

Innovation in the Brazilian, Argentine and European Industries: A Comparison of the Innovation Survey Findings

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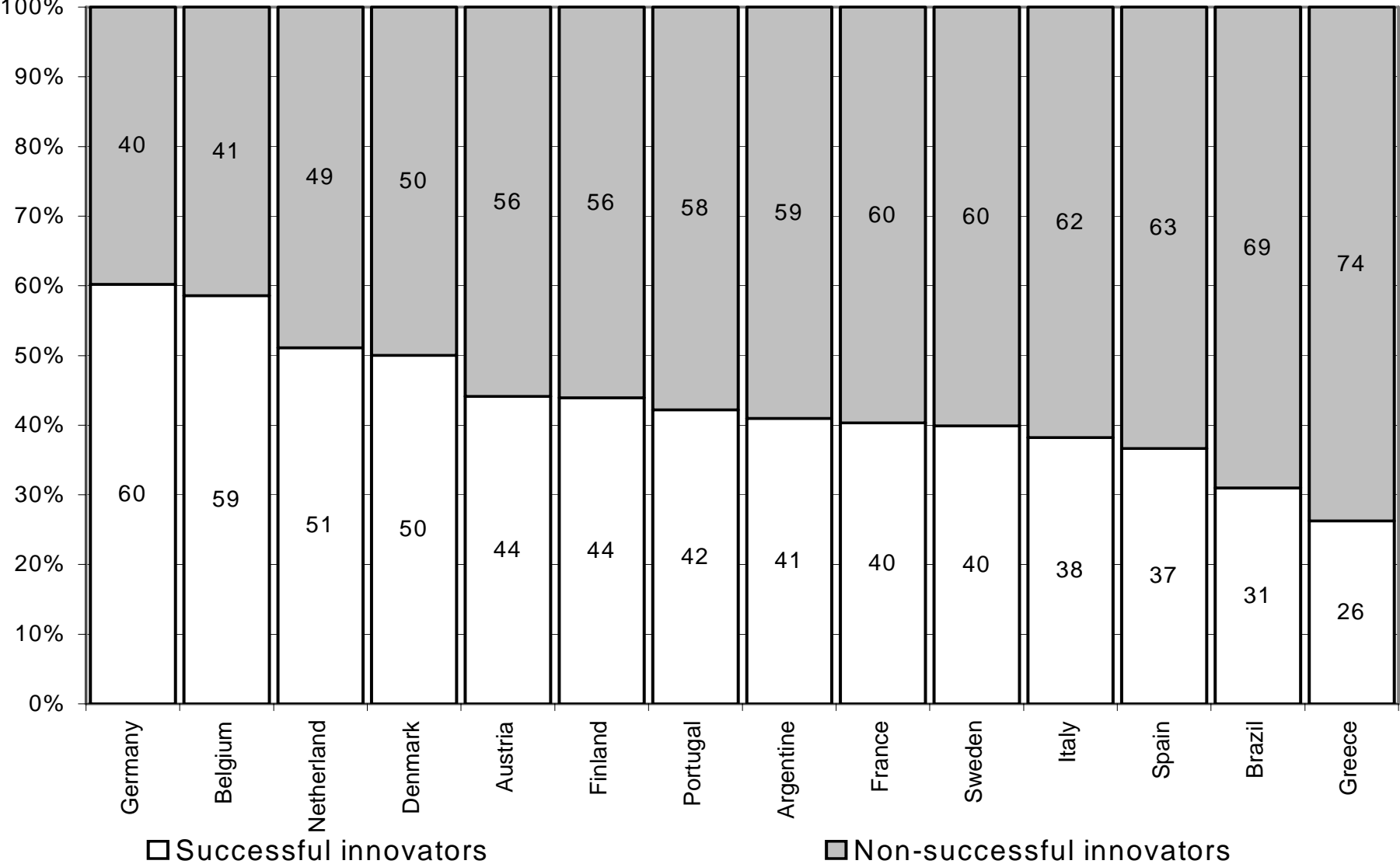
Institute for Applied Economics Research (IPEA)

CAS workshop on “Innovation in firms” - Oslo 30/10/2007 – 01/11/2007

Rates of innovation for the enterprise

- How different are the innovation processes of developing countries from those of advanced countries?
- The comparisons of results of national surveys of innovation could give important clues for the answer to this questions.
- The rate of innovation is the first and most intuitive indicator to look for in that direction.

Figure 1 – Proportion of successful innovators and non-innovators among industrial enterprises: selected countries – 1998 – 2000*



Sources: EUROSTAT, 2006; IBGE, 2004; INDEC, 2005. (authors' elaboration)

Note: (*) The Argentine survey refers to the period 1998-2001.

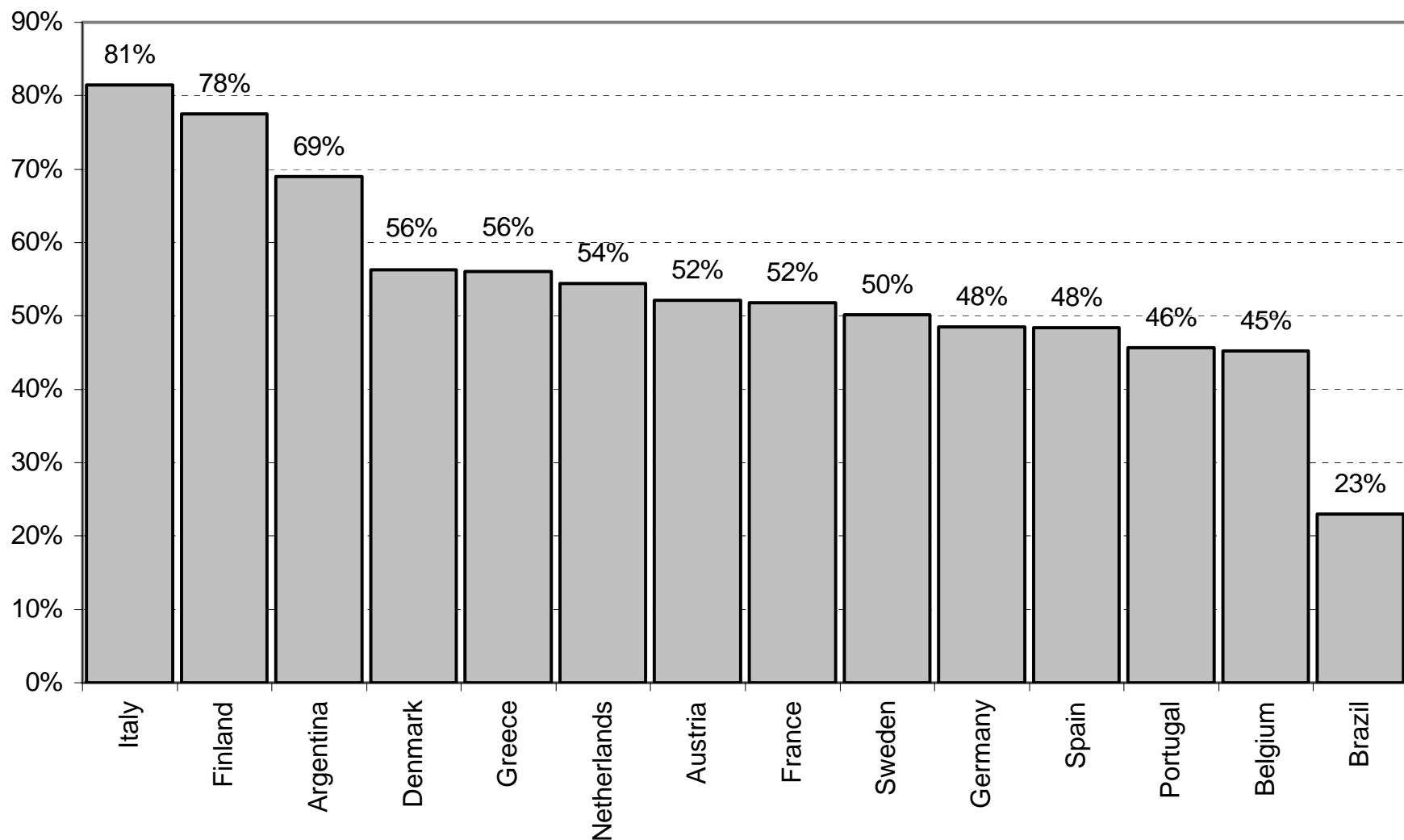
- The rates of innovation for several countries seems to be in a relative position similar to that our educated guess would suggest, but some countries are in awkward positions.
- As a matter of fact, the rates of innovation depend on several factors and not only on the quality or the level of development of countries' innovation processes.
- One of the most important factors seems to be related with the distribution of enterprises in national industries by size classes.
- Larger enterprises tend to be more innovative than smaller ones (the Schumpeterian hypothesis).
- The domestic industries with a larger share of small enterprises are the ones that register relatively lower innovation rates.
- The weight of small enterprises is high in Italy (88%), Spain (82%), Brazil (78%) and Greece (76%), precisely the same countries that have the lowest rates of innovation among industrial enterprises of all sizes.
- Only France (54% small enterprises) and Germany (58%) have industrial structures characterized by relatively lower numbers of small enterprises than Argentina (66%).

Enterprises that innovate for the market

- A second take on the quest for identifying the differences of countries' innovation processes will certainly look for differences in their rates of innovation for the market.
- The introduction of products or processes which, in addition to being new for the enterprise, are new for the market, corresponds more closely to the notion of innovation formulated by Schumpeter, which is associated with new products or processes for the world market.
- This kind of innovation usually demands greater technological effort than that required to introduce a product or process that is new only for the enterprise itself.
- Consequently, it implies a need for the acquisition of greater technological capacity on the part of the enterprise;
- at the same time, it offers higher competitive advantages to the enterprise that places the product or process on the market.
- Likewise, it creates more technological opportunities for possible generation of associated innovations.
- Therefore, the larger the rate of innovation for the market the higher should be the level of technological development of an economy.

- The rate of innovation for the market is, in principle, a better indicator because it helps in the differentiation of national systems where innovation *strict sense* plays an important role (characteristic of advanced economies) from systems dominated by just the absorption (diffusion) and improvement of innovations generated elsewhere (typical of developing economies).

Figure 3 – Proportion of enterprises that innovated for the market as a percentage of product innovators: selected countries – 1998 – 2000*



Sources: EUROSTAT, 2004, 2006; IBGE, 2004; INDEC, 2005 (authors' elaboration).

Note: (*) The Argentine survey refers to the period 1998-2001.

- “New product for the market” rates are apparently unrelated to innovation rates as a whole and also with the educated guess about countries’ relative levels of technological development.
- Greece, for example, the country with the lowest overall innovation rate, has an exceptionally high “new product for the market” rate.
- Italy, in turn, which has the highest “new product for the market” rate, is among the four countries with the lowest overall innovation rate.
- Germany seems to be in an undeserved relative position.
- This unexpected relative positions of countries seems to be rather a consequence in the wording of the CIS3 questionnaire than of the indicator itself.
- The sections on the survey questionnaires dealing with “innovation for the market” present differences that partially compromise the quality and comparability of the findings.
- The definitions of “market” vary from one survey to another.
- “Innovation for the market” means a product new for the “domestic market” in the case of Brazil and Argentina.
- In the case of CIS3, however, the difference is significant because the definition refers to the market in which the enterprise operates.

- It could be hypothesized, for example, that the exceptionally high Italian rate is owing to the great number of small enterprises within its industrial structure. Since the majority of these small enterprises probably operate in very restricted markets, most of the products they introduce are likely to be new for their specific markets.
- Unfortunately, the best indicator for the purpose of gauging the differences between national processes of technical change typical of developing X developed economies is jeopardized by a methodological problem in the CIS questionnaires.
- Overcoming this problem, following, for instance, the Canadian example, of fundamental importance obtaining more precise indicators regarding the innovation phenomenon as such, distinguishing it from the simple diffusion of products and processes.
- The use of precise definitions of innovation for the domestic and international markets are also crucial for distinguishing technical change processes typical of developing economies.

Domestic versus foreign enterprises in Brazil

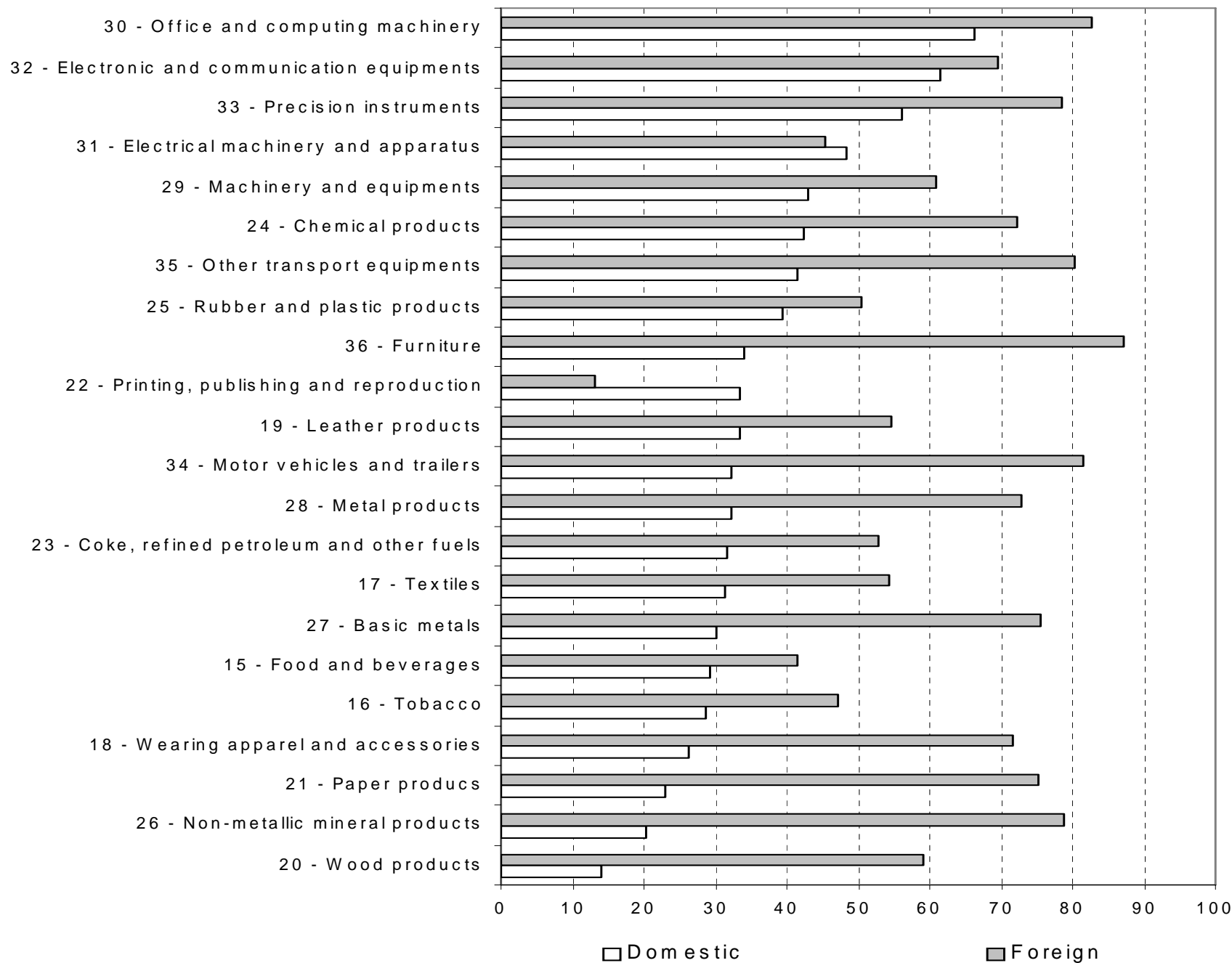
- FDI is perceived by many as an important tool for the promotion of the technological development of countries and, therefore, should attract the attention of those interested in understanding this processes.
- Unfortunately, the European survey did not gather data on the origin of capital of industrial enterprises, so it is not possible to compare the innovative performances of domestic versus foreign enterprises.
- Foreign owned enterprises are very important in the industries of Brazil and Argentina.

Table 5 – Brazilian and Argentine industrial enterprises by size, origin of capital, proportion of total number of enterprises, share of turnover and rate of innovation

Enterprises	Brazil		Argentina	
	Domestic (%)	Foreign (%)	Domestic (%)	Foreign (%)
Total Industry				
Number of enterprises	97	3	92	8
Total turnover	67	33	54	46
Successful innovators				
Number of enterprises	31	61	40	58
Total turnover	62	38	51	49

Sources: IBGE, 2004; INDEC, 2005 (authors' elaboration).

Figure 5 – Innovation rates in the Brazilian manufacturing industries by activity and origin of capital, 1998-2000



Source: IBGE, 2004 (authors' elaboration)

- Interestingly, the ranking of the most innovative Brazilian sectors roughly corresponds to the classification of activities by technological intensity.
- For example, activities 30 (office and computing machinery), 32 (electronic and communications equipment) and 33 (precision instruments), all high-tech, are exactly the activities that display the highest innovation rates in Brazil.
- At the same time, of the seven activities with the lowest innovation rates, only one is not on the low-tech list.
- In the case of Brazil, in those sectors in which the domestic enterprises as a whole have high innovation rates, the differences in the rates of innovation between enterprises with domestic capital and those with foreign capital are less significant.
- Surprisingly, there exists a certain inversion in the ranking of foreign enterprises by innovative activity.
- Certain low-tech activities, such as furniture (36) and non-metallic mineral products (26) are relatively well positioned among the more innovative sectors.
- Likewise, the innovation rates of foreign enterprises in the natural-resource-based sectors also appear to be quite high.

- Advanced sectors, such as electronic and communications equipment (32), precision instruments (33) and electrical machinery (31) are comparatively low in the sectoral innovation ranking of foreign enterprises.
- Surprisingly, the foreign enterprises are relatively less innovative precisely in the higher-tech sectors they dominate.
- This may indicate that these enterprises are likely to contribute less than generally supposed to the technological capability and technological development of Brazil.
- An econometric exercise performed using data from the Brazilian innovation survey corroborates this hypothesis, having found that, in comparison to domestic enterprises, foreign enterprises are seen to invest a significantly smaller share of their revenues in R&D when factors such as enterprise size and sectoral distribution are controlled for (Araújo 2005).
- The divergence underlined above and the possible dominance of passive technological strategies among the foreign enterprises in Brazil may be responsible, at least in part, for the frustrated expectations concerning the role of these enterprises as a vehicle for driving technological development and raising the competitiveness of these economies.
- Were these expectations properly founded, the performance of the Brazilian manufacturing industries would have been far superior given the extraordinary levels of participation already achieved by foreign enterprises in this economy.

Innovation efforts by enterprises

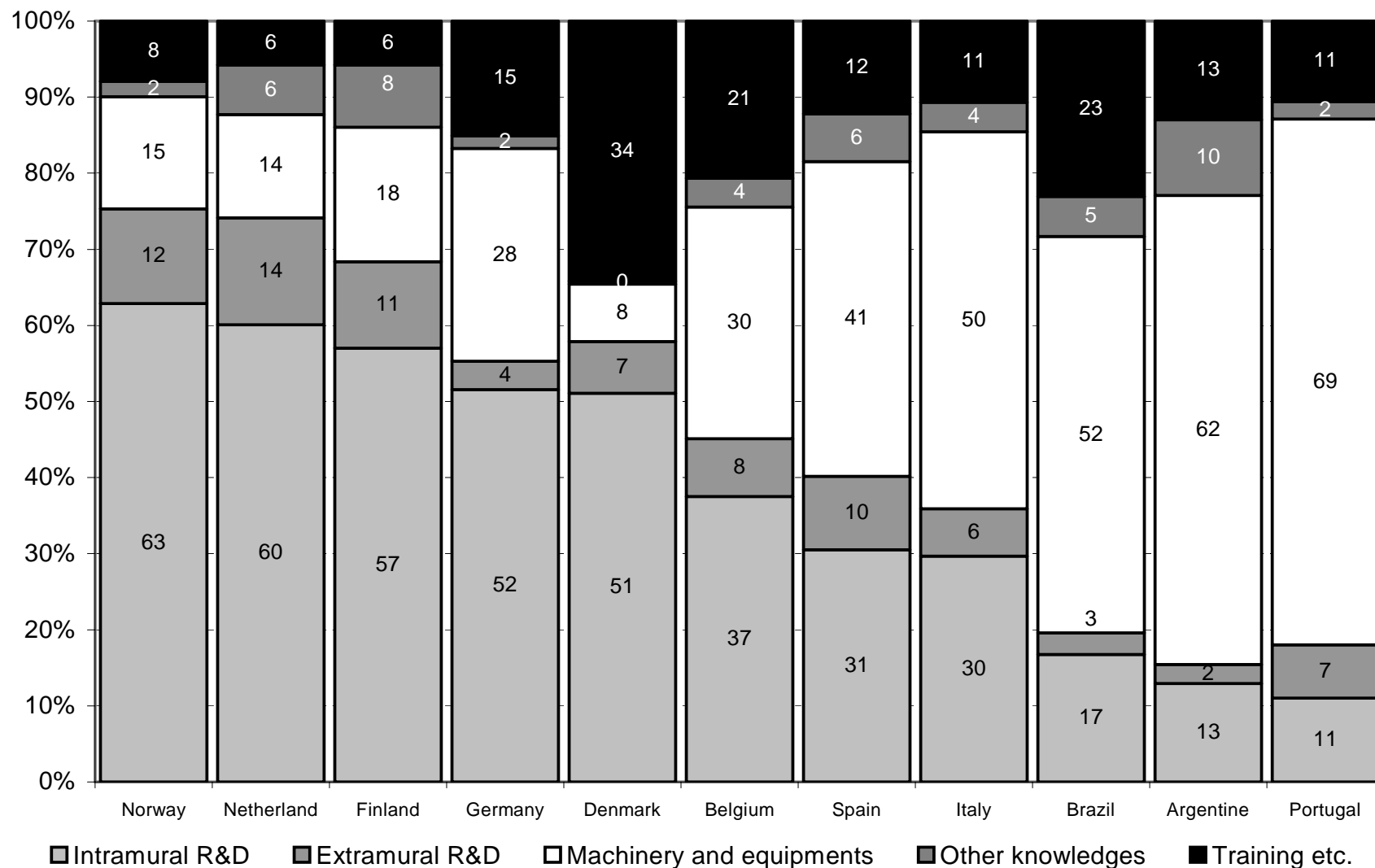
- The dimensions and features of the innovative efforts of industrial enterprises in each country should also be related with the nature of its process of technical change.

Table 7 – Expenditures on innovation activities (in € millions and as a proportion of turnover) for industrial enterprises with innovation activities: selected countries – 2000*

Country	Turnover	Innovation activity expenditures											
		R&D		Intramural R&D		Extramural R&D		Acquisition of machinery and equipment		Acquisition of other external knowledge		Training, other design preparation and market introduction	
		€ mi	%	€ mi	%	€ mi	%	€ mi	%	€ mi	%	€ mi	%
France	602,177	22,738	3.8	16,115	2.7	6,622	1.1	na	na	na	na	1,776	0.3
Germany	1,167,045	36,018	3.1	33,597	2.9	2,421	0.2	18,205	1.6	1,102	0.1	9,821	0.8
Finland	91,613	2,770	3.0	2,311	2.5	459	0.5	717	0.8	331	0.4	235	0.3
Netherlands*	16,749	4,374	2.7	3,553	2.2	821	0.5	805	0.5	370	0.2	329	0.2
Belgium	14,929	3,631	2.5	3,018	2.1	612	0.4	2,452	1.7	304	0.2	1,663	1.2
Italy	44,756	7,215	1.6	5,962	1.3	1,253	0.3	9,966	2.2	775	0.2	2,146	0.5
Norway	9,280	1,029	1.1	858	1.0	170	0.2	201	0.2	28	0.0	108	0.1
Spain**	27,691	2,795	1.0	2,130	0.8	665	0.2	2,866	1.1	432	0.2	844	0.3
Brazil	297,638	2,566	0.9	2,197	0.7	369	0.1	6,831	2.3	689	0.2	3,025	1.0
Portugal	57,774	416	0.7	254	0.4	162	0.3	1,593	2.8	53	0.1	244	0.4
Denmark	43,361	297	0.7	263	0.6	35	0.1	39	0.1	2	0.0	176	0.4
Argentina	78,151	248	0.3	208	0.3	40	0.1	992	1.3	160	0.2	209	0.3
Greece	22,368	na	na	na	na	23	0.1	530	2.4	na	na	85	0.4

Sources: EUROSTAT, 2006; INDEC, 2005; BACEN, 2006; Viotti *et al.*, 2006, p. 667 (authors' elaboration).

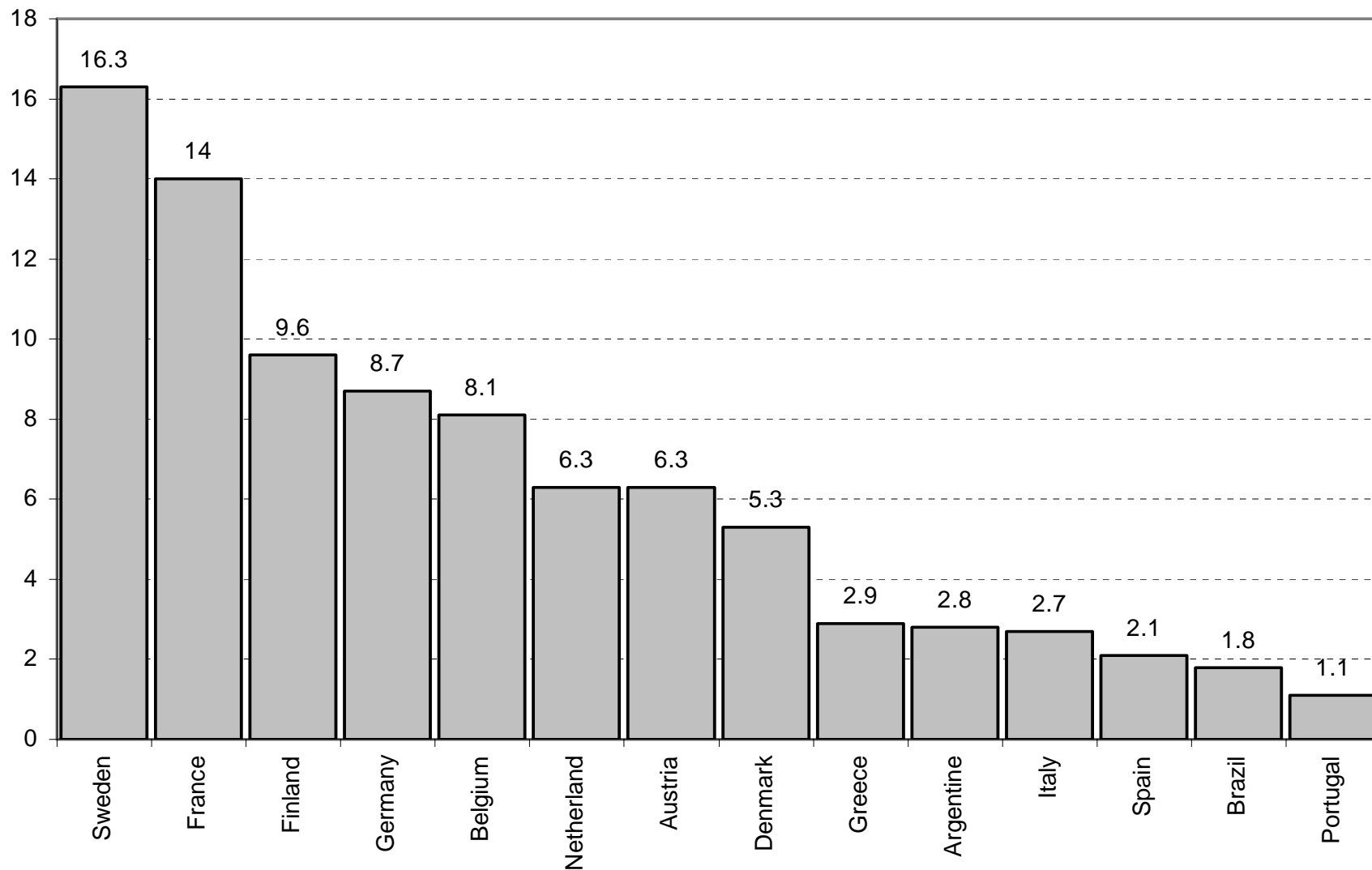
Figure 8 – Expenditures in each innovation activity as proportion of the total expenditures in innovation activities for industrial enterprises with innovation activities: selected countries – 2000*



Sources: EUROSTAT, 2006; INDEC, 2005; BACEN, 2006; Viotti *et al.*, 2005: p. 667 (authors' elaboration)

Nota: (*) The Argentine expenditures correspond to the year 2001.

Figure 9 – Average number of intramural R&D personnel employed by industrial successful innovators: selected countries – 2000*



Sources: EUROSTAT, 2006; IBGE, 2002; INDEC, 2005 (authors' elaboration).

Nota: (*) The Argentine data refer to 2001.

Sources of information

Table 9 – Normalized proportion of enterprises with innovating activity indicating that selected sources of information were considered as highly important for innovation: selected countries – 1998-2000*

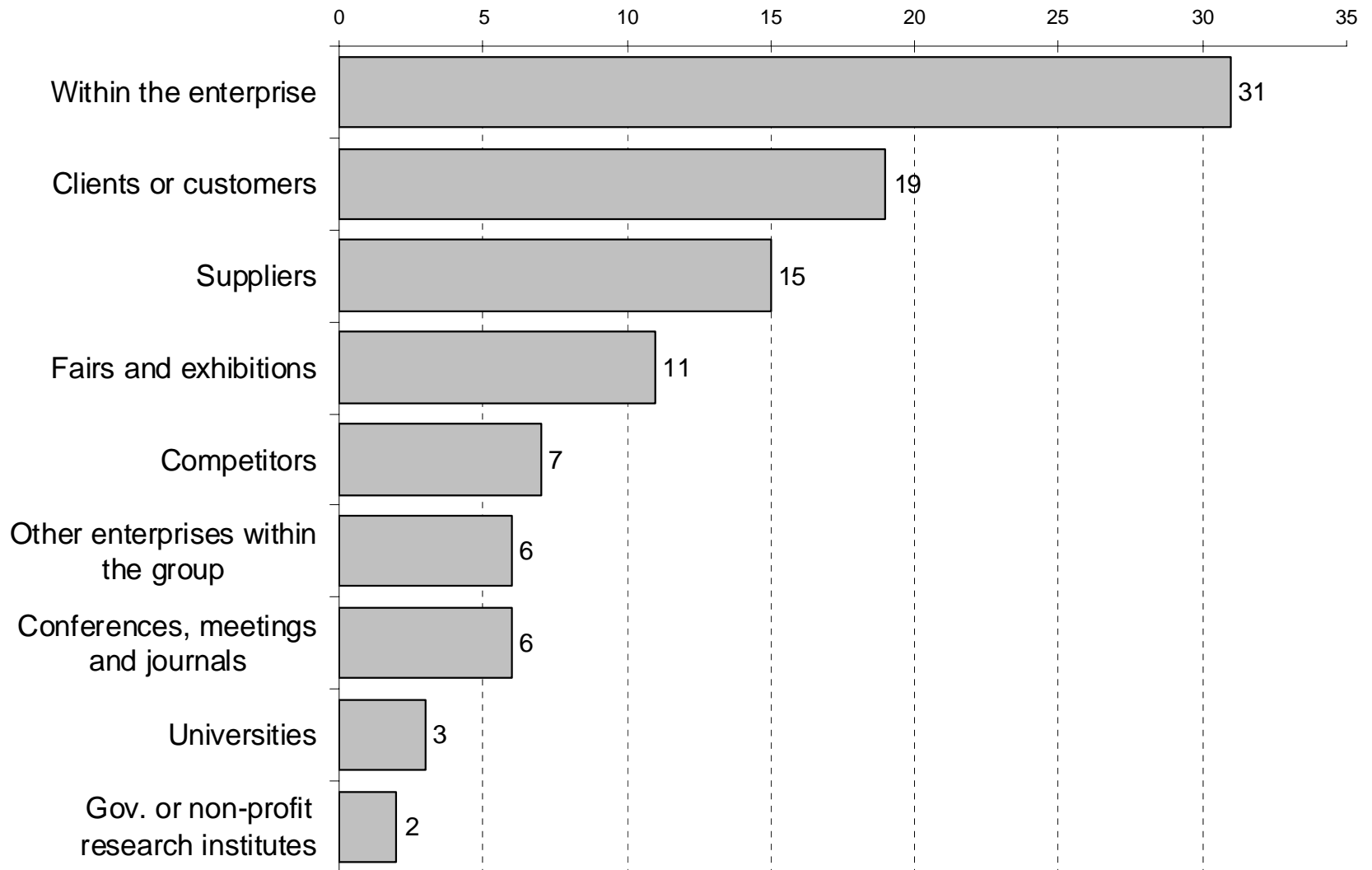
Country	Within the enterprise	Clients or customers	Suppliers	Fairs and exhibitions	Competitors	Other enterprises within the group	Conferences, meetings and journals	Universities	Gov. or non-profit research institutes
Germany	22	23	12	15	9	5	9	4	2
Argentina	33	14	12	na	10	13	na	na	na
Austria	38	18	12	7	4	7	7	4	2
Belgium	32	16	18	10	6	8	5	3	2
Brazil	24	17	17	16	10	2	7	4	3
Denmark	23	25	15	15	8	0	6	4	3
Spain	25	15	18	15	7	6	7	2	4
Finland	42	23	10	4	4	8	2	2	5
France	32	27	11	6	11	8	3	1	1
Greece	30	13	18	18	6	0	11	3	2
Netherlands	46	16	10	5	7	7	4	2	2
Italy	29	17	18	14	8	3	6	2	2
Portugal	24	17	19	20	6	4	5	3	2
Sweden	34	29	14	4	5	6	2	3	1
Average	31	19	15	10	7	6	5	3	2

Sources: EUROSTAT, 2004: 246; EUROSTAT, 2006; INDEC, 2005; Viotti *et al.*, 2005: 674 (authors' elaboration)

Note: Since each enterprise could give more than one answer to the question, the sum of the percentages for a country could be over 100%. Using that sum for each country as a basis, new normalized percentages were computed (sum = 100).

- Surprisingly, the national patterns of proportions of enterprises indicating that selected sources of information were considered as highly important for innovation does not indicate a clear differentiation by countries' levels of technological development.
- It seems, on the contrary, to have revealed a certain order of enterprises priorities attributed to the sources of information by approximately all countries as it could be seen in the next graphic.

Average normalized proportion of enterprises with innovating activity indicating that selected sources of information were considered as highly important for innovation: selected countries – 1998-2000 (%)



- The order of importance attributed by enterprises to their sources of information require the attention of those who formulate, execute and analyze science, technology and innovation policies.
- Even considered together, universities and research institutes fall in the last place.
- Curiously, the ties between enterprises and such institutions are usually at the center of national science, technology and innovation policies, while the links between enterprises and their other sources of information tend to be relatively neglected.
- Innovation policies, especially in developing countries, stand to benefit from more attention paid to the other sources of information underlying the innovation efforts of enterprises.

How to improve innovation surveys

- Surveys of innovation need to improve its capacity to, firstly, better grasp the different scopes of innovations and, secondly, better gauge the technological and innovative capabilities of enterprises.

Innovation for the markets

- To improve the quality of the survey findings, as well as to render them comparable at the international level, a clear distinction needs to be drawn between what constitutes a pioneer innovation just for the enterprise concerned; that which is pioneer for the domestic market, but not for the international market; and that which is the first for the world market.

Technological capabilities

- Another aspect that needs to be further explored in the innovation surveys concerns the technological capabilities of enterprises.
- On these capabilities depend not only the efficiency and efficacy of innovation policy measures, but also the present and future success of the innovation and learning processes of the enterprises themselves.
- In truth, it is hard to measure the physically intangible knowledge, capability and skill bases on which the innovation process rests.

- Nonetheless, certain facets of this base can and should be measured directly or indirectly by innovation surveys.
- This applies, for example, to the human-resource base on which enterprises depend for their productive activities, and especially to those employees dedicated to R&D activities. Unfortunately, the European survey did not give due attention to this item.
- More detailed information on the acquisition of capital goods would enrich the data on the technological capabilities of enterprises, as well as on the flow of embodied technologies as revealed by the machinery and equipment purchased.

Foreign versus domestic enterprises

- Given the accelerated globalization of corporations throughout the world, identifying whether the controlling capital of enterprises is of domestic or foreign origin is important in all economies. It is particularly important, however, in developing economies.