

Innovation Inputs and Outputs in Argentine Manufacturing Firms in Bad Times (1998-2001)

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Innovation Activities in Argentine Industry

- # The changing macro environment and the structural reforms applied in the 1990s led to heterogeneous responses among firms in the manufacturing industry
 - While many firms went bust, a substantial number of them survived and even innovated

During the growth period, innovation expenditures increased from 3 to 3.7 % of sales in 1992-96 (first innovation survey)

*Was this trend modified by the recession that begun in 1998?
Have innovation activities persisted during bad times?*

Innovation in Bad Times (1998-2001)

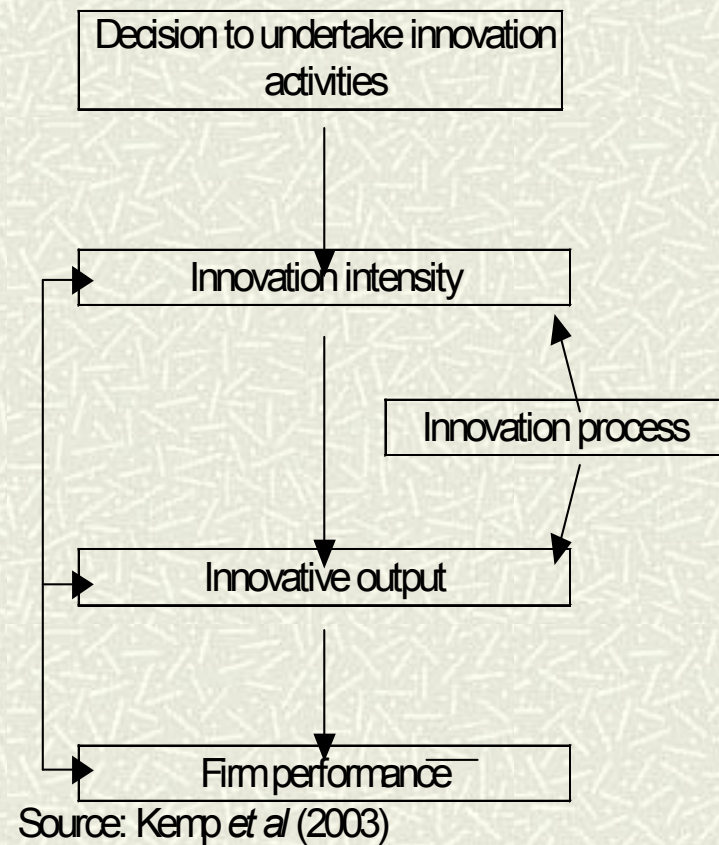
- # In an adverse macroeconomic environment we expected a fall in output and employment and a drastic reduction in innovation expenditures in 1998-2001
 - # This is clearly reflected in the data from the Second Innovation Survey. However, this declining trend does not apply to in house innovation activities (R&D)
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Objectives of the Paper

- # To analyze the data from the Second Innovation Survey (1998-2001) in order to identify:
 1. The determinants of both the decision to undertake innovation activities and their intensity at the firm level
 2. The determinants of the innovative output
 - In particular, to capture substitution or complementary effects of the different innovation inputs into the innovative output
 3. The impact of innovative output on firms' productivity performance
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The Conceptual Framework: The Stages of the CDM Model

- # Most recent papers have followed the conceptual framework set by Crepon, Duguet and Mairesse (1998).
- # The model is appropriate for analyzing innovation surveys



The Stages of the CDM Model (Applied to the Argentine Case)

- # Innovation intensity includes average expenditures in R&D and in embodied and disembodied technologies (domestic and foreign), per employee, during 1998-2001
 - # Firms with positive innovative output are considered innovators. Output is measured by the intensity of **innovative sales** of new or substantially modified products (for the firm and the national market) during 1998-2001
 - # Firm performance is measured by sales per employee in 2001
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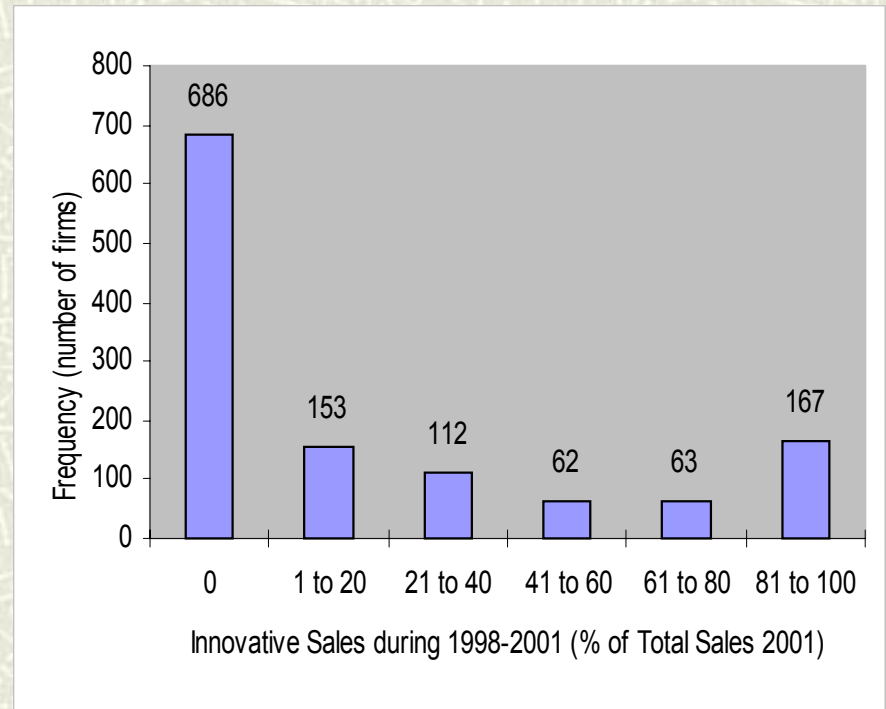
Basic Data – Innovation Inputs

	1998		2001	
	Average*	%**	Average*	%**
<i>All surveyed firms (1243)</i>				
Total Expenditures	4.52	51.3	3.15	54.1
In house R&D	0.84	24.7	0.97	26.6
<i>Innovators (557 firms)</i>				
Total Expenditures	4.55	76.7	3.35	79.7
In house R&D	0.9	46.1	1.02	47.4
* Expenditures as a percentage of total sales. Calculated for firms that report a positive value for the respective variable. ** Percentage of firms that report a positive value for the respective variable				

- ✓ More than half of the firms have innovation expenditures and a quarter perform R&D
- ✓ Total innovation intensity decreased since 1998, but the opposite occurred with R&D
- ✓ Although these trends are similar between innovators and non-innovators, the respective figures are substantially higher for the former
- ✓ Innovators have more cooperation linkages than non innovators
- ✓ Innovation activities mainly take the form of technology acquisition (mostly embodied)

Basic Data – Innovation Output

- # 45% of the surveyed firms are Innovators (i.e. firms reporting positive innovation output during 1998-2001)
- # Among innovators, average innovation output during 1998-2001 was 52% of sales



- # Large and foreign owned firms have a larger presence among innovators

Basic Data – Firm Performance

■ As compared with non innovators, innovators have higher productivity; employ more skilled people; export & import more often.

	1998		2001	
	Average*	%**	Average*	%**
<i>All surveyed firms (1243)</i>				
In terms of total employees				
Sales*** (pesos)	128599	100	109367	100
Skilled labor (%)	33.7	100	35.3	100
In terms of total sales (%)				
Exports	21.9	50	23	53.4
Imports	17.3	60.3	15.5	60.3
<i>Innovators (557 firms)</i>				
In terms of total employees				
Sales*** (pesos)	148828	100	139373	100
Skilled labor (%)	38.4	100	40.5	100
In terms of total sales (%)				
Exports	20.1	62.8	20.6	67.1
Imports	17.1	74.9	16.3	74.3

* Calculated for firms that report a positive value of the respective variable.

** Percentage of firms that report a positive value of the respective variable.

*** Excluding sales of goods produced by third parties.

Main Findings (I)

Econometric Analysis

1. Firm's productivity performance increases with innovative output intensity
 2. R&D and technology acquisition have complementary roles regarding the innovation output of manufacturing firms during 1998-2001 (continued in next slide)
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Main Findings (II)

Econometric Analysis

Variable	Significant impact on	
	Probability of innovating	Intensity of innovative output
R&D	Moderate	No
Continuous R&D	High	Moderate
Embodied Technology		
Foreign	No	High
Domestic	No	Low
Disembodied technology		
Foreign	No	No
Domestic	No	No

Among innovation inputs, while R&D activities are required to innovate, (foreign) embodied technology acquisition is the main determinant of the intensity of the innovative output

Other findings (I)

Econometric analysis

- # Large firms are more prone to have innovation expenditures than small firms, but their innovative efforts are less intense
 - # Among the interactions firms establish with other agents and institutions for undertaking innovation activities, linkages with suppliers seem to be the most relevant
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Other findings (II)

Econometric analysis

- # Foreign owned firms have higher probabilities of spending in innovation activities but the intensity of the latter does not differ *vis a vis* domestic firms
 - # Labor skills and exports have a positive impact both on the probability as well as on the intensity of the firm's innovative effort
 - # The same happens for firms operating in R&D intensive sectors
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Further Research

- # To compare firms' behavior in both innovation surveys in order to analyze the impact of the different macro environments
 - # To test the impact of policies such as R&D tax credit
 - # To study the obstacles to the innovation process such as limited access to credit and lacking or weak linkages
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