>

- CNPq effectiveness is high since its creation in the seventies
- Brazil's share in total articles published that are indexed to ISI, almost doubling every decade (for example to 2.63 in 2008 from 1.33 in 2000)
- FINEP's efforts have failed to generate impressive results and country's expenditures have not increased much in the last decades

General Indicators(2)

- Only from 2005 onwards that S&T expenditures to GDP ratio have increased in the last decade: to 1.13 in 2008 from 0.97 in 2005
- Indicators reflect expenditure pattern: US\$172000/researcher (mean OECD level) against per capita of US\$ 120 (much below OECD level)
- R&D expenditures related to environment are not properly measured by the R&D system since they are added to health ones: less than 9% of total in 2008 (much less than OECD level)

Studies on Firm's Behavior

Studies on R&D investments are based on data prior to 2005, particularly on PINCET (2003 and 2005 survey on industrial firms undertaken by the Brazilian Statistical Office, IBGE) so:

- Results are certainly affected by the economic recession of the period, and
- Impacts of the new regulatory framework cannot be fully accounted for in these surveys

PINTEC database

- ❖ Negri&Lemos (2008): firms that receiving official funds invested 54 to 104% more than others.

- ❖ Xavier, Allencar and Cunha (2008):
 - (i) Brazilian exports intensive in R&D grown have increased their market share to 0.6 in 2005 from to 0.3 in 1998 led by aviation and telecommunications; and
 - (ii) despite this increase Brazil's share is still a third of Mexico's and 20% of South Korea's.

PINTEC database (2)

PINTEC results indicate R&D consequences on environment performance have decreased from 2005 to 2003.

And they are much less relevant than other impacts, such as the 40-50% related to competitiveness and product differentiation

	2003	2005
Impacts	(%)	(%)
energy saving	17	5
water conservation	16	3
pollution control	45	21

Other databases

Ferraz and Seroa da Motta (2002) with a 1998 survey on São Paulo industrial firms (CAEP) and Seroa da Motta (2006) with a 1998 sample of Brazil's industrial firms analyze environmental investment decisions of Brazilian firm's (input substitution, waste management and clean processes, etc)

Both showed that size and international ownership are the major determinants and that gains with export sales have an equivalent weight that the domestic regulation.

Case 1

Aviation

- Partnership with MIT created in late forties the Aeronautical Technical Center (CTA) a research center on aeronautical issues addressing both civil and military purposes and in mid-fifties an institute for under-graduation and graduation studies (ITA)
- Both relied heavily on technology transfer at the beginning and were granted autonomous budget and reasonable management discretion.
- They are the main determinants for Brazil's advancement on aviation.

Case 2

The Amazon Forest

- The Large Scale Program on Biosphere and Atmosphere in the Amazon (LBA) analyses biosphere-atmosphere interaction in the Amazon Forest and its hydrological cycles and resulting social-economic consequences.
- From 1998 to 2007 the program was carried in a partnership between the National Institute of Space Research (INPE) and the National Research Institute of the Amazon (INPA) and several international research centers, particularly NASA. They together have already invested US\$ 100 million. Research results are worldwide recognized, particularly regarding climate change-related issues. Today funding comes from the MCT's budget.

Case 3

Climate Change

- The Clean Development Mechanism (CDM) motivated a variety of projects of energy conservation, biomass energy, methane recovery and waste management and the country's today capture 11% of the whole CDM market despite its clean energy matrix.
- More than 60% of the projects are sponsored domestically showing that market mechanisms create incentives for endogenous technology-based initiatives (source UNFCCC).
- Currently in discussion the bill on the National Fund for Climate Change (FNMC) that will finance adaptation and mitigation actions and addresses directly eco-innovation
- It is expected that Brazil will make commitment on GHG reduction schedule at COP 15 and create a carbon market. Such arrangement will be an opportunity to address eco-innovation directly and reckon on technology transfer with even stronger power incentives than CDM and third-party funding sources.

Main Conclusions

- Centralized R&D system counting on two major institutions (CNPq and FINEP) showed good results but not enough to match the ones reached by other emerging economies
- Aside MCT innovation also are sponsored by official agencies of agriculture, forestry, energy and aviation
- R&D investments have increased in the last years showing that the positive effects of 2004 changes on policy goals (PITCE) that increased targeting on priority areas
- Brazil's R&D expenditures and GDP ratio increased recently to 1.13 but still lower in international terms
- Federal public budget and private expenditures to R&D constant even in recession periods and grown steadily since 2005 with the economic recovery and not slowed down in 2008.
- State budgets, perhaps due to their stronger budget constraints, instead, have a cycle movement.

Main Conclusions (2)

- Reliance on cost plus instruments rather than in power incentives (fixed prices and prizes)
- Still incipient use of innovative financing instruments (e.g. bank loans, venture capital)
- R&D policies mainly committed to competitiveness but environmental conservation and clean technology are easily identified in the agenda
- Studies show nature of the firms and international trade as relevant to motivate firms in Brazil to invest in eco-innovation with a decreasing trend in the period 2000-2005, perhaps due to recession (recent data are not available to update these findings)
- Management of tropical forest and renewable energies are successful cases of eco-innovation in Brazil based on sound budgeting, good targeting and technology transfer
- CDM made also great contribution to these areas and future Brazil's commitment on the Climate Convention if based on market mechanisms may be an unique opportunity to address directly eco-innovation with power incentives.

References

- Ferraz, C. & Seroa da Motta, R. (2002) Regulação, mercado ou pressão social? Os determinantes do investimento ambiental na indústria, *Texto para Discussão 863*, IPEA
- Negri, J. A. & Lemos, M. B. (2009) Avaliação das Políticas de Incentivo à P&D e Inovação Tecnológica no Brasil, *Nota Técnica*, IPEA
- Seroa da Motta, R. (2006) Analysing the environmental performance of the Brazilian industrial sector, *Ecological Economics* 57, 269-281
- Xavier, C. L.; Avellar, A. P. Macedo and Cunha, S. F. (2008) Desempenho da indústria em P&D: comparação entre o Brasil e países selecionados de 1994-2005, *Revista Brasileira de Inovação* 7 (2), 409-444