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Innovation Policy for Development: an overview by Manuel Trajtenberg. Comments

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Comments: Innovation Policy for Development: an Overview by Manuel Trajtenberg

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Purpose of the paper

- Discuss innovation policy guidelines for developing countries.
- Employ the very successful Israeli experience to derive lesson for growth-promoting innovation policies.
- Main message: policies should aim at maximizing local spillovers and applications of innovation output.
- Israeli experience offers an interesting case of an apparent failure of domestic innovation to promote economy-wide growth in productivity.

Organization of my comments

I will take the main issues introduced by the paper and offer complementary evidence from developing countries: mainly Argentina.

1. What is the scope of innovation in developing economies: R&D vs other innovation activities. Distribution across firms and sectors

2. Evidence on how partial appropriability and credit market problems affects innovation decisions?

3. Policy instruments: how government support schemes have worked in developing countries vis-a-vis developed ones?

1. What is the scope of innovation in developing economies

- Innovation in a development context ought to be a much broader concept. Difference between R&D (for example, done in labs established within the firm) and other innovation activities.
- Also, it is important to know how spread are R&D and innovation investments across *firms* and *sectors* (Is R&D made by few large international firms concentrated in few “high tech” sectors (ICT?).

Innovation activities adopted by Argentine firms

Argentina. Composition of Innovation Expenditures (IE)

	1st Survey(1639 firms)			2st Survey(1639 firms)		
	1996			2001		
	Amount*	% of TEIA	% sales	Amount*	% of TEIA	% sales
R&D	77.061	5,0%	0,16%	110.021	16,6%	0,26%
Embodied IE	1.064.761	63,0%	2,61%	381.187	57,4%	1,03%
Capital good purchases	977.865	58,0%	2,36%	351.799	53,0%	0,97%
Hardware	86.896	5,0%	0,25%	29.388	4,4%	0,06%
Disembodied IE	537.637	32,0%	0,95%	172.399	26,0%	0,39%
Software	115.092	7,0%	0,17%	23.271	3,5%	0,06%
Licensing and technology transfers	201.988	12,0%	0,34%	67.213	10,1%	0,13%
Ingeneering and industry design	79.265	4,0%	0,20%	47.561	7,2%	0,12%
Training	70591	4,0%	0,10%	18.811	2,8%	0,04%
Consulting	70.699	4,0%	0,14%	15.543	2,3%	0,04%
Total	1.766.429	100,0%	3,72%	663.607	100,0%	1,68%

*in current thosands of US$

Source: CEPAL, INDEC, SeCyT (1998), (2003)

How spread is R&D and innovation activities across firms?

R&D investments

Year	Number of Firms	% of Firms with R&D =0
1992	1.528	81,68
1996	1.627	75,41
1998	1.518	73,85
1999	1.075	72,37
2000	1.141	72,13
2001	1.568	71,49

Innovation investments

Year	Number of Firms	% of Firms with Innovations =0
1992	1.528	25,72
1996	1.627	21,76
1998	1.518	48,42
1999	1.075	50,05
2000	1.141	48,99
2001	1.568	44,96

How spread is innovation across manufacturing sectors in Argentina?

Argentina. Industry average values of R&D and Innovation Expenditures. Selected years

	1992		1998		2001	
Industry	**R&D/L**	**TEIA/L**	**R&D/L**	**TEIA/L**	**R&D/L**	**TEIA/L**
Food and Beverages	4,20	317,46	11,10	212,64	14,01	144,24
Tobacco	77,55	282,99	2,25	52,32	4,47	105,75
Textil products	2,73	220,93	8,23	171,61	9,53	86,32
Apparel	1,39	66,86	7,28	24,76	7,48	23,37
Leather, footwear	9,22	69,02	9,93	48,61	6,38	37,61
Wood production (non furnitures)	0,26	74,71	19,21	85,33	10,34	93,23
Paper production and paper products	1,03	224,34	15,47	899,68	19,10	574,62
Printing and publishing	2,44	267,20	12,05	335,89	16,53	170,58
Petroleum destilery	28,51	456,36	168,18	328,69	167,03	476,18
Chemical products	42,41	395,70	87,23	784,68	114,88	499,80
Rubber and Plastic products	6,40	563,16	10,31	440,75	14,05	188,63
Non metal mineral products	8,44	640,99	23,86	505,74	19,30	272,67
Basic metals	7,82	154,15	19,70	280,51	14,80	171,04
Metal products (Non machinery and equipment)	6,33	221,38	62,19	252,49	49,93	150,51
Machinery and equipment	10,11	160,19	26,59	121,56	24,72	107,13
Computer , Accounting and Office Machinery	0,00	213,36	214,29	266,07	164,38	204,11
Engines and Electric equipment	11,03	1317,67	19,45	112,91	30,58	83,97
Audio, video, TV, and communication equipment	90,13	411,80	81,92	491,07	22,87	337,99
Medical, Ophtalmic, watches, clocks,etc.	12,51	190,54	17,99	196,90	20,17	112,21
Motor vehicles and equipment	22,76	470,52	49,10	421,52	34,68	255,81
Other Transportation equipment	2,13	120,15	13,52	35,20	33,03	43,00
Furnitures and manufacturing industries	10,84	172,53	23,37	108,29	15,26	62,91

*in current thosands of US$

Source: CEPAL, INDEC, SeCyT (1998), (2003)

2. Economic rationale for government support

- Partial appropriability and credit market problems affects innovation decisions.
- How serious are these problems? Critical input to motivate and design public policy!!
- Relationship between size of the firm and innovation expenditures.
- Argentina credit crises and the response of R&D vs other innovation expenditures.
- Evidence on social rate of return of R&D for Chile.

Argentina: evidence of non linear relationship between size and R&D expenditures

Argentina: Quantitative impact on R&D/employee

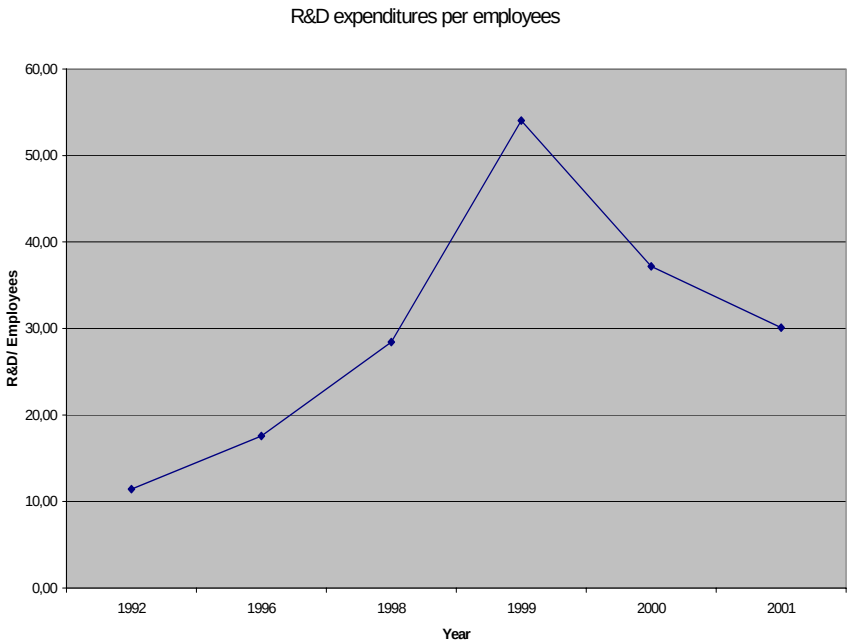
Explanatory variables	**mean X**	**Estimated marginal effec**	**Estimated change (10% increase in X)**
Firm level determinants			
Size	212	0,0589	1,14
Size square		-0,00001	
market share	0,033	47,3	0,15
foreign part	14,01	0,14	0,19
Industry level determinants			
Concentration	0,72	-20,75	-1,494
tariffs	0,17	-95,6	-1,6252
Skill	0,32	50,53	1,61696
VBP	1,61E+09	-	-
Fontar	0,027	62	62

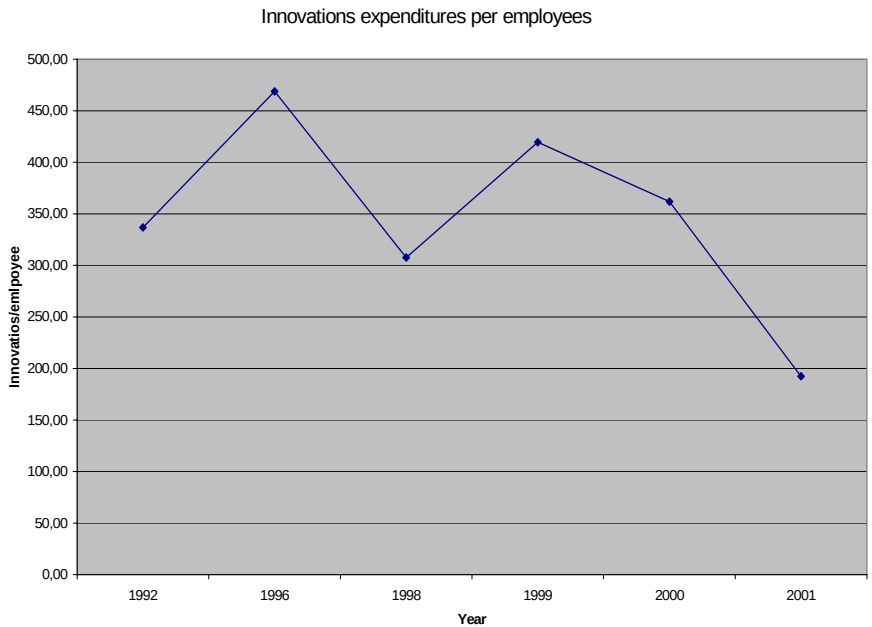
Argentina: evidence of non linear relationship between size and Innovation expenditures

Argentina: Quantitative impact on TEIA/employee

Explanatory variables	mean X	Estimated marginal effect	Estimated change (10% increase in X)
Firm level determinants			
Size	212	0,471	9,09
Size square	44944	-0,00009	
market share	0,033	1138,9	3,75837
foreign part	14,01	2,0488	2,8703688
Industry level determinants			
Concentration	0,72	-172,17	-12,39624
tariffs	0,17	-	-
Skill	0,32	544,47	17,42304
VBP	1,61E+09	-	-
Fontar	0,027	323,7	323,7

Argentina. Evidence on innovations expenditures and macroeconomic fluctuations: funding gap?





3. Policy instruments

- Policy section does not offer a discussion of two types of policies instruments quite relevant for developing countries:

  a) Intellectual property laws (IP): How does the design of IP affects the trade off between larger possibilities of using established technologies vis-à-vis incentives to generate new ones?

  b) Design and evaluation of government support schemes (tax brakes, soft credit and grants)

- Large literature on impact evaluation of public subsidies for R&D (matching grants). There are problems even without considering corruption. Self selection problem: sometime these programs are not effective in raising R&D expenditures (public funds crowd-out private resources).

3. Policy instruments: evidence on impact of public R&D subsidies

- Wallsten (2000) studies a US program on small, high-tech firms and finds that the SBIR grants crowded-out private R&D one-to-one. Czarninitzki et al (2002) studies the effect of these subsidies in the service sector in Germany and find a strong additionality effect. The evidence of Busom (2000) for Spain is mixed (30% of firms reduced expenditure while the rest increased it. Douguet (2003) finds no crowding-out effect in the case of France but no additionally effect. **Lach (2002) finds, in the case of Israel, a strong stimulating impact for small firms but not for large enterprises**. Finally, Benavente (2003) found evidence of a strong additionality in the case of Chile.
- FONTAR program in Argentina: included three types of instruments: soft credits, tax deductions and direct subsidies. 1997-2001

3. Policy instruments: FONTAR program in Argentina

- FONTAR was in full operation from 1997 onwards. We find that this variable comes out positive and significant when included as another regressor, but we suspect that this result can be affected by a selection (endogeneity) bias.

- We perform a Difference in Difference (DID) estimation. In this case, the FONTAR variable does come out positive and significant for R&D expenditures, but we don't find any positive impact for total innovation expenditures.

- The same conclusion comes when we applied Matching Methods to select for each treated firm a matched individual (or group of individuals) within the non-participating firms. The computed mean difference in R&D expenditures between the treated and the selected control firms comes out significant.

- We finally combined matching methods and DID when we compare the before and after difference in the R&D and innovation outlays for each treated and matching control observation. The result again suggests that the FONTAR program has had a positive effect on R&D expenditures (and none on total innovation) of around 50 to 70$ pesos per employee.

4. Concluding remarks

- Very interesting paper that makes the point that innovation should aim maximizing local spillovers and applications in order to be growth enhancing.
- Developing countries are already taken steps in designing public policies to solve market failures affecting innovation activities. Ej. Fontar program in Argentina.
- Results of these programs need to be evaluated but there is some preliminary evidence of positive impact. Nevertheless these issues are not even solved in developed countries (Israel?)