

- According to the 2005 survey of technological innovation in industry (PINTEC 2005) conducted by IBGE, the Brazilian Institute of Geography & Statistics, roughly 20% of industrial firms in São Paulo State introduced product innovations, 26% process innovations, and 13% product and process innovations in the period covered (2003-05).

São Paulo State: Innovation rate in mining & manufacturing by type of innovation, 2001-05

Type of innovation	Innovation rate in industry (innovative firms as % of all firms surveyed)			
	2001-2003		2003-2005	
	Brazil	SP	Brazil	SP
Total	33.3	31.1	33.4	33.6
Product	20.3	18.8	19.5	20.4
Process	26.9	24.6	26.9	26.0
Product & process	14.0	12.3	13.1	12.8

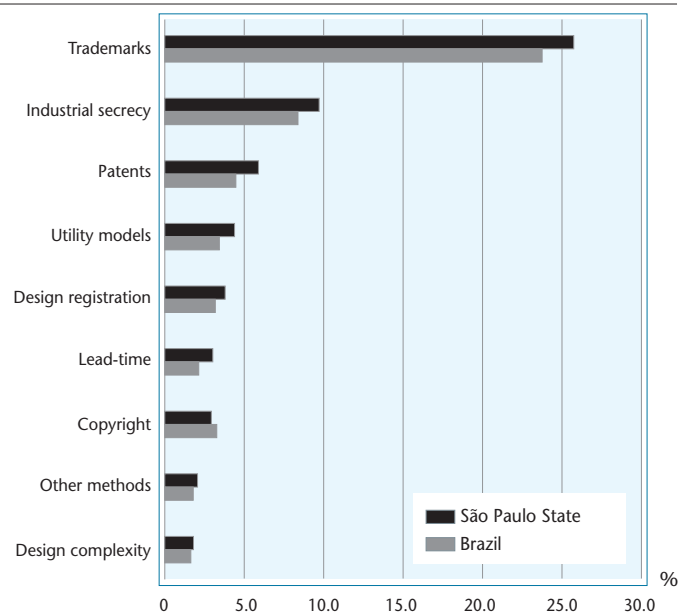
Source: IBGE (PINTEC 2003, 2005).

- Approximately a third of the state's industrial firms (33.6%) introduced at least one technological product and/or process innovation in the period 2003-05. The comparable international statistic is 41% in Europe, according to Eurostat (CIS4, 2004). Thus both Brazil and São Paulo State lag Europe on this measure. Germany has the highest innovation rate in Europe, with 72.8%, while France's rate (36.1%) is slightly higher than the rates for Brazil and São Paulo State.
- The largest proportions of innovative firms for Brazil as a whole were in the so-called electronics complex, comprising information technology (IT), with an innovation rate of 69.2%; instrumentation, with 68.0%; and electronic and communications material, with 56.9%.
- Lower innovation rates in the range of 50% were found for a second group relating to the chemical industry. These segments, not necessarily associated with high technology, include pharmaceuticals, the rest of the chemical industry, and oil refining. A third group with rates in the range of 40% comprised machinery and mechanical equipment, electrical appliances, automotive vehicles, aircraft, and publishing and printing.
- Knowledge-intensive services, especially in IT, ranked closer to the electronics complex. The innovation rate for IT services was 57.6%, while the innovation rate for telecommunications services was 45.9%.
- In São Paulo State, the leading industries were aircraft and pharmaceuticals, which are classed as high-tech, with innovation rates of 60.9% (compared with 35.4% in Brazil) and 69.0% (compared with 52.4% in Brazil) respectively. It can be inferred that creative activities in these sectors are strongly concentrated in São Paulo State.
- In the period 2003-05, large firms with 500 or more employees were the most innovative in the Brazilian industrial sector. In São Paulo State, the innovation rate for this group was just under 81%, compared with a national average of 79.2%, while the innovation rate for smaller firms, with 10-29 employees, was 28.5% in São Paulo, the lowest among groups of firms separated by size, compared with 27.6% in Brazil.
- Foreign firms operating in Brazil displayed far higher innovation rates than locally owned firms. The proportion of foreign firms that introduced new products for the domestic market in the period 2003-05 exceeded 30%, compared with less than 4% for local firms.
- In São Paulo State the relative importance of multinational firms was even greater. The state accounted for 63.4% of net sales by innovative multinationals with Brazilian subsidiaries in 2005, compared with only 30.8% for innovative local firms. These firms, which were responsible for most of the state's industrial produc-

tion, accounted for 56.6% of industrial research and development (R&D) investment in São Paulo State in 2005.

- The proportion of originally innovative firms is an important criterion for distinguishing firms that generate innovations from firms that adopt third-party innovations.
- The proportion of originally innovative manufacturing firms in São Paulo State was 63.0%, slightly above the national average. The superiority of firms in São Paulo is clear both in low-tech industries such as wood (75.4% of innovative firms in São Paulo compared with 57.9% in Brazil), furniture (67.0% v. 58.0%), pulp and paper (69.3% v. 49.0%), and non-metallic mineral products (70.5% v. 46.1%), and in high-tech industries such as automotive vehicles (63.6% v. 61.1%), aircraft (73.3% v. 60.5%) and electronic material (84.3% v. 79.1%), as well as knowledge-intensive services (84.4% v. 78.5%).
- Trademarks were the main innovation appropriation mechanism in Brazilian industry. The proportion of innovative manufacturing firms that used trademarks to protect their innovations was 23.6% in Brazil and 25.7% in São Paulo State. The presence of mechanisms associated with technological innovation was more discreet: 8.3% of innovative firms in Brazil and 9.6% in São Paulo State used industrial secrecy for innovation protection. Patenting came third, with 4.5% and 5.8% of innovative firms using patents for protection in Brazil and São Paulo State respectively.

Brazil & São Paulo State: Innovation protection in manufacturing, 2003-05 (in per cent)

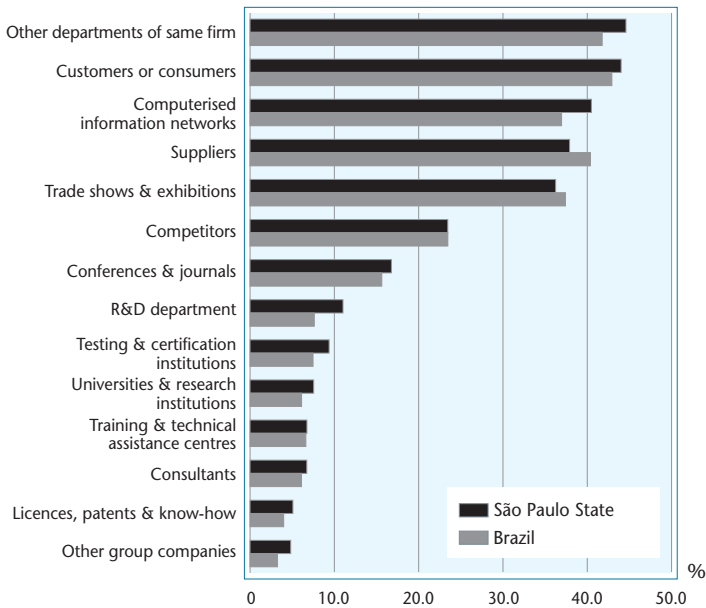


Source: IBGE (PINTEC 2005).

- Between 2003 and 2005, industrial firms in São Paulo State displayed greater patenting propensity (8.3%) than the national average (6.2%). This was particularly the case in industries such as textiles (9.1% in São Paulo State compared with 5.5% in Brazil), pulp and paper (14.0% v. 5.0%), pharmaceuticals (12.2% v. 8.4%), precision instruments (19.5% v. 16.5%), automotive vehicles (13.6% v. 11.1%), and furniture etc. (15.0% v. 6.7%).
- Size was also a key factor in explaining differences in patenting propensity. The proportion of large firms (500 or more employees) was 29.2% in 2005, compared with only 3.0% for small firms (10-29 employees).

- Universities and research institutions were considered important sources of information for innovation by 6% of innovative firms in Brazil (1,812 manufacturers). Even fewer (855 or 2.9%) established co-operative links with universities and research institutions. Only 2.7% (812) co-operated with universities and institutions located in Brazil.

Brazil & São Paulo State: Sources of information for innovation in manufacturing, 2003-05 (% of innovative firms)



Source: IBGE, PINTEC 2005.

- The intensity of co-operation for innovation in Brazil was lower than in some European countries. In Brazil, 2.9% of the firms surveyed attributed a high priority to such co-operation, compared with 10% for France and the U.K., 8% for Germany, and 5% for Italy and Spain.
- There were major differences among industries in Brazil in terms of the propensity to co-operate for innovation. The highest was in high-tech industries, led by other transport material except aircraft (21.9%). Next came electronic and communications material (20.7%), pharmaceuticals (18.4%), chemicals (16.2%), and aircraft (15.9%).

- The situation in services contrasted strongly with that in industry. More than 60% of telecommunications service providers prioritised co-operation, while the proportion of IT service providers was just under 20%.
- The rank order in São Paulo State was quite different, showing that innovative firms' propensity to co-operate is strongly influenced by regional discrepancies. Firms that prioritised co-operation did not necessarily belong to high-tech industries in São Paulo State. The leader was pharmaceuticals, with 25.7% (18.4% in Brazil), followed by IT and related services (24.8% v. 19.3%), non-metallic mineral products (17.3% v. 9.9%), aircraft (17.2% v. 15.9%), automotive vehicle (17.2% v. 12.3%), and wood products (17.1% v. 3.5%).
- In 2005, according to PINTEC, the innovation effort of industrial firms in São Paulo State was 3.5% (innovation expenditure in proportion to net sales), above the national average of 2.8%. The gap was greatest in machinery purchasing and R&D, but could also be seen in external knowledge acquisition and market introduction of innovative products.
- Innovation effort varies with firm size. PINTEC 2005 shows substantial innovation effort by small industrial firms (i.e. those with 10-29 employees and 30-49 employees) in São Paulo State (7.77% and 9.15% of net sales respectively), well above that of medium and large firms (2.32% and 3.16% respectively).
- In the case of small firms, innovation effort focuses on investment in plant and equipment, i.e. embodied technology from external sources, pointing to an intensification of technology diffusion in the industrial sector. Large firms, on the other hand, focus more on internal and external R&D. In this respect the predominant pattern in the state resembles that of the developed countries.
- PINTEC 2005 also shows that the average R&D intensity of the Brazilian manufacturing industry is only 1.5%, well below the OECD average (7.7% in 2001). This indicator most clearly reflects the innovative weakness of Brazilian industry. In São Paulo State it is 2.1%, significantly higher than the national average but still well below the OECD average.
- Most of Brazil's industrial R&D takes place in São Paulo State, which accounts for 58.4% of the total, although one or two industries stand out, particularly automotive manufacturing and aerospace.
- Exports of technologically innovative manufactures by São Paulo State as a share of the total (20%) far outperform the national average. This high-tech export capacity is found in almost all industries, led by aircraft (79.4% in São Paulo State, compared with 69.2% in Brazil). Next come IT equipment (72.7% v. 46.3%), furniture etc. (40.7% v. 15.8%), tobacco (34.1% v. 18.3%), and machinery and mechanical equipment (45.1% v. 37.1%).