Innovation and Foreign Ownership

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WEB APPENDIX: NOT FOR PUBLICATION

Table S1: Variable Definitions

Variable	Survey Question number	Question wording (highlighted as in the original questionnaire)
Foreign	A11	State whether there was some **foreign participation** in the company's capital, directly or indirectly (through a company in which over 50 percent of the capital is in foreign hands), and its percentage.
Process Innovation, New Machines, New Methods of Organizing Production, Both	E8	State whether the company introduced some important modification in the production process (**process innovation**). If so, state whether it consisted of: 1. Introduction of new machinery 2. New methods for organizing production 3. Both
Product Innovation	E7	State whether the company has undertaken **product innovations** (completely new products, or with such modifications that they are different from those produced earlier).
Assimilation of Foreign Technologies	E3_3	State whether the company carried out or contracted efforts for assimilating imported technologies.
Export via foreign parent	F3_3	State whether the company used each one of the following mechanisms as a way of gaining access to international markets: 1. It has its own resources (agents' network, branch, delegation or affiliated company) 2. It uses a parent company established abroad (companies with foreign capital) 3. It uses a specialized intermediary established in Spain 4. It participates in some kind of collective action for exporting (industry-wide export agreement, exporters' association or export cooperatives) 5. Other (specify)

Notes: Variable definitions are given as in the 2002 questionnaire, which is available at ftp://ftp.funep.es/ESEE/pet_extr/c-esee02.pdf. Firms are asked the same questions in other years.

Table S2. The Selection Decision: Probit Specification

Productivity Measure	Ln Sales			Ln Labor Productivity		
Panel A: The probability of being acquired during the sample period	1a	2a	3a	4a	5a	6a
Base year productivity	0.363***		0.414***	0.374***		0.584***
	(0.0248)		(0.0469)	(0.0662)		(0.100)
2nd quartile Base year productivity		0.997***			0.410***	
		(0.255)			(0.127)	
3rd quartile Base year productivity		1.234***			0.473***	
		(0.247)			(0.126)	
4th quartile Base year productivity		2.011***			0.684***	
		(0.239)			(0.123)	
Exporting firm in base year			0.128			0.619***
			(0.0983)			(0.0863)
Exporting in base year*Base year productivity			-0.0977*			-0.428***
			(0.0551)			(0.128)
Observations	3354	3354	3354	3265	3265	3265
Pseudo R-squared	0.222	0.213	0.225	0.0732	0.0730	0.121
Panel B: The probability of being acquired in a given year	1b	2b	3b	4b	5b	6b
Lagged productivity	0.277***		0.330***	0.355***		0.481***
	(0.0205)		(0.0377)	(0.0659)		(0.126)
2nd quartile Lagged productivity		0.588***			0.181*	
		(0.193)			(0.108)	
3rd quartile Lagged productivity		1.017***			0.463***	
		(0.183)			(0.0998)	
4th quartile Lagged productivity		1.460***			0.677***	
		(0.179)			(0.101)	
Lag Exporting firm			0.104			0.493***
			(0.0856)			(0.0786)
Lag Exporting firm*Lagged productivity			-0.0903**			-0.280*
			(0.0444)			(0.146)
Observations	19786	19786	19750	19457	19457	19421
Pseudo R-squared	0.174	0.161	0.173	0.0831	0.0924	0.108
Industry FEs (both Panels) and year FEs and industry trends (in Panel B)	yes	yes	yes	yes	yes	yes

Notes: Foreign is an indicator variable that equals one if the firm has at least 50-percent foreign ownership. Base year (lagged) ln Sales is the natural logarithm of the firm's real sales, relative to the industry mean, in the first year the firm appears in the sample (one year prior to the dependent variable). Base year (lagged) labor productivity is the natural logarithm of real value added per worker, relative to the industry mean, in the first year the firm appears in the sample (one year prior to the dependent variable). Exporting firm in base year equals one if the firm was an exporter in the first year it appears in the sample. Lag Exporting firm equals one if the firm was an exporter the previous year. The first year the firm appears in the sample is dropped from all regressions. Panel B regressions condition on the firm being not foreign-owned in the previous year. Standard errors are clustered by firm. * indicates 10% significance; ** 5% significance; *** 1% significance.

Table S3: Productivity Regressions Including Innovation Variables

	Ln Value Added (1)	Ln Value Added (2)	Ln Value Added (3)
Ln Capital	0.102***	0.116***	0.116***
	(0.0131)	(0.0127)	(0.0231)
Ln Labor	0.723***	0.730***	0.759***
	(0.0285)	(0.0282)	(0.0542)
Process Innovation	0.0247***		
	(0.00315)		
Product Innovation		0.0197***	
		(0.00317)	
Assimilation of Foreign Technologies			0.0975***
			(0.0270)
Firm FEs	yes	yes	yes
Observations	19529	19529	5170
R-squared	0.261	0.258	0.292

Column 1 presents univariate probit regressions of the Foreign ownership dummy on the set of lagged variables used in the propensity score estimation, on all industries pooled (for the results shown in the paper, we estimate the propensity score by industry, to allow for different coefficients on the included variables). Column 2 presents the multivariate probit regression using the same variables, on all industries pooled. All regressions include industry dummies. The right-hand side variables are highly correlated, so that when we run the multivariate regression, many of them become insignificant. Note that lagged firm sales is the most significant determinant, consistent with our model. In the paper, the propensity score weights are obtained by estimating the multivariate regression for each industry separately. All regressors are balanced in all industries using the set of covariates in Column 2. When we used a more parsimonious specification, with fewer variables, some of the regressors were not balanced across blocks in some industries. These results are shown in Table S5, for a simpler specification of the propensity score.

Table S4: Probit model for propensity score estimation

	Foreign Univariate 1	Foreign Multivariate 2
Lag ln sales	0.240***	0.180**
	(0.0245)	(0.0906)
Lag labor productivity	0.260***	-0.0987
	(0.0619)	(0.0840)
Lag Sales growth	-0.0990	-0.185
	(0.117)	(0.149)
Lag export status	0.498***	0.109
	(0.0889)	(0.108)
Lag average wage	6.20e-07	1.27e-07
	(3.77e-07)	(6.06e-07)
Lag Innovation	0.221***	0.0717
	(0.0752)	(0.0953)
Lag Stock of Innovation	0.0171	-0.0336*
	(0.0132)	(0.0200)
Lag ln capital	0.215***	0.0537
	(0.0217)	(0.0938)
Lag ln capital per worker	0.284***	0.0945
	(0.0389)	(0.0938)
Year		-0.0188
		(0.0115)
Industry FEs	yes	yes
Observations	15417	15417
Pseudo R-squared		0.151

This table re-estimates the propensity score regressions in the paper, using a parsimonious specification for the propensity score that includes only Lagged firm sales, Lagged labor productivity and year as controls when calculating the score. The score is again calculated by industry, to allow for differences across industries in the coefficients. In this case, the covariates are not balanced in some industries and blocks, which is why we chose a richer specification for the paper, where all covariates are balanced. However, as the table shows, the results are fairly robust when using this simpler specification for the score.

Table S5: Propensity score estimation when using only Lag Sales and Lag Labor Productivity in the score

	Process Innovation	Product Innovation	Assimilation of Foreign Technologies
Corresponding Col in Paper	Table 3 Col 5a	Table 3 Col 5b	Table 3 Col 5c
Lag Foreign	0.473**	0.142	0.0867
	(0.194)	(0.207)	(0.0577)
Observations	20545	20545	5406
R-squared	0.523	0.392	0.177
	Both	**New Machines**	**New Organization**
	Table 4 Col 5a	Table 4 Col 5b	Table 4 Col 5c
Lag Foreign	0.353**	-0.105	0.225**
	(0.154)	(0.0927)	(0.104)
Observations	20545	20545	20545
R-squared	0.266	0.372	0.153
	Exports/Sales	**ln Exports**	**ln Average wage**
	Table 7 Col 5a	Table 7 Col 5b	Table 7 Col 5c
Lag Foreign	0.0356	0.162	0.0426*
	(0.0252)	(0.178)	(0.0250)
Observations	20506	10808	20541
R-squared	0.066	0.140	0.240
	ln Sales	**ln Labor Productivity**	
	Table 8 Col 6a	Table 8 Col 6b	
Lag Foreign	0.124**	0.0596	
	(0.0532)	(0.0572)	
Observations	20545	20245	
R-squared	0.104	0.017	
Firm FEs	yes	yes	yes
Propensity score weighting	yes	yes	yes

Table S6. Foreign Ownership and Innovation: Restricted Sample

Panel A	Process Innovation			Both		
	1a	2a	3a	1a	2a	3a
Lag Foreign	0.564**	0.452**	0.446**	0.408**	0.366**	0.361**
	(0.229)	(0.211)	(0.226)	(0.193)	(0.166)	(0.170)
Observations	12,767	12,767	12,767	12,767	12,767	12,767
R-squared	0.485	0.516	0.534	0.230	0.290	0.299

Panel B	Product Innovation			New Machines		
	1b	2b	3b	1b	2b	3b
Lag Foreign	0.261	0.164	0.167	0.0400	0.0232	0.0201
	(0.245)	(0.234)	(0.238)	(0.105)	(0.111)	(0.116)
Observations	12,767	12,767	12,767	12,767	12,767	12,767
R-squared	0.359	0.406	0.412	0.329	0.349	0.370

Panel C	Assimilation of Foreign Technologies			New Methods of Organizing Production		
	1c	2c	3c	1c	2c	3c
Lag Foreign	0.146	0.0867	0.0898	0.116	0.0630	0.0648
	(0.100)	(0.0987)	(0.101)	(0.132)	(0.117)	(0.117)
Observations	2,886	2,886	2,886	12,767	12,767	12,767
R-squared	0.160	0.207	0.221	0.128	0.176	0.178

Firm FEs	yes	yes	yes	yes	yes	yes
Industry trends		yes	yes		yes	yes
Selection controls			yes			yes

Notes: Foreign is an indicator variable that equals one if the firm has at least 50-percent foreign ownership. The dependent variables are our measures of innovation (see Section 3 for details). Selection controls include lagged ln firm sales, lagged ln labor productivity, lagged sales growth, lagged export status, lagged average wage, lagged ln capital per employee, lagged ln capital. The sample includes only observations when contemporaneous and forward Foreign as well as all selection controls are non-missing, and coincides with the sample in column 4 of Tables 3 and 4, respectively. All columns include year fixed effects. Standard errors are clustered by firm. * indicates 10% significance; ** 5% significance; *** 1% significance.

Table S7. Access to Export Channel and Innovation: Restricted Sample

Panel A	Process Innovation		Product Innovation	
	3a	4a	1a	2a
Export via foreign parent	0.954***	0.853***	0.815***	0.792***
	(0.304)	(0.288)	(0.260)	(0.271)
Export	0.209	0.198	0.0261	0.0627
	(0.129)	(0.129)	(0.121)	(0.115)
Lag Foreign	0.828	0.612	-0.134	-0.186
	(0.648)	(0.584)	(0.434)	(0.379)
Export*Lag Foreign	-0.237	-0.249	0.0415	-0.146
	(0.672)	(0.611)	(0.513)	(0.455)
Observations	4,096	4,096	4,096	4,096
R-squared	0.485	0.517	0.359	0.409

Panel B	Both		Assimilation of Foreign Technologies	
	3b	4b	1b	2b
Export via foreign parent	0.848***	0.752***	0.297**	0.282**
	(0.281)	(0.251)	(0.116)	(0.114)
Export	0.0809	0.0683	0.0245	0.0253
	(0.0821)	(0.0800)	(0.0257)	(0.0254)
Lag Foreign	0.0183	-0.146	0.149**	0.117
	(0.451)	(0.419)	(0.0725)	(0.0738)
Export*Lag Foreign	0.241	0.345	-0.132	-0.143
	(0.475)	(0.444)	(0.0975)	(0.0972)
Observations	4,096	4,096	4,096	4,096
R-squared	0.238	0.301	0.172	0.210
Firm FEs	yes	yes	yes	yes
Industry trends		yes		yes

Notes: Export is an indicator variable that equals one if the firm exports any goods. Export via foreign parent is an indicator variable that equals one if the firm declares that it exports through a foreign parent. Foreign is an indicator variable that equals one if the firm has at least 50-percent foreign ownership. The dependent variables are our measures of innovation (see Section 3 for details). Selection controls include lagged ln firm sales, lagged ln labor productivity, lagged sales growth, lagged export status, lagged average wage, lagged log capital per employee, lagged log capital. The sample includes only observations when all selection controls are non-missing, and coincides with the sample in columns 5 and 3 of Tables 5 and 6, respectively. All columns include year fixed effects. Standard errors are clustered by firm. * indicates 10% significance; ** 5% significance; *** 1% significance.