Intellectual Property and Socio-economic Development: Brazil

Graziela Zucoloto
(IPEA)

WIPO
"The Economics of Intellectual Property"
14th Section of the CDPI
November 11, 2014

The Project includes the following reports:

- Report 1: Descriptive Statistics
- Report 2: Statistical Analysis – IP and export performance of Brazilian firms

Databases

1. WIPO database: IP Indicators in Brazil

- Invention patents, utility models, industrial design and trademarks

2. Pintec database: Patents and other appropriability methods of technological innovation:

- Editions: 2003, 2005 and 2008

- Sectorial, regional and firm size analysis
- Innovative Expenditures
- Cooperation for Innovation
- Public Incentives for Innovation
- Characterization of firms (origin of capital, foreign trade, employees skills)

3. Export database

Sectorial Analysis

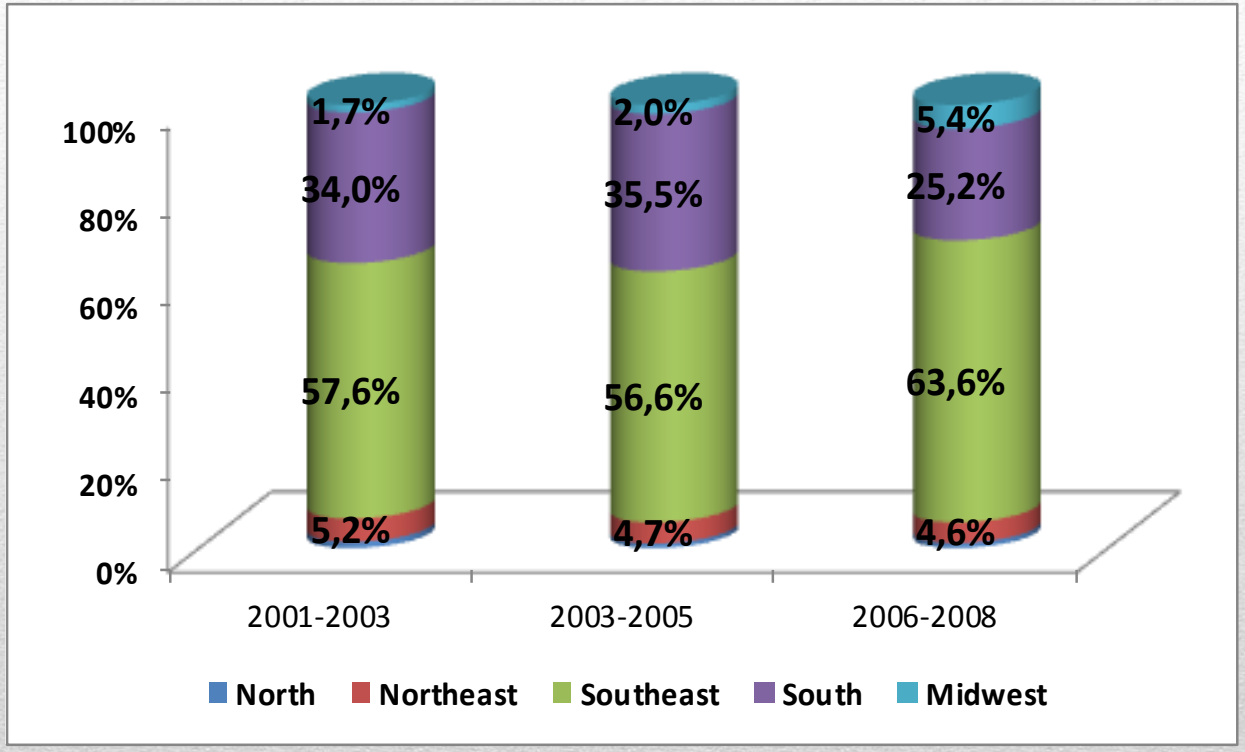
2006-2008

	% of Innovative Firms that use appropriability methods				
	Patents and ID	Trademarks	Design Complexity	Industrial Secret	Lead Time
Manufacturing	9.4	24.1	1.6	8.6	2.1
Services	6.2	39.6	5.8	7.8	2.5

- Trademarks: most relevant;
- Sectorial differences in the use of IP methods:
  - Patents: High-tech industries > (Innovative) Services > Low-tech industries
- Design Complexity and Lead Time: seldom accessed

Regional Analysis

Patents

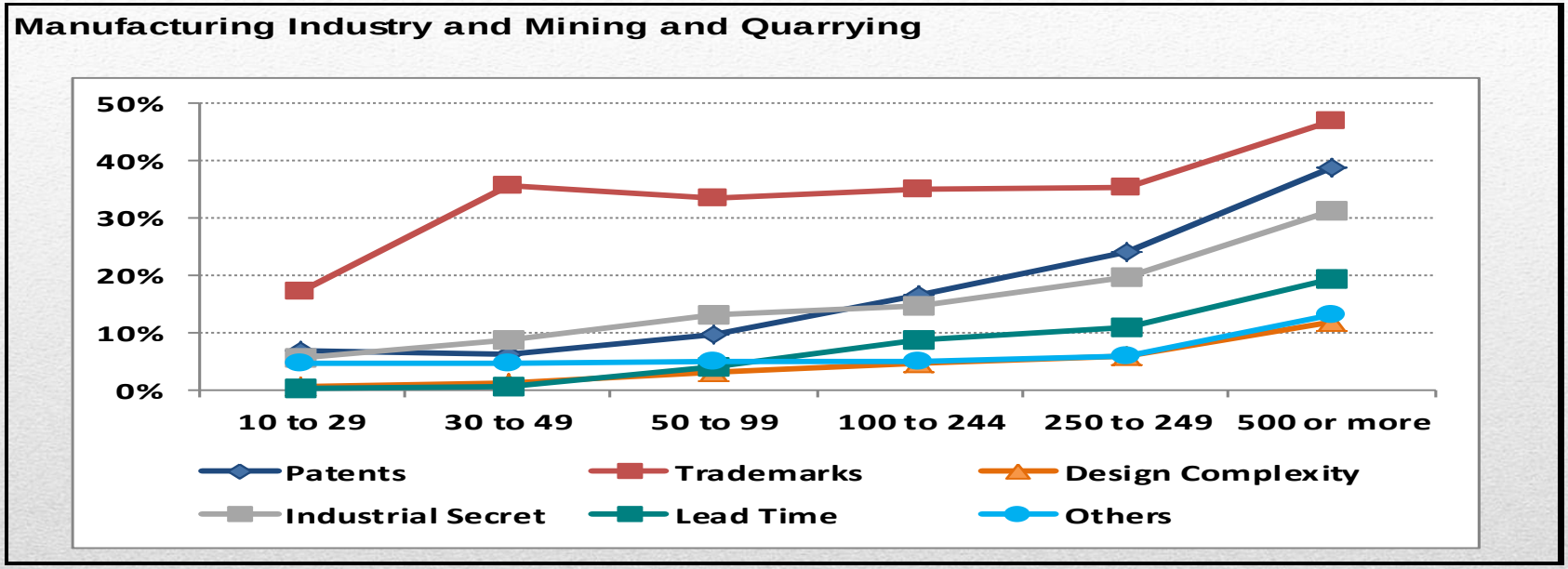


Brazil:

- Productive and innovative structure concentrated in the Southeast (SP)
- 63.6% of patent users in Southeast (2006-2008)

Use of IP Methods per Firm Size (number of employees)

(2006-2008)



- Growing relationship between firm size and IP use (all types): higher percentage of large firms use IP methods compared to smaller firms.
- Patents and trademarks: similar – large firms / different: small firms (30-49 employees)
- Trademarks: the main growth happens among small firms

Characterization of Firms

Invention Patent or Utility Model	2006 to 2008	
	do not use	use
Total Revenue per Firm (1000 US$)	8,184	143,527
Export (average value per firm) (1000 US$)	658	18,212
R&D expenditures / Revenue (%)	0.70%	1.28%
Employees per Firm	78.5	502.4
Master and PhDs' employees per Firm	0.08	2.94
Cooperation (with suppliers)	5.4%	9.1%
Use of R&D incentives	1.1%	8.0%

- **Patents users perform better:**
  - Larger (revenue and number of employees)
  - Export more
  - Higher R&D expenditures
  - Cooperate more
  - Higher percentage use incentives for innovation

Correlation (not necessarily causality!)

Report 2:

Technological Appropriability and Export Performance of Brazilian Firms

Literature Review: Innovative firms tend to be more intensive in exports

In Brazil, innovative firms present better export performance

- "probability to export" (higher percentage of innovative firms are exporters)
- exported value
- participation on sectorial exports

Export perfomance of innovative and non-innovative firms (2008)

	Average Values		
	Exporting firms / total (%)	Exports (US$)	Exports: Firm / Sector (%)
Non-Innovative	8.2	351,047	0.12
Innovative	14.6	3,310,078	0.43

Report 2: Technological Appropriability and Export Performance of Brazilian Firms

Question:

Innovative firms that use appropriability methods (IP, UM, ID and trademark) **present a better export performance?**

Exports and appropriation methods

(of industrial innovative large firms)

	Non-Exporting Firms (%)	Exporting Firms (%)
Invention Patent	2.9	17.7
Utility Model	2.1	8.3
Industrial Design	3.6	8.1
Trademarks	21.2	40.5

Higher percentage of exporting firms use IP methods

Report 2: Technological Appropriability and Export Performance of Brazilian Firms

- **Main result of statistical tests**: a positive statistically significant correlation between **Invention Patents** and **all export performance variables** tested (probability to export, export revenues and export market share)

- **Additional analysis**: positive and significant correlation between the use of patents and **other variables** (market share, introduction of new products / sales)

Future studies

- Suggestion: include PTO database

- PINTEC Advantages:
  - Comparison with informal / strategic methods of protection (ex. Industrial secret)

- PINTEC limitations
  - Number of patents per firm?
  - Use in Brazil and/or abroad?
  - Time of protection?
  - Two short

Thank You

graziela.zucoloto@ipea.gov.br

Cooperation for Innovation

Cooperation	2006-2008						
	Customers and Consumers	Suppliers	Competitors	Other firms of the group	Consulting Firms	Universities and Research Institutes	Training and Technical Assistance Centers
Total	**3,8%**	**5,4%**	**1,1%**	**1,2%**	**2,0%**	**2,1%**	**1,7%**
Formal Methods of Appropriability							
Invention Patent	9,8%	9,1%	2,5%	5,6%	3,3%	7,7%	1,7%
Utility Model	11,2%	10,0%	1,4%	3,9%	5,1%	7,3%	3,7%
Industrial Design	6,7%	11,3%	2,2%	2,9%	2,8%	8,0%	4,0%
Trademark	5,0%	7,7%	1,5%	2,0%	3,2%	3,4%	2,2%

- A small percent of the innovative firms identified cooperation as important.
- IP users: cooperate more than non users (valid for all IP methods and all types of cooperation)
- Suppliers and customers are considered the main partners

Public Incentives for Innovation

Public Incentives	2006-2008				
	Fiscal incentives to R&D and to technological innovation	Information Technology Laws	Funding to R&D and innovative projects	Funding to the acquisition of machineries and equipments employed in innovation activities	Scholarships - RHAE Program
Total	**1,1%**	**1,7%**	**1,1%**	**13,0%**	**0,6%**
Formal Methods of Appropriability					
Invention Patent	8,0%	3,6%	4,4%	16,9%	1,7%
Utility Model	5,9%	2,3%	3,3%	9,9%	1,4%
Industrial Design	11,0%	3,8%	3,0%	10,2%	1,7%
Trademark	2,3%	1,3%	1,8%	13,6%	1,0%
Copyright	5,3%	4,5%	12,8%	14,5%	7,3%

- IP users: access more any type of incentive for innovation
- Funding for the acquisition of machinery and equipment (M&E) for innovative activities is the main type of instrument;

Pooled Panel / Logit Model

Dependent Variable:	Dummy Export		
	(1)	(2)	(3)
invention patent	0.133***	0.0941***	0.0815***
	(0.0263)	(0.0263)	(0.0257)
utility model	0.0617*	0.0373	0.0321
	(0.0320)	(0.0337)	(0.0344)
industrial design	0.0588*	0.0536	0.0399
	(0.0342)	(0.0359)	(0.0357)
trademark	0.0264	0.0250	0.0119
	(0.0174)	(0.0175)	(0.0177)
foreign		0.131***	0.117***
		(0.0257)	(0.0261)
mixed		0.219**	0.231***
		(0.0893)	(0.0832)
log(number of employees)		0.0335**	0.0234*
		(0.0140)	(0.0126)
log(R&D expenditures)			0.00631**
			(0.00306)
log(technology transfer expenditures)			0.00489
			(0.00353)
log(machinery and equipment expenditures)			-0.000846
			(0.00283)
log(other innovative expenditures)			0.00620*
			(0.00339)
firm age		0.000326	0.000177
		(0.000647)	(0.000611)
Observations	1,639	1,556	1,556
R-squared			
Firm Fixed Effect	No	No	No
Dummy Period	Yes	Yes	Yes
Dummy ISIC	Yes	Yes	Yes

Pooled (1-3) and Fixed Effect (4-6)

Dependent Variable:	log (exports)					
	(1)	(2)	(3)	(4)	(5)	(6)
invention patent	2.517***	1.278***	1.103***	0.569*	0.543*	0.516*
	(0.305)	(0.297)	(0.296)	(0.305)	(0.300)	(0.300)
utility model	0.413	0.148	-0.0116	0.404*	0.429*	0.420*
	(0.343)	(0.319)	(0.323)	(0.243)	(0.243)	(0.246)
industrial design	0.502	0.398	0.281	-0.131	-0.138	-0.157
	(0.364)	(0.340)	(0.339)	(0.231)	(0.236)	(0.235)
trademark	0.447	0.369	0.0925	-0.543**	-0.534**	-0.505**
	(0.319)	(0.298)	(0.299)	(0.235)	(0.229)	(0.223)
foreign		2.758***	2.468***		-1.071	-1.006
		(0.299)	(0.304)		(0.872)	(0.872)
mixed		2.826***	2.670***		-0.0789	0.00741
		(0.423)	(0.433)		(0.877)	(0.884)
log(number of employees)		1.560***	1.223***		-0.213	-0.265
		(0.219)	(0.218)		(0.560)	(0.550)
log(R&D expenditures)			0.154***			0.0227
			(0.0575)			(0.0538)
log(technology transfer expenditures)			0.0407			-0.0210
			(0.0467)			(0.0426)
log(machinery and equipment expenditures)			0.0357			-0.0465
			(0.0502)			(0.0291)
log(other innovative expenditures)			0.130**			0.0451
			(0.0619)			(0.0517)
firm age		0.00326	1.54e-05			
		(0.0116)	(0.0113)			
Observations	1,639	1,638	1,638	1,639	1,639	1,639
R-squared	0.050	0.223	0.240	0.022	0.027	0.031
Firm Fixed Effect	No	No	No	Yes	Yes	Yes
Dummy Period	Yes	Yes	Yes	Yes	Yes	Yes
Dummy ISIC	Yes	Yes	Yes	No	No	No

Pooled (1-3) and Fixed Effect (4-6)

Dependent Variable:	firm share on sectorial exports (3 digits)					
	(1)	(2)	(3)	(4)	(5)	(6)
invention patent	**0.0982*** **	**0.0684*** **	**0.0604*** **	**0.0406** **	**0.0394** **	**0.0386** **
	(0.0193)	(0.0193)	(0.0198)	(0.0172)	(0.0173)	(0.0173)
utility model	-0.0314	-0.0335	**-0.0384***	-0.00854	-0.00797	-0.00785
	(0.0228)	(0.0221)	(0.0222)	(0.0148)	(0.0148)	(0.0147)
industrial design	0.0325	0.0293	0.0235	-0.00340	-0.00317	-0.00371
	(0.0260)	(0.0254)	(0.0256)	(0.0178)	(0.0173)	(0.0173)
trademark	0.0126	0.00625	-0.00418	**-0.0249***	**-0.0245***	**-0.0242***
	(0.0163)	(0.0161)	(0.0162)	(0.0138)	(0.0138)	(0.0137)
foreign		0.0820***	0.0707***		-0.0968	-0.0974
		(0.0184)	(0.0186)		(0.0677)	(0.0671)
mixed		0.150***	0.140***		-0.0644	-0.0650
		(0.0467)	(0.0480)		(0.0557)	(0.0558)
log(number of employees)		0.0477***	0.0366***		0.0133	0.0140
		(0.00981)	(0.0101)		(0.0344)	(0.0342)
log(R&D expenditures)			0.00520*			-0.000705
			(0.00295)			(0.00371)
log(technology transfer expenditures)			0.00377			-0.000728
			(0.00289)			(0.00226)
log(machinery and equipment expend			-0.00145			-0.000977
			(0.00261)			(0.00200)
log(other innovative expenditures)			0.00575*			0.000447
			(0.00296)			(0.00322)
firm age		0.00133**	0.00119**			
		(0.000519)	(0.000515)			
Observations	1,639	1,638	1,638	1,639	1,639	1,639
R-squared	0.022	0.062	0.072	0.013	0.019	0.020
Firm Fixed Effect	No	No	No	Yes	Yes	Yes
Dummy Period	Yes	Yes	Yes	Yes	Yes	Yes
Dummy ISIC	Yes	Yes	Yes	No	No	No

Including interactions - Pooled (1-3) and Fixed Effect (4-6)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
IP	**2.705*** **	**1.578*** **	**1.581*** **	**1.166***	**1.142***	**1.174***
	(0.577)	(0.561)	(0.564)	(0.623)	(0.628)	(0.630)
UM	**2.983*** **	0.787	0.792	0.438	0.332	0.398
	(0.986)	(0.903)	(0.906)	(0.546)	(0.563)	(0.571)
ID	**1.609***	1.440	1.449	0.213	0.210	0.224
	(0.937)	(0.918)	(0.914)	(0.340)	(0.362)	(0.362)
TM	0.167	-0.0840	-0.0755	-0.331	-0.267	-0.200
	(0.450)	(0.414)	(0.420)	(0.295)	(0.285)	(0.282)
IPUM	**-3.246** **	-1.933	-1.937	-0.172	0.0578	-0.0681
	(1.492)	(1.375)	(1.376)	(0.994)	(0.996)	(0.999)
IPID	-1.586	**-3.527** **	**-3.519** **	**-1.527***	**-1.457***	-1.366
	(1.471)	(1.488)	(1.492)	(0.832)	(0.866)	(0.879)
IPTM	0.872	0.215	0.215	-0.786	-0.829	-0.838
	(0.743)	(0.711)	(0.711)	(0.565)	(0.573)	(0.572)
UMID	**-3.428***	-1.792	-1.799	0.106	0.414	0.381
	(1.960)	(1.814)	(1.814)	(0.631)	(0.680)	(0.669)
UMTM	-0.698	0.566	0.560	0.811	0.913	0.819
	(1.245)	(1.181)	(1.183)	(0.926)	(0.951)	(0.934)
IDTM	0.680	-0.389	-0.391	-0.161	-0.206	-0.206
	(1.253)	(1.192)	(1.190)	(0.627)	(0.632)	(0.624)
IPUMID	3.064	3.299	3.302	1.340	0.786	0.933
	(2.728)	(2.518)	(2.520)	(1.562)	(1.587)	(1.597)
IPUMTM	0.531	-0.0335	-0.0280	-0.650	-0.874	-0.738
	(1.731)	(1.625)	(1.626)	(1.269)	(1.274)	(1.253)
IPIDTM	-0.919	1.632	1.618	**1.638***	1.553	1.413
	(1.980)	(1.862)	(1.875)	(0.937)	(0.953)	(0.962)
UMIDTM	0.296	0.649	0.658	-1.387	-1.664	-1.596
	(2.452)	(2.348)	(2.348)	(1.367)	(1.374)	(1.347)
IPUMIDTM	0.296	-0.954	-0.959	-0.484	0.0703	-0.0543
	(3.317)	(3.091)	(3.093)	(2.087)	(2.056)	(2.043)
SM			-0.0298			-0.287
			(0.300)			(0.211)