Industrial and innovation policies in Brazil: recent paths and main challenges

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Industrial and Innovation Policies in Brazil: recent paths and main challenges

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Cambridge, Babbage Seminar, 13 December 2012
Agenda

1) The context
   ✓ Brazil in a nutshell
   ✓ History matters...

2) PITCE – Política Industrial, Tecnológica e de Comércio Exterior, 2003

3) PDP – Plano de Desenvolvimento Produtivo, 2008

4) PBM – Plano Brasil Maior, 2011

5) Main challenges for the future
Facts and figures

- Borders with 10 countries
- 50% of South America’s surface
  More than 8 million sq. km
- 50% of the South American Population
  190 million inhabitants
- 55% of South American GDP
  US$ 1.9 billion
  8th world’s largest economy

* VENEZUELA:
  full MERCOSUR member, in process of adhesion
There is a Brazil that many people know

Amazon forest  Soccer  Carnival  Coffee

It keeps being successful, but there is still more to know

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The Brazil that you must know

Innovation, technology, competitiveness and productivity

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MIDDLE CLASS GROWTH
% of total population

2003: 38%
2006: 46%
2009: 50%

Source: FGV and IBGE
BRAZILIAN CONSUMPTION...

Computers: 5th World Market

Source: IDE
BRAZILIAN CONSUMPTION...

Cosmetics: 3rd World Market

Source: INSTITUTO EUROMONITOR
BRAZILIAN CONSUMPTION...

Mobile Phones:
5th World Market

Source: RC CONSULTORES
## BRAZILIAN GROWTH

### 2018 GDP

1. USA  
2. China  
3. Japan  
4. India  
5. Germany  
6. **BRA**  
7. Russia  
8. UK  
9. France

### 2026 GDP

1. China  
2. USA  
3. Japan  
4. India  
5. **BRA**  
6. Germany  
7. Russia  
8. UK  
9. France

Source: Economist Intelligence Unit (USA)
121,000 NEW GRADUATES A YEAR IN SCIENCE & TECHNOLOGY AREA

source: MCT
161 TECH TRANSFER OFFICES IMPLEMENTED SO FAR...

source: ANPROTEC
400 technical incubators involving 6,000 innovative businesses. 
Source: ANPROTEC
Brazil – energy matrix

Renewable 46.4%

Other sources 3%

Non Renewable 53.6%

Oil 37%

Ethanol 16%

Firewood 13%

Hydropower 15%

Uranium 1%

Coal 6%

Gas 9%
Brazilian companies go global

- **AMBEV/INBEVI**: The world's largest brewer
- **JBS-FRIBOI**: 1st company in animal protein production
- **VALE**: 2nd company in mining production in the world
- **EMBRAER**: 3rd largest aircraft company in the world
- **MARCOPOLO**: 7% global production of bus bodies and parts
- **TOTVS**: 8th world biggest business software company
- **GERDAU**: 8th company in steel production in the world
- **PETROBRAS**: 8th largest company in the world
2- Artigos científicos do Brasil indexados no ISI

Artigos Publicados Indexados (ISI) (Brasil)

2002: 12.681
2005: 17.155 (+35%)
Brazilian scientific articles indexed in the Institute for Scientific Information (ISI)
S&T in Brazil: a partner for innovative tropical agriculture

- Natural resources; Genetic resources; Cereals; Vegetables; Animal breeding;
- Raw materials; Agroforestry / forestry production;
- Family farming; Post-harvest/Agribusiness;
- Environmental protection; Farming automation;
- Rural and regional development; Fruits

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After early failures (since 1909), research (in biological nitrogen fixation, soil, ...) made soy one of the most important crops (planted area, production and exports) in Brazil.

Soy contributes around 6% of the Brazilian gross national product (GNP).

Around 1 million people are employed in the soy sector in Brazil.
Brazil is the world leader in developing bio-fuels and their use in automobiles

“Brazil represents a great success story, as the country’s National Alcohol Program dates back to 1975, when the Brazilian government first introduced the policy as a measure to reduce its dependence on petrol imports and enable the country to produce renewable and environmentally friendly energy.

From 1985 to 1990, around 90% of all automobiles manufactured in Brazil were powered by ethanol.

To date, more than 6 million ethanol and flexible fuel vehicles have been manufactured in Brazil”

Ford Motor Company, USA, May 10, 2005
(http://media.ford.com/print_doc.cfm?article_id=20825)
Example of pre-competitive cooperation between Universities and Companies, involves 13 enterprises, 7 universities and 3 research centers from National Research Institute for Agriculture (Embrapa): a suite of genomic, field and information resources to discover, sequence, map, validate and understand the underlying variation of genes and genomic regions of economic importance in Eucalyptus with a focus on wood and disease resistance.
Petrobras: world's top producer of oil in deep waters

1970
Piraúna 293 m

1980
1983
Piraúna 293 m

1990
1992
Marlim 781 m

PRÓXIMA DÉCADA

2001
Roncador 1.886

Tupi – up to 7.000 m

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Cooperation Petrobras / Universities in Brazil

<table>
<thead>
<tr>
<th>Region</th>
<th>State</th>
<th>Research Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>Amazonas</td>
<td>01</td>
</tr>
<tr>
<td>Northeast</td>
<td>Bahia</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>Ceará</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Paraíba</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>Sergipe</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>Pernambuco</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Rio Grande do Norte</td>
<td>04</td>
</tr>
<tr>
<td>Centre West</td>
<td>Distrito Federal</td>
<td>02</td>
</tr>
<tr>
<td>Southeast</td>
<td>São Paulo</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Minas Gerais</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>Espírito Santo</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Rio de Janeiro</td>
<td>58</td>
</tr>
<tr>
<td>South</td>
<td>Paraná</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Santa Catarina</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Rio Grande do Sul</td>
<td>13</td>
</tr>
</tbody>
</table>

Total Research Groups 129

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Computational Fluid Dynamics (CFD)

• 8 Institutions: Embraer, CTA, USP – Poli & São Carlos, UNICAMP, UFSC, UFU, PUC-Rio
• 3 enterprises: ESSS, CITS & DELTACORE.
• 100 specialists.

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Sustainable use of the marine environment

United Nations Convention of the Law of the Sea (UNCLOS) granted the right to exclusive use of marine resources within 200 nm economic zone.

REVIZEE program:
- Inventory of living resources and environmental features of ZEE;
- Determination of their biomass;
- Establishment of sustainable capture potentials;
- People employment and means.

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Living Resources in the Exclusive Economic Zone

Research Network:
10 Ministries & Agencies
42 Research Institutions
> 100 research vessels/boats

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nanotech applications
optical fiber
innovative networks (clusters)
automation
new materials
cheese rolls

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Populational Growth

2011: 192,379,287

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GDP

Population 2011:
192,379,287
GDP – US$ dollars

2011: US$ 2.48 trillions
R&D/GDP

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A bit of history

The building of the Brazilian Production System

- Late industrialisation
  - Industries were forbidden until April 1, 1808
    - Only sugar mills, for export

- Most of the main value chains / networks governed by TNCs
  - 5 out of 10 / 8 out of 20 largest companies are TNCs, the others were created by the State
    - Exceptions: Braskem, Ipiranga

- Productive chains / networks based on electromechanicals
  - Gaps in (micro)electronics, fine chemicals
**A bit of history**

**The building of the Brazilian Production System**

**Origin of Capital – 10 largest companies by sector**

<table>
<thead>
<tr>
<th>SETOR</th>
<th>ESTRANGEIRO</th>
<th>BRASILEIRO</th>
<th>OBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobilístico</td>
<td>10</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Bens de Capital</td>
<td>4</td>
<td>6</td>
<td>Não há brasileiras integradoras</td>
</tr>
<tr>
<td>Bens de Consumo</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Eletroeletrônica</td>
<td>9</td>
<td>1</td>
<td>Brasileira é montadora na Zona franca de Manaus, operando com tecnologia e produtos com marca japonesa</td>
</tr>
<tr>
<td>Farmacêutica</td>
<td>7</td>
<td>3</td>
<td>Apenas 1 empresa brasileira com molécula própria (MeToo*, não molécula radicalmente inovadora)</td>
</tr>
<tr>
<td>Indústria Digital</td>
<td>9</td>
<td>1</td>
<td>A brasileira é o Serpro, de serviços para o Estado Federal</td>
</tr>
<tr>
<td>Papel/Celulose</td>
<td>5</td>
<td>5</td>
<td>Setor baseado em recursos naturais</td>
</tr>
<tr>
<td>Química/Petroquímica</td>
<td>7</td>
<td>3</td>
<td>Brasileiras em petroquímica e fertilizantes (commodities)</td>
</tr>
<tr>
<td>Telecomunicações</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Têxtil</td>
<td>10</td>
<td>0</td>
<td>Houve troca de comando em pelo menos 1 empresa após o levantamento</td>
</tr>
<tr>
<td>Varejo</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
R&D, engineering design & manufacturing

Many researches have demonstrated the crucial role of location

Location of R&D and product engineering activities have a close link with location of physical production

The concept of Design Headquarters (Salerno et al, 2009)

Controlling engineering specifications

Efforts for innovation → internal R&D expenditures / income

Brazilian Cos. have efforts 81% higher than foreigners Cos. (probabilistic model by Araújo, 2005)
Industrial polices since 1950s (1)

- Getulio Vargas (1940s)
  - State-owned heavy industries (steel, basic chemicals, oil - Petrobras)

- Juscelino (JK) government – “Plano de Metas” 1950s
  - “50 years in 5”, but no exigency of design activities
  - Attraction of foreign industries to produce for the internal market
    - Ex.: Auto assemblers for foreigners; the policy killed the Brazilian industry at the time
  - Import substitution: closed market (for TNCs...)

- The hegemony of foreign capital in industry may explains the differences of the Brazilian import substitution policy from those of Japan and Korea
Industrial polices since 1950s (2)

- Military dictatorship (1960s -70s)
  - Nationalistic view of production, not of engineering and product design
  - Heavy investments to fulfil gaps in industrial chains (petrochemicals, machinery etc.), external debt
  - Mid70s
    - Brazil as the fast growing economy of XX century
    - Imports accounted for only 6% of its GDP

- Oil crisis / debt crisis and political fights against dictatorship have dismantled the model
  - Crisis - the “lost decade” (80s) with high inflation and low growth
FHC: 1995 – 2002

FHC: “The best industrial policy is not to have one”, by Pedro Malan, Ministry of Economy
- Focus on stabilizing the economy (Plano Real)
- Fixed parity real – US$ dollar, industrial regression
- Privatizations, financed by BNDS
- Some programs based on “total quality”
- Automotive regime to cope with investments being deviated to Argentina
- New funds aiming at regaining historical levels of public investments in scientific research

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Lula’s Government: PITCE 2003

- First explicit industrial policy in many decades
- **Focus 1: technology and innovation**
  - Innovation law
  - Tax incentive law, inducing R&D employment
- **Focus 2: exports**
  - Credit, Apex, procedures simplification, monitoring
- **Focus 3: institutional**
  - ABDI – Brazilian Agency for Industrial Development
  - CNDI – The National Council of Industrial Development
  - BNDES: back to the finance of new facilities
The Building of PITCE 2003

Mandate
- Building the mandate
- Consolidating it
  - Research, studies, data and analysis for Ministers and public
  - Reforming it (“MRO”)

Process
- CPE
- GE-PITCE

Institutional building
- New laws
- ABDI – Brazilian Agency for Industrial Development
- CNDI – The National Council of Industrial Development

Coordination
- The formal document has helped a lot
- ABDI

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Focus: to sustain growth

A consolidation of a myriad of instruments measures etc., focusing on the increase of the investments
- Official presentation had 240 slides...
- To increase offer
- To preserve balance of payments
- To increase innovation
- To strength production chains

In practice, the main measures were linked to the strengthening of medium-large Brazilian groups
- They suffered a lot during the debt crisis
- They suffered a lot during Plano Real (R$1 = US$1)

2008 crisis slowed down PDP
Síntese da Política

DAR SUSTENTABILIDADE AO ATUAL CICLO DE EXPANSÃO

Objetivo Central

Desafios

- Ampliar capacidade de oferta
- Preservar robustez do Balanço de Pagamentos
- Elevar capacidade de inovação
- Fortalecer MPES

Metas

Macrometas 2010

Metas por programas específicos

Políticas em 3 níveis

Ações Sistêmicas: focadas em fatores geradores de externalidades positivas para o conjunto da estrutura produtiva

Programas Estruturantes para sistemas produtivos: orientados por objetivos estratégicos tendo por referência a diversidade da estrutura produtiva doméstica

Destaques Estratégicos: temas de política pública escolhidos deliberadamente em razão da sua importância para o desenvolvimento produtivo do País no longo prazo
Dilmas’s Government: PBM 2011

Plano Brasil Maior

Focus: innovation & tech development.

Priorities

- To build and strengthen critical competencies
- To enhance productivity and technological density within value chains
- To expand the domestic and external markets of Brazilian Cos
- To ensure socially domestic and environmentally sustainable growth

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Plano Brasil Maior: three main dimensions

Structural Dimension: sectoral guidelines
- Strengthening Production Chains
- New Technological and Business Competencies
- Energy Supply Chain
- Diversification of Exports and Internationalization
- Competence in the Natural Knowledge Economy

Systemic Dimension: cross-sectional topics
- Foreign Trade
- Investment
- Innovation
- Professional Development and Qualification
- Sustainable Production
- Competitiveness of Small Businesses
- Special Regional Development Actions
- Consumer Well-Being
- Labor relations and working conditions

Sectorial Organization
- Mechanics, Electro-electronics and Health Systems
- Scale Intensive Systems
- Labor Intensive Systems
- Agribusiness Systems
- Trade, Logistics and Services
<table>
<thead>
<tr>
<th>Sustainable Development</th>
<th>Innovate and invest to increase competitiveness, support growth and improve the quality of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Expansion</td>
<td>Diversify exports and promote the internationalization of Brazilian companies</td>
</tr>
<tr>
<td></td>
<td>Increase Brazilian share in energy technology, goods and services markets</td>
</tr>
<tr>
<td></td>
<td>Expand access to goods and services by the population</td>
</tr>
<tr>
<td>Productive and</td>
<td>Increase national value added</td>
</tr>
<tr>
<td>Technological</td>
<td>Increase participation of knowledge intensive sectors in GDP</td>
</tr>
<tr>
<td>Enhancement of Value</td>
<td>Strengthen micro, small and medium-sized companies</td>
</tr>
<tr>
<td>Chains</td>
<td>Produce in a cleaner way</td>
</tr>
<tr>
<td>Building and</td>
<td>Increase fixed investment</td>
</tr>
<tr>
<td>strengthening</td>
<td>Increase corporate spending on R&amp;D</td>
</tr>
<tr>
<td>Critical Competencies</td>
<td>Increase HR qualification</td>
</tr>
</tbody>
</table>
What have happened after all these plans?

- Some Brazilian companies are stronger now
- More Brazilian multinationals
  - Important due to intra-company external trade
- Inequality reduction and income increase have created a whole new market (~30 million people)
  - Companies have focused on the Brazilian market
  - Foreign companies too → imports were rising due to lack of competitiveness
- Education improvement is finally highlighted

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The relationship engineering – industrial policies
my own experience

- Most of the daily life of public agencies are fulfilled with economic issues
- A generic approach is a necessary but not sufficient condition for a successful history
- It is easier to discuss productive issues with entrepreneurs if one knows the logics of production systems
  - Implicit association engineers – production – product
  - Engineering is associated with efficiency, innovation, product development, value creation
Before the end...
What are we doing at the University?

Innovation Management Lab

- Focus: innovation systems for companies
- Unity of actuation: companies, firms
- Disciplines/courses on innovation management: under graduated, post-graduation, extension (modular)

Projects

- Models for organization and management of innovation in companies
- Innovation programs
- Initial planning for start ups

The Observatory of Innovation and Competitiveness

- Focus: public policies on innovation
- Interdisciplinarity: engineers, sociologists, economists, lawyers, doctors
- Periodic seminars transmitted live on the web

Projects:

- Modelling of technological demonstrators platforms;
- Scorecard of countries’ competitiveness (with CoC-USA and GFCC)
- EngenhariaData – website on informations and analysis on engineering in Brazil

Mario Sergio Salerno - University of São Paulo, Brazil
Criado em 2007 - iniciativa dos Profs. Glauco Arbix (FFLCH-USP) e Mario Sergio Salerno (POLI-USP)

Articulado com diversas instituições externas

Sediado no Instituto de Estudos Avançados da Universidade de São Paulo (IEA-USP)

Foco
- Inovação, Competitividade e Desenvolvimento na sociedade do conhecimento

Objetivos
- Geração de conhecimento;
- Discussão de políticas públicas e de estratégias empresariais pró-inovação
- Difusão
Projeto NAP/OIC

Lançado publicamente dia 9 de maio de 2011

**DataEngenharia:**
*Sistema de indicadores de Engenharia*

Construção de um amplo e consistente sistema de indicadores que permita avaliar sistematicamente a situação das engenharias no Brasil, viabilizando análises regionais, setoriais e comparações internacionais.

**Sistema de indicadores de Inovação**

Construção de sistema de indicadores que possibilite recortes temáticos (inovação não tecnológica, patentes, educação, etc.) e regionais, para permitir discussões de desenvolvimento e de políticas de inovação (nacionais, regionais, setoriais,...)

Observatório da Inovação e Competitividade - IEA/USP
Industrial and Innovation Policies in Brazil: recent paths and main challenges

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Cambridge, Babbage Seminar, 13 December 2012
THANK YOU!

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Cambridge, Babbage Seminar, 13 December 2012
IPEA Research

• Based on national large databases
  – PIA (Annual Industrial Research), PINTEC (CIS3 like) / IBGE
  – External trade / SECEX-MDIC
  – RAIS (employment, wages, qualification, education & turn over) / MTE
  – Foreign capital census (BACEN)
  – Federal acquisitions database (MPOG)

• It concerns
  – 72,000 industrial companies
  – 5,000,000 workers
  – 90% of value added
  – 1996 – 2002

• Participation of main Brazilian academics + IPEA team
  – UFMG, UFRJ, UNb UNICAMP, USP
    • economics, engineering, regional development, sociology, statistics
Classification by Competitive Strategy and Performance

A. Firms that have product differentiation and have launched a new product to the market
   - new product: PINTEC (similar to CIS3)
   - differentiation: 30% extra-price in exports regarding the average to the same product (Mercosul classification) weighted by market share
     - classification is based on product specification (tighter than sector)

B. Firms specialized in standardised products (commodities)
   - exporters not included in A or not exporters but with equal or higher productivity than B exporters

C. Firms without product differentiation and with lower productivity
   - not classified in A or B
Themes Analysed
(by category of firm)

• General overview of companies' strategy
• Firms internationalisation
• Work force and wages
• Technological spill over MNCs-nationals
• Regional issues
  – spatial distribution of firms
  – technology and innovation
• Determinants of firms’ growth
• Sectorial analysis
• Innovation and technology in the agro-industry
• General overview of food industry
• “C” companies profile and competitive patterns
• Cooperation between firms and with other institutions
• Technological content of exports
• Cost and income structure
• Industrial concentration
• Governmental acquisitions
• Productivity
• Origin of capital
• International comparisons (with CIS3)
Some Initial Results
General overview (I)

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Brazilian owned</th>
<th>Foreign capital</th>
<th>Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Innovate and differentiate product</td>
<td>1.199</td>
<td>742</td>
<td>394</td>
<td>63</td>
</tr>
<tr>
<td>B) Specialised in commodities</td>
<td>15.311</td>
<td>13.876</td>
<td>1.243</td>
<td>192</td>
</tr>
<tr>
<td>C) No differentiation / lower productivity</td>
<td>55.486</td>
<td>55.161</td>
<td>214</td>
<td>111</td>
</tr>
<tr>
<td>Total</td>
<td>71.996</td>
<td>69.779</td>
<td>1.851</td>
<td>366</td>
</tr>
</tbody>
</table>
Some Initial Results
Firms by competitive strategy and capital origin (I)

• Cat A: only 1% of firms
  – 39% of all A firms are foreign / mix capital

• 79% of MNCs are not A
  – Technological effort concentrated in headquarters
  – Brazilian subsidiaries established for the internal market
  – Established to explore natural resources/ low cost workforce

• Technological spill over from MNCs to Nationals
  – MNCs have a positive impact on the development of Brazilian companies innovative effort
Some Initial Results
Is innovation a good policy for Brazil?

- Technological innovation is one of the export determinants
  - Firms realizing technological innovation have 16% higher probability to be an exporter comparing to non innovative firms

- Wages
  - Average A= R$1.255,00 / B=R$749,00 / C= R$431,00
    - But compares different conditions (income, sector, external trade etc)
  - Probabilistic model controlling 200 variables (income, sector, exports, qualification, school time, employment time, turn over, capital origin etc.)
    - A firms pay wages **23% higher** than C and 11% higher than B
    - Wage premium paid by firms that differentiate and innovate product
    - So, more A companies tend to have positive effects on general wages

- Innovative effort is greater in Brazilian-owned firms
  - The result is against the common sense largely diffused in Brazil
  - Probabilistic model controlling variables such as income, personnel, sector etc
    - Brazilian-owned (P&D internal expenditures / income) is **80,8% greater** than the MNCs ones
Some Initial Results
General overview (II)

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Workers</th>
<th>Income R$ 1.000,00</th>
<th>Value added R$ 1.000,00</th>
<th>Scale efficiency (Indicator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Innovate and differentiate product</td>
<td>545,9</td>
<td>135,5</td>
<td>51,1</td>
<td>0,77</td>
</tr>
<tr>
<td>B) Specialised in commodities</td>
<td>158,1</td>
<td>25,7</td>
<td>10,6</td>
<td>0,70</td>
</tr>
<tr>
<td>C) No differentiation / lower productivity</td>
<td>34,2</td>
<td>1,3</td>
<td>0,45</td>
<td>0,48</td>
</tr>
</tbody>
</table>
## Some Initial Results

General overview - competitiveness indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Productivity (R$1,000/worker)</th>
<th>Technical efficiency</th>
<th>Market leadership</th>
<th>P&amp;D expend. (% income)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Innovate and differentiate product</td>
<td>74,1</td>
<td>0,30</td>
<td>0,02</td>
<td>3,06</td>
</tr>
<tr>
<td>B) Specialised in commodities</td>
<td>44,3</td>
<td>0,18</td>
<td>0,004</td>
<td>0,99</td>
</tr>
<tr>
<td>C) No differentiation / lower productivity</td>
<td>10,0</td>
<td>0,11</td>
<td>0,00028</td>
<td>0,39</td>
</tr>
</tbody>
</table>

Value added by worker

De Negri’s indicator

(Firm income) / (CNAE sector income)

P&D expenditures / income

Mario Sergio Salerno - IPEA
Some Initial Results

External Trade

- Firms realizing technological innovation have probability 16% higher to be exporters than non innovative firms
- Product innovation and product differentiation (extra-price) are highly correlated
- Product innovation has a strong association with medium tech intensity exports
- Process innovation is associated to high tech intensity exports
- Imports are very high for high tech exporters (trade imbalance)
- MNCs have higher propensity to export medium tech intensity products
Some Initial Results

Characteristics of Innovation Process

• Only 4.1% of the firms introduced a new product for the market (2.8% new process for the market)

• A firms
  – 71% are also process innovators
    • 35.6% introduced process innovation for the market
  – higher % of own process development
  – less dependent of other companies

• B&C pattern: innovation by technological diffusion
  – 26% of B firms introduced product innovation
    36% of B firms introduced process innovation
  – 13% of C firms introduced product innovation
    21% of C firms introduces process innovation

• 23% of A firms declared innovation as highly important to fit external market rules and standards / 13% of B firms
Some Initial Results
Finance Support for Innovation Process

• P&D expenditures: own resources is twice as important as public resources (finance, grants etc.)
  – 10% more of own $ → 2,8% growth in the probability to accomplish a technological innovation
  – 10% more of public resources → 1,4%

• But this is a picture of the current situation
  – There is public funding for process innovation (mainly for machinery acquisition)
  – There is virtually no public funding/resources for product innovation
  – So, there is a necessity to introduce programs to
Political Implications

• Innovation is a good strategy for Brazilian industry
• Brazilian industry has enough scale to dispute but it should be improved
• The need to improve Brazilian firms to A category
• The need to improve MNCs technological activities locally
• New institutionalism to improve firms – universities & public research institutes cooperation
• Instruments to reduce innovation costs and risks
  – According to different types of firms
• Revision support laws
Is *Plano Brasil Maior* working?
Reduction of factors’ costs & economy wide costs

- Relief of the tax burden over the payroll
  - Welfare tax over the payroll (20%) was zeroed for different sectors
- Improved set of BNDES’ long term funding mechanisms
- Taxes on capital goods were lowered
- The interest rate has been steadily reduced
- Tax regimes for businesses’ incorporation were enlarged – Simples & MEI
- Measures to lower energy costs are being designed
Innovation and Technological Development

- Brazil’s Innovation Agency (Finep) expenditure grew 24 x since 2002
- Finep’s disbursement: ~R$ 6.5 bi in 2011 → + R$9 bin in 2012
- Science and Technology Development Fund grew +3 x since 2004 (R$ 1.96 bi)
- New and/or improved BNDES financial lines to support innovation
- Innovation Law (Bayh-Dole Act like) – 2005
  - Amended in 2011 to support advanced procurement for innovation
- New legal mandate for the Brazilian Institute for Metrology, Quality and Technology
- Science Without Borders – 100,000 STEM students to be sent abroad
- Brazilian Industrial Innovation Corporation (Embrapi) set up in 2011 – 6 institutes
- Public procurement for innovation – preference margins mechanism set in 2012
- 9 PPPs in the health industry complex
- Number of companies using R&D incentives grew + 5x since 2006
Efficiency and Productivity

- National vocational and technical training program - Pronatec
- US$ 2 bi for SENAI’s new training centers
  - Funded by BNDES and the National Confederation of Industry
- New tax regimes for a selected set of industrial systems
  - Automotive, PADIS, REPNBL, RETID, PATVD, Repporto, Repetro etc.
- Focus on supply chain development
The research

- We set a research to capture which kinds of innovation processes are relevant to configure managerial actions
  - Methodology similar to Clark & Wheelwright’s, Clark & Fujimoto’s, Cooper’s, Hansen & Birkinshaw’s etc.
  - Unity of research: innovation projects, not companies
    - Different processes run in a same company
  - 131 innovation processes analyzed in 71 companies
    - 68 Cos in Brazil, 2 in The Netherlands, 1 in France
    - All sectors mixed, including some services
      - Hospitals, Engineering Service Providers, R&D services
  - Objective: to map the real process followed by each project and the contingencies that have shaped it
  - Financed by Fapesp (Foundation for Research Support of the São Paulo State, Brazil) and CNPq (The National Council of Research)
Concept, R&D, NPD

Traditional graphical representation of innovation process show a single flow
But ... it is useful to consider up to three flows (or subsystems or... integrated with other corporate functions like marketing, finance etc.)

1. Concept flow: a process to define product concepts
   - led hegemonically by marketing (Natura: “well being”)

2. R&D flow: a process to generate technologies, tech platforms
   - Led by R&D departments or a dedicated team performing similar tasks

3. NPD flow
   - Uses inputs from the other two, or from other sources

Mario Sergio Salerno - University of São Paulo, Brazil
Since 2004 investment growth rates have been higher than GDP growth, except for 2009.

GDP and Investment – GFCF (% YoY)

* Estimated data
Source: IBGE and Ministry of Finance
Job Creation (millions)

* Ministry of Finance forecast
Source: RAIS/Ministry of Labour
Elaboration: Ministry of Finance
International reserves have been rising steadily

Source: Central Bank of Brazil
Credit supply in a steady growth

Credit (% of GDP)

Source: Central Bank of Brazil
Energy costs have been increasing

Energy Price - Industry
(average electricity price - R$ by MWh)

Source: Ipeadata
The exchange rate is the highest compared to China, Germany and US

Real Effective Exchange Rate* (index number, 2005=100)

* Deflator: Consumer Price Index from each country. A rise means exchange appreciation and a fall means depreciation
Source: BIS
Elaboration: Ministry of Finance