

PRODUCTION, TECHNOLOGY AND INNOVATION STUDIES

Fernanda De Negri

Bruno Araújo

INSTITUTE FOR APPLIED ECONOMIC RESEARCH (IPEA)

Objectives

- To analyze innovation in Brazil compared to other countries
- To establish a network of researchers on innovation in Brazil: “Innovation observatory”
- To evaluate public policy on innovation
- To estimate the impacts of technological innovation in Brazilian economy

Products

- IPEA and invited researchers have published 6 Books since 2005.
 - ✓ Innovation, technological patterns and performance of Brazilian industrial firms
 - ✓ Technology, exports and employment
 - ✓ Structure and dynamics of service sector
 - ✓ Brazilian firms and international trade
 - ✓ Technological innovation in Brazilian and Argentinean firms
 - ✓ Innovation policies in Brazil
- Other 4 books to be published
 - ✓ Innovation and Brazilian entrepreneurs
 - ✓ Technological innovation in Brazilian and Mexican firms
 - ✓ The dynamics of sectoral innovation
 - ✓ Investment and financing
- Integration of several databases (microdata) of Brazilian government and development of analytical methodologies (one of the most important assets of IPEA).
- More than a hundred researches involved in our research network

Data base

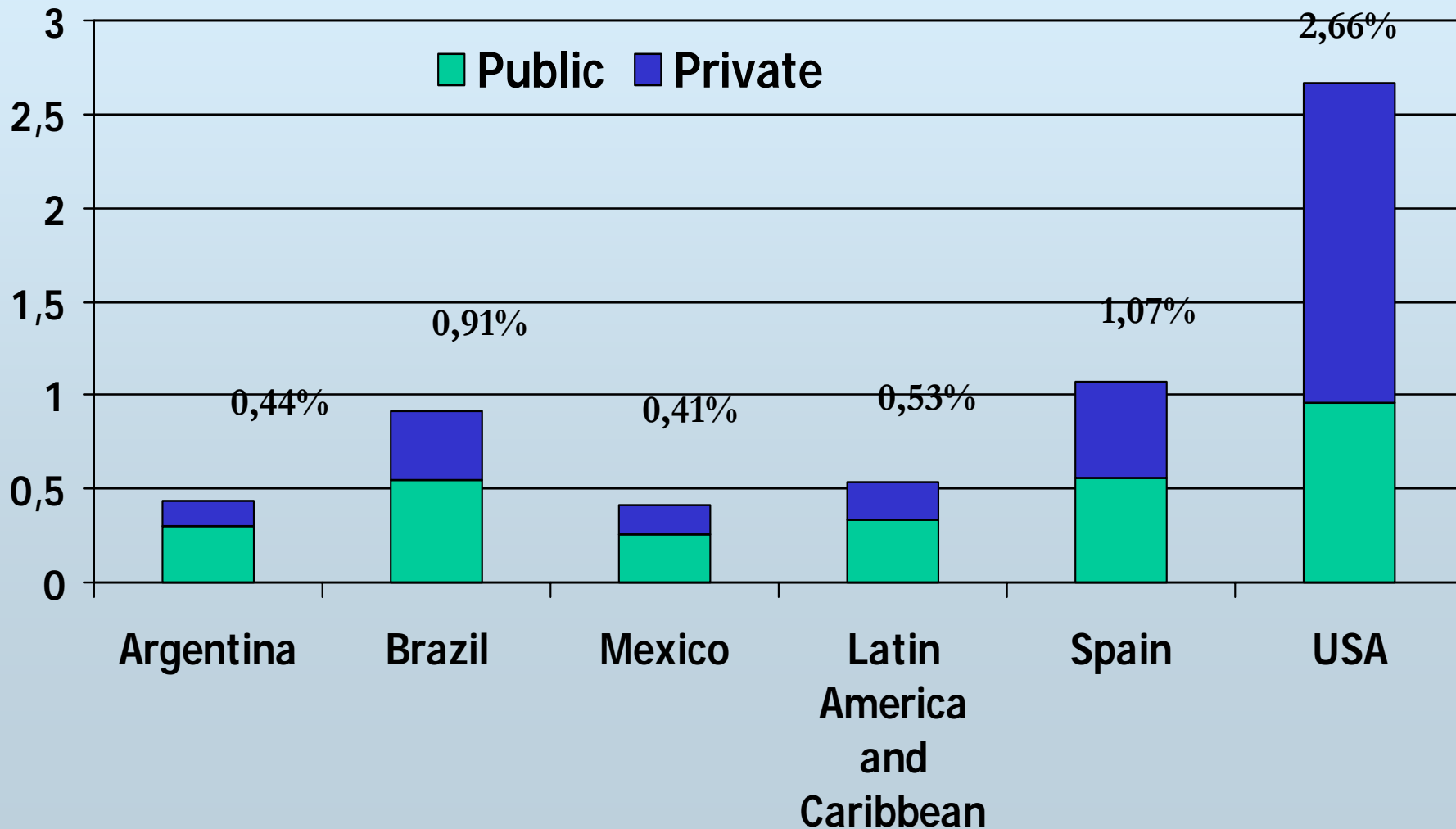
- Building up an integrated database
 - ✓ Original methodology from Institute for Applied Economic Research (IPEA)
 - ✓ The main dataset is the Brazilian Innovation Survey (PINTEC). Matched with 11 others data set (international trade, individual workers, patents, government procurement, defense, transnational corporation, Brazilian foreign direct investment, financing ...)
 - ✓ The database is a sample of approximately 80,000 industrial firms with over 10 employees. These firms are responsible for approximately 95 % of the value added in the Brazilian industry.

Innovation in Brazil: international comparisons

Synthesis of the results

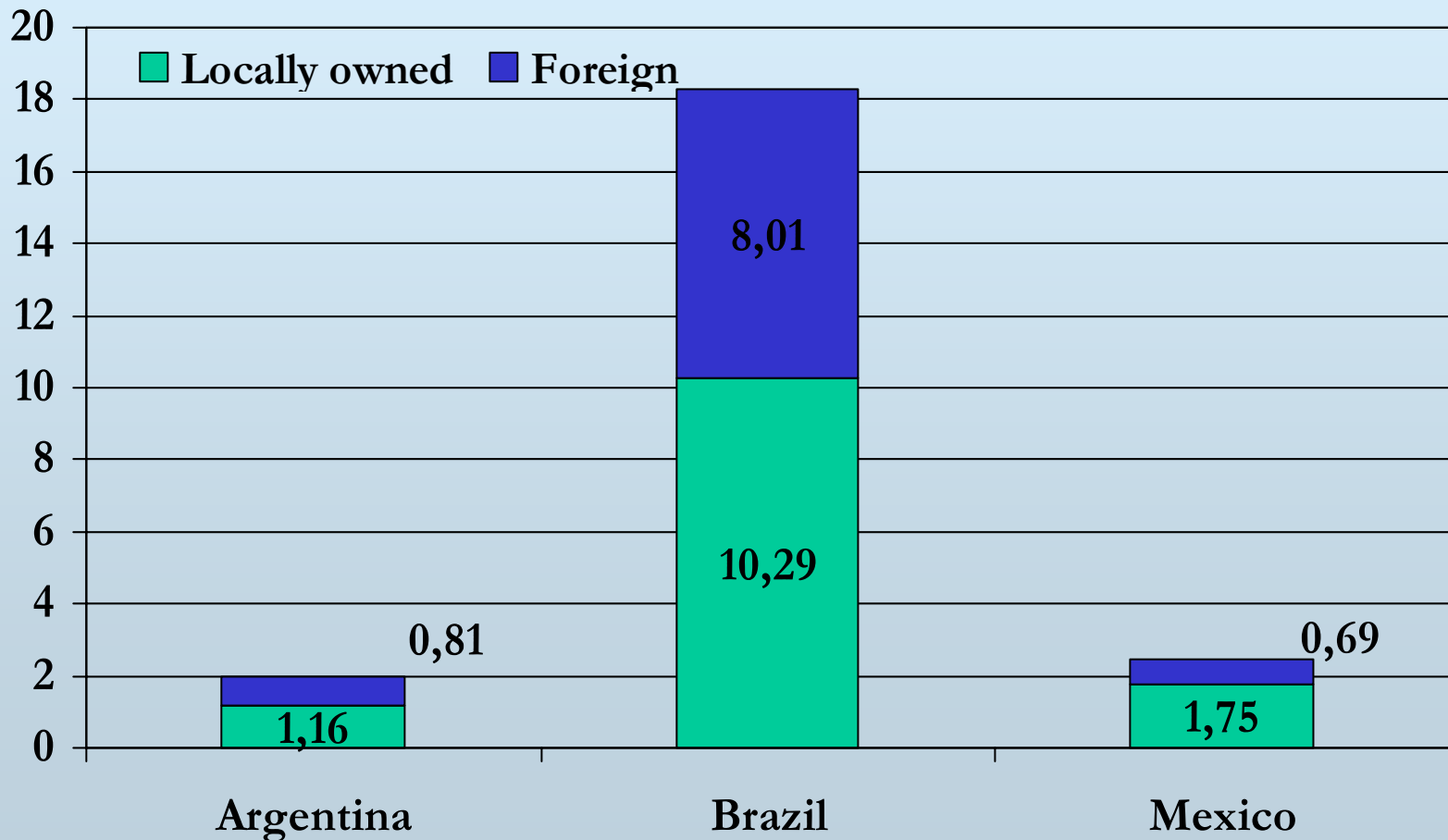
R&D expenditures in selected countries

Share of GDP (%)



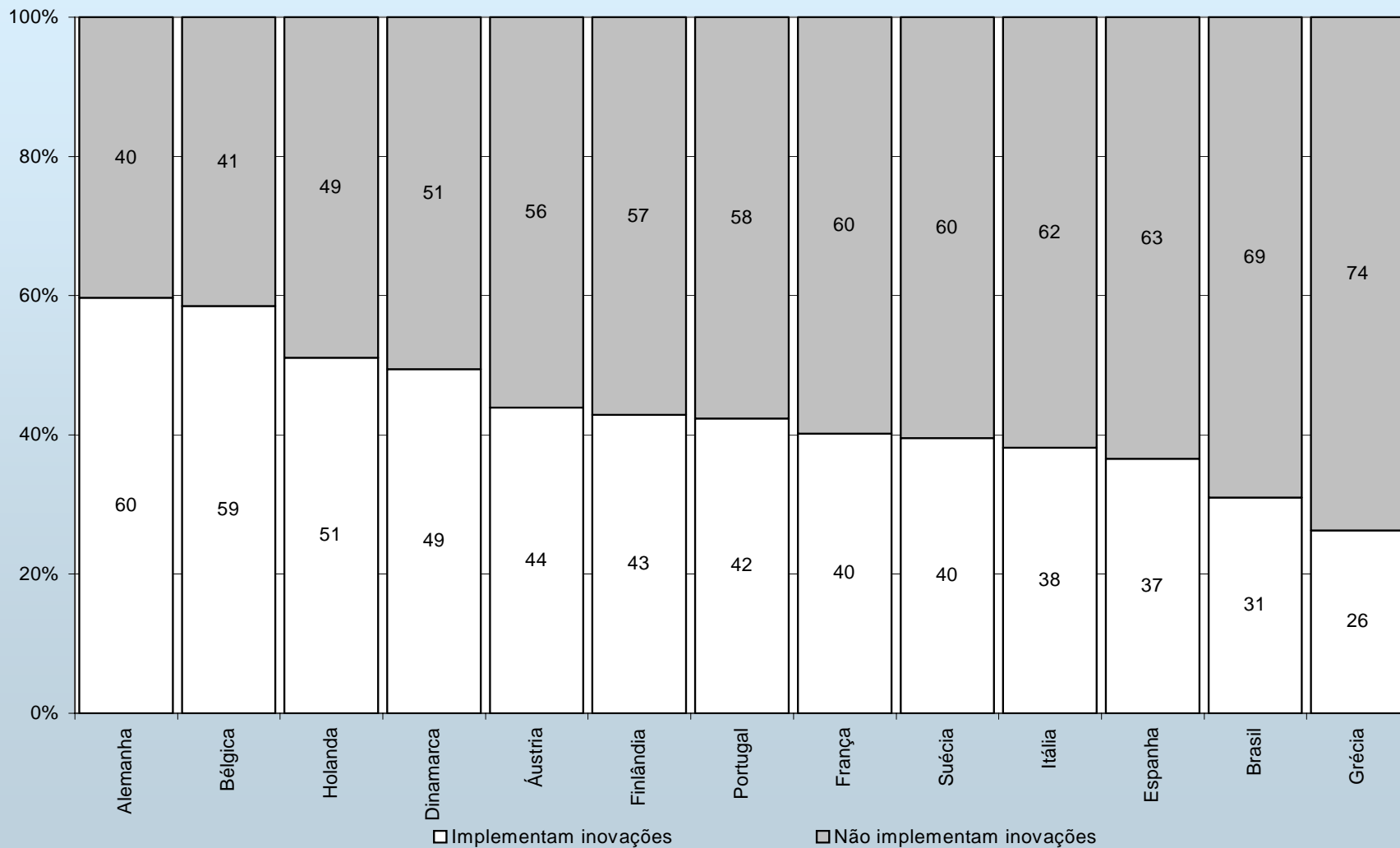
Innovation expenditures – industry

US\$ Billion (ppp)



Innovative Firms

Gráfico 1 - Percentual das empresas industriais que implementaram e que não implementaram inovações de 1998 a 2000, para países selecionados.



Fontes: EUROSTAT, 2004; IBGE¹, 2004 (elaboração Ipea).

Firm competitive strategies

Firms that innovate and differentiate products

- Firms that innovated new product for the market
- Firms that obtained a price increase of 30% in the exported goods when compared to the other Brazilian exporters of the same product

Firms focusing on those activities associated with core competences and capabilities in order to perform them better than competitors do

Firms specialized in standard products

- Exporting firms not included in the previous group
- Non-exporting firms that present the same or better efficiency (value-added per worker) than exporting firms in this group

Firms focusing cost advantage by better understanding costs and squeezing them out of the value-adding activities

Firms that do not differentiate product and have lower productivity

- Other firms not belonging to the above groups
Firms facing efficiency and productivity problems

Number of firms

Firms	Argentina	Brazil	Mexico	Spain
Innovating and differentiating products	407 (18%)	532 (7%)	263 (8,3%)	866 (23%)
Specializing in standard products	969 (42%)	3584 (45%)	1988 (63,1%)	2211 (49%)
Non-differentiating and with lower productivity	898 (39%)	3879 (48%)	899 (28,5%)	652 (17%)
Total	2276	8005	3150	3729

Firm size

(average)

Firms	Argentina		Brazil		Mexico		Spain	
	workers	turnover	workers	turnover	workers	turnover	workers	turnover
Innovating and differentiating products	178	24.9	1106	50.17	358	37.7	222	58.2
Specializing in standard products	242	45.5	515	13.74	522	70.8	299	94.6
Non-differentiating and with lower productivity	146	7.6	160	1.23	381	14.4	189	20.1

Innovation efforts

(in-firm R&D / turnover - %)

Firms	Argentina	Brazil	Mexico	Spain
Firms innovating and differentiating products	1.12	1.10	0.81	1.85
Firms specializing in standard products	0.12	0.29	0.09	0.63
Firms non-differentiating and with lower productivity	0.23	0.33	0.06	1.06
Total industry *	0.24	0.58	0.08	0.87

* Germany: 2.7% France: 2.5%

R&D investment (US\$1,000,000)

(Total)

Firms	Argentina		Brazil		Mexico	Spain	
	R&D in	R&D out	R&D in	R&D out	R&D in/out	R&D in	R&D out
Innovating and differentiating products	114	6	931	122	80	823	216
Specializing in standard products	56	23	452	65	60	1145	982
Non-differentiating and with lower productivity	15	2	97	66	13	121	19
Total	186	31	1480	253	152	2089	1216

Impacts of innovation on Brazilian Economy

Synthesis of the results

Innovation Increases Salaries

Firms	Salary (R\$/month)	Schooling (year)	Tenure (months)	Salary- Premium (%)
Firms innovating and differentiating products	1255	9.13	54.09	23
Firms specializing in standard products	749	7.64	43.90	11
Firms non-differentiating and with lower productivity	431	6.89	35.41	0

Innovation Helps Exports

Brazil is highly competitive in commodities and standard product exports

- **Brazilian exports**
 - ✓ 30% medium and high intensive technology and 40% commodities
- **World trade**
 - ✓ 60% medium and high intensive technology and 13% commodities

Technological innovation stimulates higher value-added Brazilian exports

- Innovating firms have 16% higher probability to be exporters
- Innovating firms export more
- Product innovations and *price-premium* are strongly correlated

Technology, exports and employment

- Innovative firms with more than 500 employees create more jobs than non-innovative: the growth rate of employment in these firms was 29% (in the last 4 years) against 19% industrial firms as a whole
- The new exporting firms employ 20% more in the first year after the initiation in the export market
- Wages in exporting firms are 24,7% higher than in non-exporting firms from the same industry and region and with the same basic characteristics
- Transnational companies pay higher wages than domestic firms (38,3%)

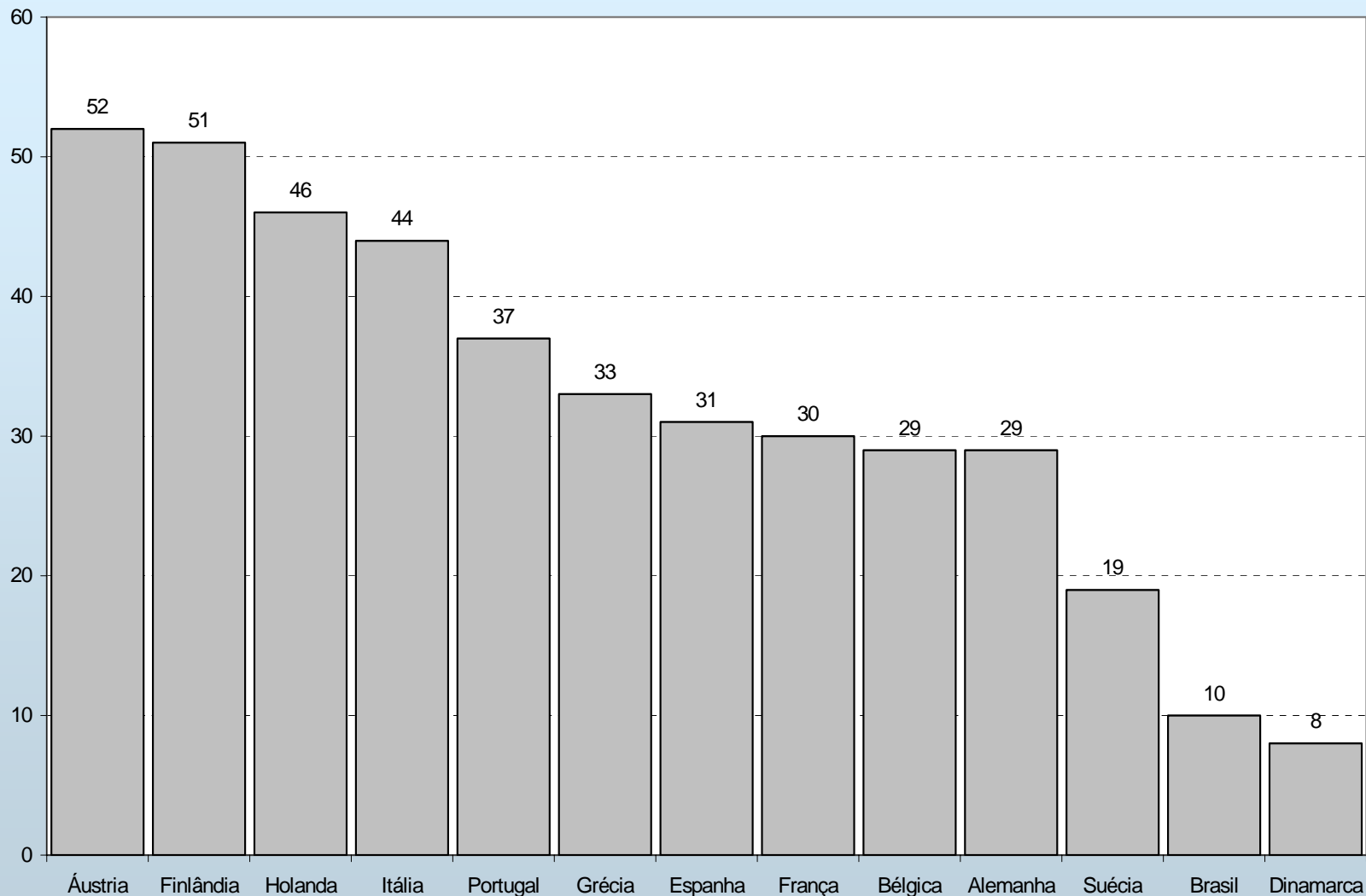
Public policy

Synthesis of the results

Brazilian Incentives to R&D and Innovation

- Immediate depreciation for R&D investment (depreciation rate: 100%)
- Tax incentives for R&D investment (all sectors): income tax deduction up to 200% of R&D investments
- Grants
- Loans
- Equity investments (seed capital and venture capital funds)
- Partnership between Research Institutes and Private Enterprises (facilitated by Innovation Law)

Firms and Public Funding – 1998-2000 (%)



Fonte: EUROSTAT 2004 e IBGE 2004. (Elaboração Ipea).

The impact of public policies on private R&D spending (Adten and Fndct)

Method	Variables		
	Growth	Productivity	R&D
PSM		Ns	+
Selection models		Ns	+
Dif-dif	+	Ns	