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New Stuff or Better Ways: What Matters to Survive International Markets?

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Outline of the Presentation

- Introduction
- Hypotheses
- Data and Methods
 - Results
- Final Words

Introduction

- Bi-directional relationship between innovation and exports
- Firm level perspective: firms PREPARE (innovation before) or RESPOND (innovation after).
- Main idea: QUALITY (new products) or PRICE (efficiency)
- Previous literature tends to focus on product and process innovation (Schumpeter). Here we have FOUR types grouped in two categories:
 - Innovation that delivers new stuff to satisfy the taste of more demanding clients (PRODUCT)
 - Innovation that improves the way that the old stuff is produced, marketed, or delivered (PROCESS, ORGANIZATION, COMMERCIALIZATION).
- Focus on small, middle-income, open economy: URUGUAY

Hypotheses

- **H1:** Product innovation affects the exporting status of firms more than the other forms of innovation.
- **H2:** Productivity-enhancing (cost-reducing) innovations affect the exporting status of firms more than product innovation.
- **H3:** Exporting mainly increases the probability of product innovation compared to other forms of innovation.
- **H4:** Exporting mainly increases the probability of productivity-enhancing innovations compared to product innovation.

Previous Research

- Exporting firms are more productive, bigger, more capital, and pay higher wages (Aw and Hwang 1995; Bernard and Jensen 1999; Cassiman et al. 2010; Clerides et al. 1998; Delgado et al. 2002).
- Strong and positive correlation between innovation, exporting and performance. Three non-exclusive hypotheses:
 - **(1) self-selection** (Eliasson et al. 2012; Love and Roper 2015; Monreal-Pérez et al. 2012; Ricci and Trionfetti 2012; Wagner 2007; Bernard and Jensen 1999; Melitz 2003).
 - **(2) conscious self-selection or anticipation** (Alvarez and Lopez 2005; Van Beveren and Vandenbussche 2010).
 - **(3) learning-by-exporting** (for Uruguay: Barboni, Ferrari, Melgarejo, and Peluffo 2012).

Previous Research

- Innovation and exporting propensity:
 1. Many studies show a **positive impact** of innovation on exports (Cassiman et al. 2010; Leonidou et al. 2007; Monreal-Pérez et al. 2012; Wagner 2007).
 2. **Self-selection**: more productive firms are more likely to engage in both activities (Ganotakis and Love 2011).
 3. Some studies found **no evidence** that either product or process innovation increase the probability of exporting (Damijan et al. 2010).
- Exports are expected to affect innovation:
 1. **Stronger competition** would force firms to improve products and processes.
 2. Exposure to **foreign knowledge** and information from foreign customers (Salomon and Shaver, 2005).
 3. Exporting firms can benefit from **economies of scale** that make costly innovations more profitable (Pla-Barber and Alegre 2007; Rodil et al. 2015).

Data and Methods

- Innovation Activities Surveys (Encuestas de Actividades de Innovación en la Industria – EAI)
- 1998-2000; 2001-2003; 2004-2006; 2007-2009; 2010-2012.
- Two inclusion criteria: forced and random.
- Mandatory response for sampled firms (+/- 90% compliance)
- Unbalanced Panel
- 1,678 privately owned firms; 275 are observed throughout the full period; 517 firms are observed only once
- Empirical Methods
- Panel LOGIT: Conditional Probabilities
- Matching Differences in Differences (MDiD): Causality
- Alternative Specification: Panel Regression, Tobit, Instrumental Variables.

Descriptive Statistics

Main characteristics of sampled Firms.

Main characteristics of firms according to exporting and innovation status (2003-2012)

	Non-Exporters		Exporters	
	Non-Innovators	Innovators	Non-Innovators	Innovators
Age of the Firm	25.1	29.3	29.9	35.9
Avg. Workers	31.5	58.5	107.8	181.4
Avg. Share of SkW	8.2	12.4	8.7	12.8
Avg. Sales	34.9	87.2	279.1	540.1
Sales/Worker	1.0	1.1	4.3	3.6
Avg. RnD per Worker	0.0	0.8	0.0	1.7
Foreign Capital	3.2%	6.3%	22.6%	28.3%
Work in FC Firms	6.0%	16.3%	39.2%	34.7%
Sales in FC Firms	12.0%	34.1%	54.1%	46.3%
Frequency (OBS)	1,365	733	518	769

Number of Observations by Types of Innovation

Product	Process	Organization Commercialization			
		NO	NO	YES	YES
		No	Yes	No	Yes
NO	No	1,996	33	98	29
	Yes	280	24	132	48
YES	No	134	16	27	8
	Yes	286	54	109	190

No Innovations	1,996	1,468	Any Innovation
Only Product	134	644	Any but Product
Product and Other	690	48	All but Product

Results: Part 1

The impact of innovation activity on export behavior

LOGIT model: Export activity

Innovation (t-3)	0.311*	0.345**					
	(0.168)	(0.172)					
Only Product (t-3)			-0.0245	0.125			
			(0.380)	(0.367)			
Product and Other (t-3)			0.232	0.250			
			(0.206)	(0.209)			
Any but Product (t-3)			0.439**	0.471**			
			(0.206)	(0.211)			
Product Inn. (t-3)					-0.182	-0.149	
					(0.204)	(0.205)	
Process Inn. (t-3)					0.220	0.150	
					(0.202)	(0.206)	
Org. Inn. (t-3)					0.372*	0.428*	
					(0.222)	(0.224)	
Comm. Inn. (t-3)					0.0984	0.180	
					(0.261)	(0.259)	
Observations	1,879	1,879	1,879	1,879	1,879	1,879	
Ids	1,089	1,089	1,089	1,089	1,089	1,089	

Control Variables Lagged Exports (**Binary** or **Categorical**); Lagged workers; Shrae of Skilled Workers; Lagged sales; Foreign Capital; Industry; Year.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Comments on Panel LOGIT

- Regularities that transcend any particular specification:
 - lagged export status increases the likelihood of current export status.
 - larger firms in terms of employment and/or sales are more likely to export.
 - the share of skilled workers has no significant impact.
- Relationship between innovation and exporting depends on how the treatment is defined:
 - Single binary variable: positive and significant impact.
 - Four types separated: only organizational innovation (**multicollinearity**).
 - Any innovation –other than product- is the strongest predictor of exporting status (**Hypothesis 2**).
- **Further support:** process, organization, and commercialization is the only category with strong positive coefficient statistically different from zero in all specifications (Table 5.2 in Paper).

The impact of the different types of Innovation on Export Behavior using MDiD

Matching Method	Treated	Control	Difference	S.E.	T-Statistic
Nearest Neighbour (1)	0.40	0.36	0.04	0.08	0.53
Nearest Neighbour (3)	0.40	0.33	0.07	0.06	1.08
Nearest Neighbour (5)	0.40	0.33	0.07	0.06	1.15
Kernel Matching (Epan)	0.39	0.35	0.04	0.06	0.75
Local Linear Reg (Epan)	0.40	0.36	0.04	0.08	0.49

NO Causal Relationship

- First time innovation yields NO significant results.
- Firms that introduced innovations for the first time during the observation period are not more likely to export.
- Previous results cannot be given a causal interpretation.
- We can only conclude that there is a correlation between innovation activities and participation in exports markets.

Export Propensity

- Panel data regressions show no significant relationship between innovation –neither defined as a binary variable nor as investment in R&D over sales- and export propensity.
- Alternative specifications were also considered. Such as defining the outcome as the first difference in export propensity:

$$Y = Exp_t - Exp_{t-3}$$

...or as the rate of exports growth between observations:

$$Y = \ln(Exp_t / Exp_{t-3})$$

- None of these models produced significant results.

Export Propensity (XTREG)

	RE	FE	RE	FE	RE	FE
Innovation (t-3)	1.354 (0.927)	0.160 (1.012)				
RnD/Sales (t-3)			0.139 (0.168)	0.0785 (0.198)		
Only Product (t-3)					3.093 (2.009)	2.951 (2.141)
Product and Other (t-3)					2.451** (1.135)	1.447 (1.240)
Any but Product (t-3)					0.436 (1.058)	-0.729 (1.124)

Control Variables (t-3) Number of workers; Share of Skilled Workers; Ln(Sales/workers); Foreign Capital; Industry; Year.

TOBIT Model / IV Regs

- Export propensity is a non-negative outcome and 60% of observation are zeros → → → **TOBIT**
- **Innovation** is positively related with export propensity.
- **Product and other** shows the stronger correlation with export propensity.
- **Endogeneity** → → **IVREG**
- We instrument innovation status using lagged innovation.
- Significant results depending on specification. Coefficients are stronger when **two lags** are included as instruments.

Export Propensity (TOBIT)

	1	2	1	2	1	2
Innovation (t-3)	7.608*** (2.949)	7.608** (3.263)				
RnD/Sales (t-3)					0.392* (0.210)	0.392** (0.176)
Only Product (t-3)			0.566 (6.852)	0.566 (7.069)		
Product and Other (t-3)			9.911*** (3.470)	9.911*** (3.735)		
Any but Product (t-3)			6.245* (3.542)	6.245 (3.881)		
Control Variables (t-3)	Number of workers; Share of Skilled Workers; Ln(Sales/workers) (2); Foreign Capital; Industry; Year.					

Export Propensity (IVREG2)

	IN=IN(t-1)		IN=IN(t-1)+IN(t-2)	
Innovation	7.524 (6.399)	12.73* (7.597)	11.97 (8.684)	21.91** (9.942)
Employees 20-300	-8.134*** (2.175)	-0.213 (2.539)	-8.467** (3.435)	-3.682 (4.021)
Employees100+	-4.373 (4.087)	13.04*** (4.550)	-5.812 (5.477)	5.442 (6.520)
Share of Skilled		-0.0561 (0.0778)		-0.146 (0.102)
Log of Sales	7.027*** (1.040)		6.352*** (1.425)	
Log (Sales/Worker)		8.712*** (1.251)		8.167*** (1.713)
Foreing Capital	16.22*** (3.381)	15.11*** (3.705)	17.19*** (3.878)	17.11*** (4.157)

Results: Part 2

The impact of export behavior on innovation activity

LOGIT model: Innovation activity

Export (t-1)	-0.00367 (0.128)		-0.0354 (0.129)		-0.0255 (0.135)	
Export 1-49% (t-1)		0.161 (0.139)		0.129 (0.140)		0.129 (0.145)
Export 50-89% (t-1)		-0.157 (0.207)		-0.169 (0.208)		-0.147 (0.215)
Export 90-100% (t-1)		-0.607*** (0.215)		-0.643*** (0.216)		-0.614*** (0.223)
Observations	1,881	1,881	1,881	1,881	1,881	1,881
Ids	1,089	1,089	1,089	1,089	1,089	1,089

Control Variables Lagged Innovation (different specifications); Lagged workers; Share of Skilled Workers; Lagged sales; Foreign Capital; Industry; Year.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

LOGIT model: Innovation activity

	Product Innovation		Process Innovation		Organization Innovation		Commercialization Innovation	
Export (t-1)	0.238 (0.182)		0.0764 (0.138)		-0.0367 (0.166)		0.118 (0.219)	
Export 1-49% (t-1)	0.334** (0.160)		0.0563 (0.143)		-0.0503 (0.171)		0.165 (0.219)	
Export 50-89% (t-1)	-0.179 (0.240)		0.180 (0.208)		0.00315 (0.241)		-0.0701 (0.313)	
Export 90-100% (t-1)	-0.450* (0.263)		-0.314 (0.223)		-0.185 (0.272)		-0.335 (0.365)	
Observations	1,881	1,881	1,881	1,881	1,881	1,881	1,830	1,830
Ids	1,089	1,089	1,089	1,089	1,089	1,089	1,061	1,061

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Comments on Panel LOGIT

- No incidence of previous exporting status on current innovation activities regardless of specification.
- Unexpected negative association between high export propensity (90-100%) and innovation activity:
 - Not significant when only firms with foreign capital are included.
 - Negative and highly significant if only locally owned firms included.
 - Negative association related exclusively to product innovation.
- High propensity correlates with less **product innovation** and not more. Low export propensity seems to increase the probability of introducing new products.

NO CAUSAL RELATIONSHIP (**MDiD**)

Final Words

Discussion and Conclusions

Concluding Remarks

- Lagged innovation correlates favorably with exporting.
 - Product innovation is not the type of innovation that better anticipates the probability of exporting (unlike developed countries).
 - Reducing production costs is at least as important as generating new products in order for Uruguayan manufacturing firms to export.
- Causal interpretation is NOT supported by MDiD models.
- The link from previous exporting status to current innovation activities cannot be verified.
 - LOGIT: positive association between low export propensity and innovation; negative for high export propensity (**primary goods**)
 - No CAUSAL relationship.



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