DETERMINANTS OF EXPORTS INTENSITY OF INDUSTRIAL SMES IN ARGENTINA

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Abstract
This paper empirically explores small and medium enterprises export intensity dynamics in Argentina, over the 2004-2011 period, and its decomposition by regions and technology sectors. Evidence is presented about general determinants of the export intensity, defined as the exported share of total sales. Results confirm an export intensity contraction showing a larger size since 2007. High technology sectors present minor relative contraction, in the same way as central regions with large clusters and less costs. Finally, firm size effect differs across geographic region and technology sector.
Keywords: export dynamics, international trade, heterogeneity, panel data, censored data.
JEL classification: L25, C23, C24.

1. Introduction

Since the devaluation of its currency in 2002, Argentina underwent a process of economic growth driven by the increase of exports and the expansion of its domestic market. In this context the industrial firms found the right incentives to expand its sales both in the internal and the external market.

Until 2007-2008, Argentina presented a relatively high multilateral real exchange rate (MRER), which favored industrial exports. At that point, at least two facts came together that prompted an acceleration rate of Real Multilateral Exchange (MRER) appreciation path, as shown in Figure 1.1.

The first event was a marked positive acceleration in the terms of trade based on a positive shock on *commodity prices* (Graph 1.2). This pushed up exports of raw materials affecting the MRER through various channels related to the phenomenon of Dutch disease.[1]

Second, the Argentine economy converged to activity levels close to full employment around the same period. Together with the sustained, internal and external, demand push, this led to increased pressure on production costs (in particular, real wages), and on internal prices, in a context of economic expansion (Graph 1.3).

Other aspects of domestic economic policy, joined in. For a detailed analysis of the aforementioned channels see Carlino et to the. (2013), which explores the determinants of the appreciation on the RER at the macro level during the period pos-convertibility period in Argentina (2003-2012) and the aggregate effects on national productive structure.

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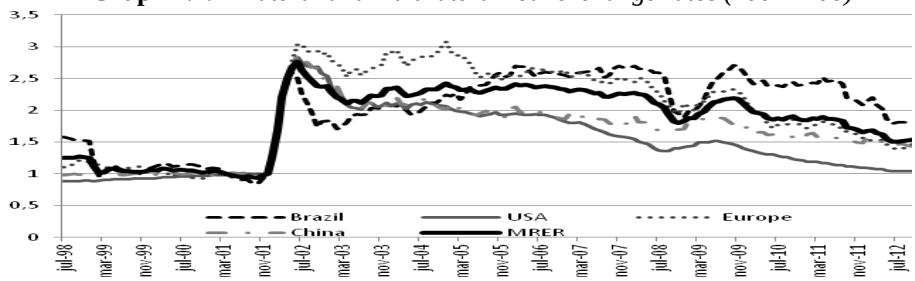
[1]The concept of Dutch disease generally refers to adverse effects on the tradable sector due to a persistent positive shock on primary sector, where the latter is the traditional export sector in a given country. Competitiveness in non-traditional export sectors, in particular the industrial sector, is reduced, and tend to shrink in terms of their relative importance in the productive structure of internal and foreign trade.

This paper empirically explores the dynamics of export intensity (EI), defined as the percentage of the value of total exports to total sales at the firm level, using micro survey data for small and medium-sized enterprises (SMEs) during the period 2004-2011. We track and quantify the export intensity behavior of SMEs, under the pressure of deteriorating relative prices in the nontraditional tradable sector. The focus augmented on the dynamics pre-post "*commodity price shock plus convergence to full employment events"* occurred in 2007. The approach addresses the factors that accentuate or weaken the external vulnerability of the SMEs in the industrial sector, in terms of its export performance. Firm size, geographical location and technological intensity are factors that affect differentially the external performance, within a context of aggregate reorientation of the industry towards the domestic market.

The results confirm a contraction in EI of SMEs at an aggregate (average) level throughout the period, with an increasing contraction from the year 2007. Within this aggregate behavior, high technology intensity sectors present a minor contraction relative to the rest of the sectors. The same happens to firms located in the Central territories, with greater agglomeration and lower costs, related to those located on more peripheral regions as the NEA (North East) and NOA (North-West). According to firm's scale *per se* results are disparate. At the aggregate level, smaller companies present a greater contraction on the export bias with respect to the larger scale firms. However, at the regional level, smaller-scale enterprises reduced their EI to a greater extent in the NEA region, while SMEs in larger scale did the same in NOA (North-West) and CUYO (Central West) regions. According to their technological intensity, firms with less intensity exhibit a greater contraction, while firms with higher technological intensity present a minor or no deterioration in the IE.

Graph 1.1. *Bilateral and multilateral real exchange rates (2001=100)*

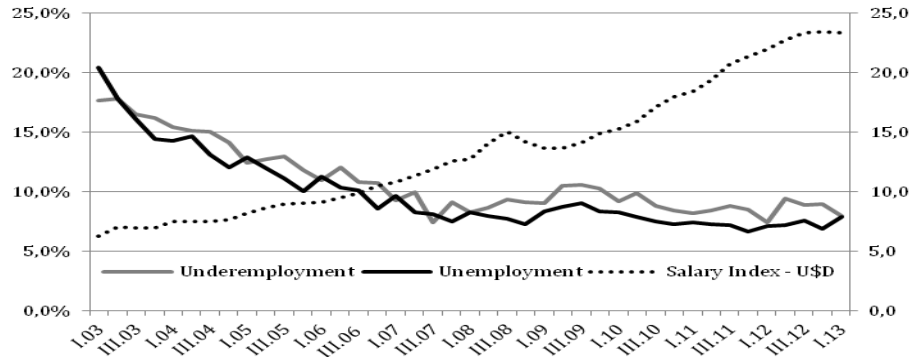


Source: Own elaborations based on Central Bank of the Republic of Argentina, and by adjusting the consumer price index on the basis of the average index of provinces.

Graph 1.2. *Commodity prices and terms of trade in Argentina (1993=100)*

Source: Economic information daily. National Direction of Macroeconomic Policy. Secretariat for Economic Policy and Development Planning. http://www.mecon.gov.ar/peconomica/basehome/infoeco.html Ministry of Economy and Public Finances. Argentina.

Graph 1.3. Unemployment and wages (in U$D)



Source: National Direction of Macroeconomic Policy. Secretariat for Economic Policy and Development Planning. Ministry of Economy and Public Finances. http://www.mecon.gov.ar/peconomica/basehome/infoeco.html

The paper presents two general contributions. Firstly, it tackles the effect of a systemic shock at the micro level, deviating from the standard aggregate/macro approach on export structures, to focus on industrial small and medium-sized enterprises. Secondly, it characterizes quantitatively the heterogeneous response at the level of regions and technological sectors, pointing that the aggregate pressures and macroeconomic incentives operate asymmetrically between groups of firms.

The empirical implementation uses data from the "Structural survey to industrial SMEs", containing data from surveys at the level of SMEs during the period 2004-2011 in Argentina[2]. Then it applies standard estimation methodologies for unbalanced and censored panel data.

The rest of the paper is structured in the following way. Section 2 discusses the theoretical framework and related literature. Section 3 describes and explores the variables employed in the estimation. Section 4 presents the results obtained with the empirical analysis and, finally, in section 5 we summarize the main conclusions.

2. Theoretical framework and related literature

Our framework has three main pillars. The first is linked to the effect of real exchange rate appreciation on the competitiveness of exports in general and the industrial sector in particular. These processes affect the profitability of the tradable sectors in general. Rodick (2008) finds that (relative) real depreciations promote growth and productive diversification in developing countries, and that real appreciations have the opposite effect.

Within this branch we find the cases when the appreciation process is induced by positive shocks on the terms of trade. More in particular, we find the appreciations lead by commodity price shocks, known as Dutch disease (Corden and Neary 1982).In this context, shocks positively affect exports leaned on the favored primary sector; however, they trigger the appreciation of the real exchange rate, negatively affecting the non-traditional export sectors, not favored by the improvement in the terms of trade. The evidence on this last channel is ambiguous in empirical terms. Both Carlino and others

[2] Survey is relieved by the Foundation *Observatorio PyME*, www.observatoriopyme.org.ar.

(2013) for the case of Argentina, and different studies at the international level (Ismail 2010), find that while the real appreciation occurs, the effect on exports and domestic production structures is ambiguous.

In this paper the focus at the SME level leaves out large *companies* linked to various forms of administered trade (such as the automotive sector) and concentrates on more dispersed sectors, not subject group negotiations and trade agreements. Within this group, we are able to better isolate the predicted mechanism, and the potential adverse effects on aggregate diversifications, and the sources of risks and vulnerabilities.

The second pillar relates to the effects of macroeconomic policies on heterogeneous firms due to differences in the cost structures, product differentiation and/or market power. The sources of heterogeneity affect firms' chances to survive in the different markets differentially. For example, Melitz (2003) and Melitz and Ottaviano (2006) extend the core *new economic geography* (gravity) model, to include idiosyncratic components at the firm level. These extensions add firm specific variables to explain the heterogeneity of export performance, such as firm productivity, to the common traditional determinants as *the size of the regional market and transport costs*. Melitz models a mechanism through which trade liberalizations can induce an increase in average productivity of exporting firms, shrinking the number of exporting firms that self-select to markets according to their idiosyncratic productivity. This has ambiguous effects on aggregate welfare at the country-level. In particular, the reduction of trade costs, in a context of monopolistic competition, presses the tradable sector and encourages firms to re-direct their production to the domestic market and in some cases to stop producing; only the most productive are able to sustain export markets.

The last pillar refers to the applied empirical research agenda oriented to the determinants of firms export performance. A first wave of empirical results based on micro data triggered objections to existing models of international trade and inspired new ones based on various forms of heterogeneity. In general, the results suggest the importance of intra-industry trade, the low participation of exporters on the total number of enterprises and production in a country, and the systematic differences between exporting firms and those dedicated to the domestic market. Bernard and others (2007) highlight that exporting firms are larger in number of employees and sales, more productive and use a different combination of inputs.

Recently, the agenda has included the measurement of the effect of systemic shocks of different duration on the performance of firms, which again returns questions to the established theoretical frameworks. Konings and Vandenbussche (2008), for example, explore firms heterogeneous responses to anti-dumping measures common to businesses in the European Union; they found that lower productivity companies are favored and increase their external participation and productivity, while the most efficient experience productivity losses. In another article, Manova (2013), models and explores the effect of shocks on credit (*financial frictions*) on the export performance of companies, finding that they affect firms through three channels: selection to the domestic market, selection to the export market, and the level of exports. Changing Stirbat, Record & Nghardsaysone (2013) find that experience and networks in export markets are the most important determinants to explain the survival of firms exporting.

The differences in technology, another source of firm heterogeneity at the sector level, present a growing development within the general framework that is used as a

reference. Part of this literature focuses on the relationship between export contents of skills, expertise and technology intensity, with the income per capita of the exporting country (Basu and Das 2011). Our work takes the sectors, grouped by firms' technological intensity, as a potential source of heterogeneity that may affect external performance, and evaluates the response at the firm level[3].

Finally, it is worth mentioning that the firm level empirical agenda has also thrived in Latin America in general and Argentina in particular. For example, Milesi and others (2007) developed an indicator of export success and apply it to 300 SMEs in Argentina, Chile and Colombia.

In this paper, we use a sample of more than 6000 firms that include about 40% of exporting companies. The data is first analyzed descriptively, and then moves on to implement an estimation strategy adequate to the data structure: unbalanced and censored panel date. This allows testing for the presence of heterogeneity on the unobserved component of error term, isolating significant explanatory variables and estimating their contribution to the export performance. It also allows breaking down the aggregate dynamics into relevant group sources of heterogeneity, focusing on regions, technology intensity and size of SMEs.

3. Sources of heterogeneity

The heterogeneous distribution of productivities and external competitiveness by sectors and regions, determine the possibility to explore areas of interest on the aggregate dynamics. By allowing costs parameters to vary by groups of firms clustered by regions or sectors, it is possible to isolate a relevant source of variability.

Heterogeneous production structures and technologies, with its corresponding fixed and marginal costs, may not be distributed evenly between sectors and regions. In this case, there will be sectors and regions most affected by the process of real exchange rate appreciation. Not all the regional economies have access to the same energy markets and costs, for example, nor do they face similar scale limitations in their local markets, or the same input quality and costs In addition, transport costs per se for marketing their products is a key variable in the cost structure, and affects differentially according to firms location.

This work considers the following determinants or sources of heterogeneity:

a) **firm scale or size.** Within the presented framework, firms' scale affects export decisions directly through profits before and after standard fixed costs, but also before/after (fixed and variable)[4] export costs. If there are no systematic differences in productivity types associated with firm size (e.g., geographical or sectoral *clusters*), a smaller scale must have a negative effect on average export intensity.

[3] We cannot estimate firm productivity due to limitations in the data. For detailed applications of the methodology, with the definition of required data, and references to the estimation of productivities see Arnold and Hussinger (2005).

[4] Export costs in Melitz (2003) for example are both fixed and variable. The first is modeled explicitly as f_e lump sum costs, while variable costs are modeled in the standard *iceberg transport costs framework*, with exports melting firms' export incomes (either prices or quantities) proportionally, $(1-\tau)$.

b) **geographic distribution of activities.** The size of the local market is one of the distinctive factors in the new economic geography that allows for agglomeration and *variety effects* in the product market. The extensions on the economics of agglomeration include also gains in productivity due to joint-actions, vertical and horizontal integration, availability (in cost and time) of inputs and resources, and other complementary and environmental variables. The environment thus affects firm's location decisions, its potential to survive and access foreign markets. These features that may trigger dynamic agglomeration economies are labeled as *home market effects*, giving rise to centripetal-centrifugal forces in the core-periphery relations with associated patterns of spatial distribution of economic activities and of the characteristics of intra-industry trade specialization and flows.

At the domestic level, these relationships also persist given the heterogeneous characteristics of the regions in terms of population, per capita income, location; these systematic differences are expected to emerge in the international trade patterns of diverse regions. More generally, there can be systematic differences in the cost structure between the average firms in different regions. In empirical terms, these factors can help explain systematic differences in cost structures and technology choices. For example, intensive technological structures in energy will be less viable in regions where the availability, quality and stability of power systems are relatively poorer.

c) **sector technology.** Heterogeneous technological structures are another source of distributional variability in *clusters*. In general the productive sectors present different cost structures, associated with differences in the intensity on the use of factors and inputs used; so each one may potentially react differently in response to a systemic persistent shock such as an appreciation of the real exchange rate. Technological heterogeneity can also affect efficient scale levels. Last, an importantly, product differentiation and margins (markups) are positively associated, and may buffer adverse shocks. Higher technological intensity brings about also market concentration that together with differentiation provides with greater flexibility margin/pricing firm policies.

Data description

We use data from the annual surveys conducted by the "Observatory for industrial SMEs" administered by the Foundation "Observatorio PyME". Data is collected based on firm-level standardized surveys forms, so that the information gathered is stable and homogeneous through time and firms. The main disadvantage lies in the potential biases of self-reporting mechanisms, and other forms of endogenous responses (including drop ins and outs of firms). The database covers all Argentinean regions over the period 2004-2011. The data structure is an unbalanced panel with a maximum of 7.426 observations, corresponding to 1.511 companies over the period, with an average de 4.2 observations by company.

Table 3.1 presents a brief description of the main variables used in the empirical part. The variable of interest is the percentage of total sales of a company that is sold abroad, *expo*.

Table 3.1. *Variable description*

Variable	Description

Expo	Participation of exports in total sales in %
employment	Employees to June of year *t*
use T-1	Employees to June of year t-1
Sales T-1	Annual amount of sales in T-1
t	Time variable in years coded as *t*= 0,..., 7, for 2004-2011.
Regions	Qualitative variable by region: AMD (Metropolitan Area), Center, West (Cuyo), NOA (North-West), NEA (North East) and South.
D.x	Dummies applied to x (regions, time)
Exporter	Dummy variable which takes the value 1 if the company exports at least in one year in the sample period
Transformations	Non-linear transformations (natural log) on variable *use T-1* and *T-1 sales*.

Note: Foundation Observatorio PyME, www.observatoriopyme.org.ar.

The variables *employment* and *sales* are scale controls, while they also control for flexible forms of technology, and labor-intensity. In the empirical specifications, these variables are used but lagged one period to reduce simultaneity and other endogeneity problems. The binary variable *exporter* takes value 1 if the company has exported at least once.

Table 3.2 *Summary statistics of the main variables*

Variable	Variación	Media	Desvío St.	Min	Max	Observaciones
Expo	overall	5.713645	15.533	0	100	Total = 6703
	between		14.982	0	100	Empresas = 2418
	within		5.993	-53.001	71.464	T-bar = 2.772
employment	overall	35.71009	38.303	0	429	Total = 6802
	between		40.240	0	400	Empresas = 2438
	within		10.920	-124.96	285.04	T-bar = 2.790
employment T-1	overall	35.43161	38.00	0	354	Total = 6719
	between		39.42	0	354	Empresas = 2425
	within		10.08	-89.57	209.77	T-bar = 2.771
Sales T-1	overall	6,595,283	1.38e+07	0	2.60e+08	Total = 5.820
	between		1.30e+07	0	1.79e+08	Empresas= 2.195
	within		5491054	-1.10e+08	1.23e+08	T-bar = 2.651
Exporter	overall	0.3983051	0.49	0	1	Total = 6962
	between		0.48	0	1	Empresas = 2459
	within		0	0.40	0.40	T-bar = 2.831

Source: Foundation Observatorio PyME, www.observatoriopyme.org.ar.
Note: T-bar represents the average number of years of observations by company. *Overall statistics* are obtained using the whole sample. W*ithin statistics are* variables obtained in deviation from group means (by company), while the *between* refers to differences in group means (firms).

Table 3.2 presents basic statistics of the main variables, including variability according to panel data standard classifications (within, between and overall). In the table, the variable *expo* includes all firms, both exporters and non-exporters; that explains the small average (only 5.7% export sales), which is driven by the large number of companies with zero exports.

Next, we define the criteria used to group firms according to their geographical location and technological characteristics (sectors).

i) geographic location indicator: each observation in the available database belongs to one of six Argentinean macro regions, available in the database. Regions include: AMBA (Buenos Aires Metropolitan Area), CEN (Center: between Ríos, La Pampa, Buenos

Aires, Cordoba and Santa Fe), CUYO (Center-West: La Rioja, Mendoza, San Juan and San Luis), NEA (Northeast: Chaco, Corrientes, Formosa, Misiones), NOA (Northwest: Catamarca, Jujuy, Salta, Santiago del Estero and Tucumán), SOUTH (Chubut, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego). In table 3.3, we present statistics associated to the variable of interest (*expo*) broken down by region and in three general categories: a) companies that have exported at least once throughout the period analyzed (*exporter*), with average of 14.7% of export to total sales, b) companies that exported in each year (*active exporter*) with a 19.6% and c) the whole population of firms, with an average of 5.7%. We can also appreciate the regional heterogeneity of exporting SMEs; for example, the North-East (NEA) and South regions stand out for their relative high participation of exports in the segment. These differences are accentuated if the sample is restricted to firms that have exported at least once *(exporter)* or those that effectively exported each year (active exporters).

Table3.3 *Exports to total sales (expo) by regions*

Region	Statistic	Exporter *	Active exporter*	Total
AMBA	Media	10.7	13.7	4.8
	Standard deviation	(14.9)	(15.7)	(11.3)
	Observations	1203	992	2676
CEN	Media	13.1	17.9	4.6
	Standard deviation	(19.8)	(21.4)	(13.3)
	Observations	660	535	1885
CUYO	Media	23.6	33.2	10.0
	Standard deviation	(30.9)	(31.7)	(23.2)
	Observations	455	430	1077
NEA	Media	25.2	34.7	8.0
	Standard deviation	(32.5)	(32.3)	(21.7)
	Observations	121	96	382
NOA	Media	8.1	13.8	1.7
	Standard deviation	(16.8)	(20.4)	(8.3)
	Observations	79	54	378
SOUTH	Media	25.0	32.8	7.8
	Standard deviation	(29.6)	(30.0)	(20.1)
	Observations	95	75	305
Total	**Media**	**14.7**	**19.6**	**5.7**
	Standard deviation	**(22.1)**	**(23.5)**	**(15.5)**
	Observations	**2613**	**2092**	**6703**

Source : Foundation Observatorio PyME, ww.obseratoriopyme.org.ar.
Note : Regions include: AMD (Buenos Aires Metropolitan Area), CEN (Center), CUYO (Center-West), NEA (northeast), NOA (Northwest), South. * the exporter column records the corresponding statistics for SMEs which have exporter at least once during the period of exhibition. * exporting active indicate that only the companies with variable strictly positive *expo* considered.

(ii) technological intensity indicator: from the sectoral point of view, we classify firms in groups according to the technological content of production; we follow the OECD classification criterion described in its report "*OECD Science, Technology and Industry Scoreboard 2005*". The OECD has computed several indicators to measure the

technological intensity of the manufacturing sectors; in this paper we use total expenditure in research and development (R&D), measured in terms of total value added by firm.

Table 3.4. *Industrial SMEs classification according to their technological intensity*

Variable	Description	ISIC Rev. 3
High-tech industries	*Computers and office machinery*	30
	Aviation equipment	353
	Pharmaceutical products	2423
	Medical, optical and precision instruments	33
	Radio, television and communication equipment	32
Medium-high technology industries	Transport equipment	34
	Machinery and electrical appliances	31
	Railway transportation equipment	352 + 359
	Chemicals (excl. pharmaceuticals)	24 exc. 2423
	Machinery and equipment	29
Medium-low technology industries	Coke, refining of petroleum and nuclear fuel	23
	Basic metals	27
	Construction and repair of boats	351
	Rubber and plastic products	25
	Other non-metallic mineral products	26
	Fabricated metal products, excluding mach.&equipment	28
Low-technology industries	Food, beverages and tobacco	15-16
	Manufacturing n.e.c.	36-37
	Spinning, textile products, leather and footwear	17-19
	Wood, pulp, paper products and printing	20-22

Note: Own elaboration based on OECD Science, Technology and Industry Scoreboard 2005.

In Table 3.4 we present the OECD classification used here, defined in terms of the ISIC Rev. 3, (International Standard Industrial Classification of All Economic Activities, Revision 3, from UNSTAT). We end up with a division of manufacturing industries into four groups: i) high technology, ii) medium-high technology, iii) medium-low technology and, iv) low technology. This grouping is carried out by establishing a ranking of industries based on the average intensity of the group, then confronted against the average of R&D for OECD firms (see OECD (2005) for details).

Table 3.5 presents a cross tabulation overview of the sample and variables. There, the reader can see the main features of the sample used in the empirical specifications. For example, according to technological content of production, more intensive technological firms have higher ratios of export to total sales. In the high-tech industries, 2 out of 3 companies exported, while in the low-level intensity the ratio falls to less than 1 of 3 firms. In terms of regions, spatial concentration is also appreciated, with the central regions (AMBA and Center) also exhibiting greater technological intensity concentration.

Table 3.5. *Classification of sectors according to technological intensity*

Variable	Variable	AMBA	CENTER	CUYO	NEA	NOA	SOUTH	Total
High-tech industries	*N ° of firms*	256	191	4	8	11	1	471
	N ° exporters	168	87	0	0	0	0	225
	Expo/sales	13.41	15.76	-	-	-	-	14.21
	Sales	9.43	10.09	0.66	0.45	2.74	-	9.24
	Employment	33.13	36.86	33,11	40.30	43.54	48.10	35.86
Medium-high technology industries	*N ° of firms*	720	529	124	16	65	41	1,495
	N ° exporters	460	305	74	4	17	23	883
	Expo/sales	12.10	12.98	1255	27.33	4.85	3.14	12.11
	Sales	6.66	8.60	4.75	0.61	5.18	6.59	7.05
	Employment	40.09	43.61	8.50	9.63	28.09	6.00	40,34
Medium -low technology industries	*N ° of firms*	1,031	592	225	43	98	69	2,058
	N ° exporters	464	180	58	5	13	16	736
	Expo/sales	8.58	10.54	7.56	4.53	4.21	16.45	9.05
	Sales	6.72	5.50	3.70	3.65	5.24	5.19	5.81
	Employment	30.16	38.27	27.38	7.63	40.12	50.20	33.57
Low-technology industries	*N ° of firms*	983	759	822	372	234	229	3,399
	N ° exporters	301	191	376	134	56	67	1125
	Expo/sales	9.14	14.64	27.60	25.78	11.04	35.06	19.97
	Sales	7.31	8.52	5.22	3.59	6.07	12.89	6.97
	Employment	31.19	32.54	27.46	31.29	44.84	40.24	32.14
Total	*N ° of firms*	2.990	2,071	1,175	439	408	340	7,423
	N ° exporters	1,393	763	508	143	86	106	2999
	Expo/sales	10.47	13.13	23.26	25.02	8.76	24.83	14.49
	Sales	7.14	7.82	4.87	3.39	5.62	10.49	6.82
	Employment	35.54	37,55	35.64	43.63	44.71	50.29	38.50

Note: OECD. **Source** : Foundation Observatorio PyME,www.observatoriopyme.org.ar. **Note**: The regions include: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUYO (Center-West), NEA (Northeast), NOA (Northwest), South. Sectors' classification is taken from OECD (2005) based on industries technological intensity in terms of ISIC Rev. 3 and the value of the ratio "R&D expenditure/value added".

There are no high-tech exporters outside the central regions. In the table, we can see that the share of exporters of the total number of companies is fairly homogeneous across regions, with more than 1 out of 3 firms with exports for all but the North-West (NOA) region with a proportion less than 1/4.

Table 3.5 also shows regional heterogeneity in the relationship between sales to the number of employees; there is a greater intensity in the use of labour in the regions of NEA and NOA, as opposed to lower and very similar ratios for both, Central (Center and AMBA), and southern regions; the CUYO (Center-West) region presents an intermediate level.

These dimensions suggest aggregate patterns in line with the discussion in the theoretical framework. In particular, regional exposure to negative systemic shocks via cost structures, differentiation levels, and technological adaptation is more marked in the NEA and NOA with respect to other regions. The Cuyo region presents an intermediate exposure.

4. Results

4.1. Export intensity

Specifications (1) to (6) of Table 4.1 model the aggregate dynamic of the percentage exported (i.e. export intensity) using the full sample of enterprises SMEs.

Table 4.1. *Regressions base and specification*

	(1)	(2)	(3)	(4)	(5)	(6)
Linear tend	-0.605***	-0.865***	-1.307***			
	(0.148)	(0.148)	(0.177)			
Log employment, T-1		13.37***	9.255***		13.57***	9.316***
		(0.762)	(0.950)		(0.764)	(0.950)
Log sales, T-1			3,784***			3.893***
			(0.545)			(0.545)
2005				-2.241*	-4.028***	-5,087***
				(1,347)	(1.332)	(1.398)
2006				-2.931 **	-4.630***	-6.708***
				(1.419)	(1.410)	(1.484)
2007				-4.698 ***	-7.276***	-9.142***
				(1,495)	(1502)	(1.605)
2008				-3.043**	-6.682***	-8.766***
				(1.407)	(1.407)	(1,506)
2009				-4934***	-7.894***	-1054***
				(1.464)	(1,458)	(1.599)
2010				-4.194***	-6820***	-9304***
				(1.425)	(1.413)	(1.546)
2011				-5.885***	-8.447***	-12.94***
				(1.445)	(1.444)	(1655)
sigma_u	37.07***	33.14***	32.52***	37.10***	33.15***	32.52***
_cons	(1.032)	(0.915)	(0941)	(1.032)	(0.914)	(0.938)
sigma_e	14.49***	14.19***	13.86***	14.45***	14.14***	13.79***
_cons	(0.276)	(0.276)	(0.291)	(0.276)	(0.275)	(0.289)
Observations	7144	6947	5997	7144	6947	5997
Groups	2470	2443	2211	2470	2443	2211
Metod. Estimate	Tobit PD	Tobit PD	Tobit PD	Tobit PD	Tobit PD	Tobit PD

Note . Dependent variable: exports on total sales. Log employment, T-1: natural logarithm of the number of workers employed at T-1. Log sales, T-1: natural logarithm of sales in T-1. Standard errors shown in parentheses with $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$. Method: Tobit PD (estimation method of random effects for censored panel data), estimated coefficients are reported. **Source:** Foundation Observatorio PyME, www.observatoriopyme.org.ar.

We can appreciate that export intensity has a decreasing moderate path for the whole sample period. This holds both using a linear trend and annual dummy variables.

The results suggests that SMEs as a whole show a gradual reorientation of sales to the domestic market, i.e., sales in the domestic market grow (shrink) faster (slower) than those aimed at international markets. It may be the case of firms actually decreasing exports and increasing sales into the domestic market. Unfortunately, we cannot tell any of these cases apart given the data available. The reduction of the export intensity fits what is expected to be found in a persistent process that combines the expansion of the domestic market with currency appreciation (via deterioration of relative prices of tradables to non-tradable goods).

4.2 Negative systemic shock and export intensity

With the above aggregate evidence of a moderate trend towards the reduction of the export intensity, the next step is to identify the effect of a systemic shock on the percentage exported. The goal is to determine a break, produced by a shock in relative prices that deepens the internist bias and "reorientation" of SMEs' sales. For this purpose, we include an indicator variable in the regression specifications using the timing of the aggregate commodity shock. Remember that in 2007 we observe the "boom" in commodity prices, exported by Argentina, coinciding with close to full employment internal macro environment (and full employment of installed industrial capacity).

Table 4.2 present results for specifications differing in the way to model the shock of relative prices.

Table 4.2 *Macroeconomic shock and dynamic performance*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
D. [2007-11]	-1.202***	-1501***			-1,028***	-1255***	-1.344***
	(0.193)	(0.222)			(0.294)	(0.340)	(0.261)
D. [2007]		-0.712***					
		(0.258)					
D. [2008-11]			-0.981***		0.083		
			(0.185)		(0.326)		
D. [2009-11]				-.913***	-0.475*		
				(0.186)	(0.246)		
Log employment, T-1	2.427***	2.41***	2.43***	2.41***	2.37***	2.461***	1.798***
	(0.235)	(0.791)	(0.235)	(0.236)	(0.236)	(0.626)	(0401)
Log sales, T-1	0.781***	0.812***	0.743***	0.727***	0.842***	0.332*	1.322***
	(0.129)	(0.129)	(0.129)	(0.129)	(0.133)	(0.199)	(0.187)
sigma_u	32.68***	32.63***	32.74***	32.79***	32.62***	32.11***	34.05***
_cons	(0.946)	(0.944)	(0.949)	(0.951)	(0.944)	(1.326)	(1.309)
sigma_e	13.85***	13.84***	13.89***	13.88***	13.86**	11.71**	15.32**
_cons	(0.291)	(0.290)	(0.292)	(0.291)	(0.291)	(0.342)	(0.492)
						(Employm., T-1) >= 36	(Employment, T-1) <= 37
Observations	5997	5997	5997	5997	5997	1843	4154
Groups	2211	2211	2211	2211	2211	729	1669

Note. Dependent variable: exports on total sales. Log employment, T-1: natural logarithm of the number of workers employed at T-1. Log sales, T-1: natural logarithm of sales in T-1. Standard errors in parentheses with $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$. Method: Tobit PD (estimation method of random effects for censored panel data); marginal effects reported. **Source:** Foundation *Observatorio PyME*, www.observatoriopyme.org.ar.

Throughout we use the same set of controls: *employment* and *sales* lagged one period. Comparing results one can appreciate that the 2007-2011 period captures the greatest negative effect on *percentage of exports*. This effect goes between 1.2 to 1.5 points fall in the percentage of exports to total sales, which has a mean equal to 19.5 in the sample of companies with positive exports. Therefore, the fall goes between 6.2% and 7.7% of total sales over the 2007-2011 period compared to the period to the average fall in 2004-2006.

The estimated effects are similar using two separate subsamples of firms, which differ in the number of employees, see models (6) and (7) in Table 4.2. Therefore the firm size does not influence the effect of the shock, once we control for the number of employees and sales of the previous year.

4.3. Heterogeneity by regions

The results discussed in the previous sub-section do not control for clustered variations between the geographical regions. The estimated effects are economically small or moderate. However, geographical asymmetries may systematically affect the variable of interest, given structural heterogeneities suggested by our theoretical framework and the descriptive statistics tabulations. Certain regions are a priori more likely to be negatively affected with respect to others.

This section aims to present results that demonstrate that the existence of regional heterogeneity significantly affects export intensity of the SMEs. In order to show this, we group companies according to their geographical location, forming six regional groups; then we estimate the effect of the percentage of exported sales of the systemic shock on relative prices.

We group firms according to their location into six regions: Buenos Aires Metropolitan Area (AMBA), Center Region (CEN), Region of Cuyo (CUY), northeast region (NEA), Northwest region (NOA), and South Region (South).

The left half of Table 4.3 (columns 1-6) shows a negative trend in our variable of interest, *expo*, for the full sample period 2004-2011. This holds for all regions, but for the southern region where the effect is non-significantly different from zero. In this specification the effect estimated only provides information on the average annual change of the percentage exported during the whole period. This annual average effect does not have a major economic significance. However, it is possible to observe a regional heterogeneity in this trend.

The right half of Table 4.3 presents the cumulative effect over 2007 – 2011. As in the previous table with the linear trend, all regions have a negative effect except the southern region (with no effect). At first glance, there is also some regional heterogeneity in the estimated coefficients, which indicate the effect in points over exports to total sales (varying between - 1 and - 4 approximately).

Given that the percentage of exports varies significantly between regions, the estimated coefficients *per se* are not a suitable to measure the relative magnitude of the effects. In order to assess the impact properly at the regional level, we report the effect in terms of average exports in the last two rows (right side) of the table 4.3 ("average % exp. Sales", calculated only with companies that do export) and the percentage that represents the marginal effect estimated on mean level ("% of the effect on the average").

Table 4.3. *Dynamic heterogeneity by regions: trend (left) and (right) systemic shock.*

Regions	(1) AMBA	(2) CEN	(3) CUYO	(4) NEA	(5) NOA	(6) SOUTH	(7) AMBA	(8) CEN	(9) CUYO	(10) NEA	(11) NOA	(12) SOUTH
Log empl, T-1	2.19***	1.95**	0.73	5.9***	0.02	2.29*	2.26***	2.21**	1.29	5.75**	0.12	2.24
	(0.27)	(0.43)	(0.82)	(1.53)	(0.74)	(1.39)	(0.27)	(0.43)	(0.82)	(1.46)	(0.70)	(1.39)
Log sales, T-1	0.28*	1.31**	2.74***	1.89**	1.31**	1.58*	0.21	0.99**	2.1***	2.12**	1.41**	1.76**
	(0.15)	(0.26)	(0.55)	(0.89)	(0.51)	(0.83)	(0.14)	(0.25)	(0.52)	(0.88)	(0.47)	(0.79)
Linear Trend	-0.22***	-0.38**	-0.58***	-0.64**	-0.25*	0.016						
	(0.05)	(0.08)	(0.15)	(0.30)	(0.13)	(0.23)						
D. [2007-11]							-0.98***	-1.17**	-1.28**	-3.80**	-1.52**	-0.47
							(0.24)	(0.36)	(0.60)	(1.23)	(0.57)	(1.02)
sigma_u	20.9***	29.2**	47.0***	54.5**	22.6**	60.9***	21.0***	29.4**	47.7***	54.7**	22.6**	60.7***
_cons	(0.95)	(1.65)	(3.25)	(7.21)	(3.09)	(7.64)	(0.95)	(1.67)	(3.31)	(7.11)	(3.04)	(7.59)
sigma_e	10.7***	13.6**	16.8***	23.4**	9.5***	15.5***	10.7***	13.7**	16.8***	22.4**	9.1***	15.5***
_cons	(0.33)	(0.55)	(0.88)	(2.50)	(1.32)	(1.66)	(0.33)	(0.56)	(0.89)	(2.41)	(1.27)	(1.65)
Observation.	2291	1732	1015	318	359	282	2291	1732	1015	318	359	282
Groups	894	644	338	132	132	92	894	644	338	132	132	92
Average % exp. sales							14	17.3	33	34	12.4	31
% of the effect on the average							-7%	-6.8%	-3.9%	-11.2%	-12.3%	-1.5%

Note: The regions include: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUY (Cuyo), NEA (North-East), NOA (Northwest), South (South). Dependent variable: exports on total sales. Log empl, T-1: natural logarithm of the number of workers employed at T-1. Log sales, T-1: natural logarithm of sales in T-1. Standard errors in parentheses with $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$. Method: Tobit PD (estimation method of random effects for censored panel data). Marginal effects reported. **Source**: Foundation *Observatorio PyME,* www.observatoriopyme.org.ar.

The last row of Table 4.3 shows a marked regional heterogeneity. NEA and NOA regions present the greatest relative reduction in exports to total sales (close to -12%). They are followed by the Metropolitan Area (AMBA) and the Central Region (with reductions of - 7% on average) and Cuyo (Center-West) region (with - 4%).

As in the aggregate case (country averages), the variables that measure the scale of production show a significant positive effect on the percentage exported. In all regions, at least one of the variables of scale presents statistical and economic significance as expected in the theoretical framework.

4.4 Regional and size heterogeneity

Firms' scale not only can determine higher export shares in levels, it can also provide a buffer to negative shocks. This section evaluates the effect of the systemic negative shock splitting the sample according to firms' size. We use the average number of employees per firm as the cut off to split the sample, analyzing the effect for each region separately. Tables 4.4 and Table 4.5 present the estimates for smaller and larger SMEs, respectively. In the tables, the rows labeled under "Number of employees" report plant regional average employees. These statistics are then used to classify firms into two scale groups. Note that the average number of employees differs between regions.

Table 4.4. *Heterogeneidad regional en empresas de menor tamaño*

Regions	(1)	(2)	(3)	(4)	(5)	(6)
	AMBA	CEN	CUY	NEA	NOA	SUR
Log employment, T-1	1.804***	2.687***	2.359*	4.347*	-0.89	2.374
	(0.444)	(0.62)	(1.233)	(2.351)	(1.17)	(1.94)
Log sales, T-1	0.907***	1.027***	2.057***	2.547**	1.66**	1.239
	(0.209)	(0.336)	(0.259)	(1.144)	(0.466)	(0.957)
D.[2007-2011]	-1.30***	-1.29***	-0.913	-5.57***	-1.74*	-1.152
	(0.297)	(0.452)	(0.748)	(2.045)	(0.98)	(1.342)
sigma_u	21.09***	30.53***	49.96***	60.56***	29.94***	67.96***
	(1.19)	(2.18)	(4.07)	(10.86)	(5.1)	(9.74)
sigma_e	11.75***	15.21***	18.57***	31.81***	12.91***	16.65***
	(0.480)	(0.816)	(1.28)	(5.33)	(2.92)	(2.53)
Number of employees	< 43	< 53	< 43	< 74	< 80	< 72
Observations	1751	1367	791	262	297	213
Groups	726	534	282	117	114	73
Average % exported sales	13.2	16.7	34.5	36	18	32
% marginal effect to regional average	-9.8%	-7.7%	-2.6%	-15.5%	-9.6%	-3.5%

Note: The regions include: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUY (Cuyo), NEA (North-East), NOA (Northwest), South (South). Dependent variable: exports on total sales. Log employment, T-1: natural logarithm of the number of workers employed at T-1. Log sales, T-1: natural logarithm of sales at T-1. Standard errors in parentheses with $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$. Method: Tobit PD (estimation method of random effects for censored panel data). Marginal effects reported. **Source**: Foundation *Observatorio PyME*, www.observatoriopyme.org.ar.

Table 4.5. *Firms' regional heterogeneity by size*

Regions	(1)	(2)	(3)	(4)	(5)	(6)
	AMBA	CEN	CUY	NEA	NOA	SUR
Log employment, T-1	1.698*	2.034	-2.524	1.230	2.615*	7.21
	(0.938)	(1.51)	(2.854)	(2.67)	(1.58)	(6.74)
Log sales, T-1	-0.423*	1.037**	2.697*	0.377	1.229**	2.557
	(0.224)	(0.443)	(1.389)	(0.68)	(0.57)	(2.02)
D.[2007-2011]	-1.007*	-0.847	-3.335**	-2.77***	-2.37***	1.469
	(0.519)	(0.774)	(1.319)	(1.01)	(0.827)	(2.07)
sigma_u	20.16***	28.12***	45.72**	43.97***	6.22***	47.10***
	(1.426)	(2.61)	(5.41)	(8.53)	(2.11)	(11.43)
sigma_e	9.054***	10.88***	12.52**	6.0***	5.26***	12.71***
	(0.434)	(0.711)	(1.176)	(0.88)	(0.87)	(2.19)
Número de Empleados	>= 43	>= 53	>= 43	>= 74	>= 80	>= 72
Observaciones	540	365	224	56	62	69
Grupos	220	149	94	23	25	22
Media del % exportado de Ventas	15	18	31	32.5	7	31
% del efecto sobre la media	-6.7%	-4,7%	-10.7%	-8.5%	-33.8%	-4.7%

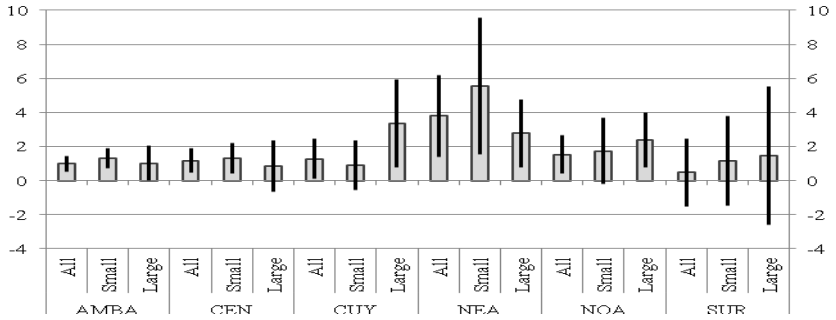
Note: The regions include: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUY (Cuyo), NEA (North-East), NOA (Northwest), South (South). Dependent variable: exports on total sales. Log employment, T-1: natural logarithm of the number of workers employed at T-1. Log sales, T-1: natural logarithm of sales in T-1. Standard errors in parentheses with $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$. Method: Tobit PD (estimation method of random effects for censored panel data). Marginal effects reported. **Source**: Foundation *Observatorio PyME*, www.observatoriopyme.org.ar.

Following the same structure as before, the estimated effects of the common shock were negative for both scale groups. However, we find again regional heterogeneity on average effects for "small" versus "large" firms across regions. There is heterogeneity in the role of scale when interacted with the systemic shock regionally. In the AMBA, Central and NEA regions smaller scale firms are more affected compared to those of larger scale, although the differences are noticeable in the case of NEA. Instead, the Central-West region of Cuyo (Center West) and NOA (North West) present opposite results, with larger SMEs presenting larger and significant negative estimates relative to smaller firms in the sample.

To facilitate a comparative assessment of the foregoing results, we present two graphs showing the estimated effects with their standard errors (Graph 4.1) and the same effects but as a share of the corresponding average of exports to total sales by region (Graph 4.2), --both effects in absolute value, i.e. with a positive sign.

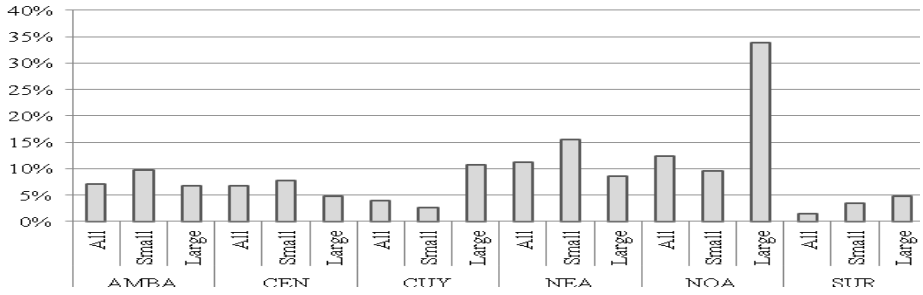
From the graphs, we can see that smaller scale firms are more affected compared to larger ones in AMBA, Central and NEA regions. As mentioned above, the latter region presents the largest negative impact for “small” SMEs, both in absolute terms (reaching 5.6) and relative to its average level (reaching 15.5%). AMB and Centro are not significantly different in absolute and in relative terms, as shown in Graphs 4.1 and 4.2.

Graph 4.1. *2007-2011 Estimated effects in exports to total sales by size (contraction in absolute terms)*



Note: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUY (Cuyo, or Central West), NEA (Northeast), NOA (Northwest), SUR (South). Confidence intervals (at 5%) in vertical lines, centered on the estimated effect.

Graph 4.2. *2007-2011 Estimated effects to average % exports/sales (relative impact)*



Note: AMBA (Buenos Aires Metropolitan Area), CEN (Center), CUY (Cuyo, or Central West), NEA (Northeast), NOA (Northwest), SUR (South). Relative effects equals to the absolute effect (foregoing graph) over the regional average.

However, in Cuyo and NOA regions, larger firms exhibit relatively larger effects. In absolute terms, Cuyo dominates the segment with a 3,3 contraction, whereas the NOA region presents the larger effect within regional averages, with a 33,8% fall.

4.5 Heterogeneity by technological sector

In this subsection we present results from extending the analysis of the heterogeneous effect of the systemic adverse shock in relative prices according to the technological intensity firms. We assign firms into four groups according to the technological content of their production; we follow the OECD classification criterion described in its report "*OECD Science, Technology and Industry Scoreboard 2005*". We described the methodology in section 3, and presented a summary in Table 3.4.

We split the results into two parts in Table 4.6, paralleling previous analysis. The estimated specifications in columns (1)-(4) present linear trend estimates; as expected, we appreciate a general negative annual (average) effect, but the effects is increasing in absolute terms and significance as we decrease in the technological content of production. Only firms with Low and Med-Low technological intensity present statistically significant estimates, with effects ranging from -0.61 to -0.26, respectively).

Table 4.6. *Sector technological heterogeneity: trend (left) and shock (right)*

Sectors by tech. intensity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low	Med-Low	Med-high	High	Low	Med-Low	Med-high	High
Ln employment, T-1	1.65***	2.0***	1.86***	3.4***	2.13***	2.08***	1.93***	3.45***
	(0.45)	(0.28)	(0.47)	(0.82)	(0.44)	(0.28)	(0.47)	(0.82)
Ln sales, T-1	2.25***	0.41***	1.23***	-0.4	1.76***	0.34***	1.15***	0.49
	(0.30)	(0.14)	(0.31)	(0.37)	(0.28)	(0.14)	(0.30)	(0.36)
T	-0.61***	-0.26***	-0.18*	-0.22				
	(0.09)	(0.05)	(0.1)	(0.16)				
D.[2007-11]					-2.06***	-1.08***	-0.68*	-0.82
					(0.36)	(0.24)	(0.41)	(0.72)
Observations	2760	1602	1247	388	2760	1602	1247	388
Groups	1088	666	509	179	1088	666	509	179
% exports/sales average					18.9	9.21	12.2	0
Effect in % over average					-10.9%	-11.7%	-5.6%	0%

Note: Sectors include: Low (low-tech sector), Med-low (medium-low tech sector), Medium-High (medium-high tech sector), High (High Technology Sector). Dependent variable: exports over total sales. Log employment T-1: natural logarithm of the number of employees at T-1. Log sales T-1: natural logarithm of the nominal amount (invoiced) of sales at T-1. Standard errors in parentheses with * p <.10, ** p <.05, *** p <.01. Method: Tobit PD (estimation method for censored panel data, with random effects). Marginal effects reported. Source: SME Observatory Foundation, www.observatoriopyme.org.ar.

We observe the same pattern of results in columns (5)-(8), for the systemic shock by technological group. Again, negative impacts and significance levels are negatively related to the technological content of production. Estimates are -2.06, -1.08 and -0.68 for Low, Med-Low, Med-High sectors respectively, and with non-significant effects for high-tech sectors. With respect to sector averages, the pattern is robust: firms with lower technological contents present higher negative relative impacts--10,9% (Low) and 11,7% (Med-Low).

In all specifications (columns 1-8), we find positive and significant coefficients on scale controls, except for total sales within high-tech group of firms.

The results so far are in line the general hypothesis presented in the theoretical framework. In this case, higher technological content in production, allows exporting

firms to buffer negative shocks and keep more stable their (internal/external) market shares.

4.6. SMEs' sector and scale heterogeneity

In this subsection, we present evidence on another heterogeneity dimension affecting firms' export performance given the systemic negative shock. Taking the recent division by sectors, we move into the opening by scale to analyze the effect of the shock in groups with variability both in size and technological intensity.

We follow the criterion described in subsection 4.4 to group firms into a *small* or *large*. We define a threshold value based on the average number of employees by sector, and assign each firm accordingly. For a given firm, we classify it as small if its number of employees is smaller than its average sector value; otherwise, we classify it as a *large firm*. We report the average sector thresholds in Tables 4.7 and 4.8, in the raw labeled "Number of employees".

Table 4.7 presents the estimated effects of the systemic shock over the export intensity, for each technological sector, corresponding to both smaller firms (left) and larger firms (right). We present these results graphically to compare the heterogeneous effects visually (Graphs 4.3 and 4.4).

From the results we retrieve three main observations. First, the Low and Medium-low sectors still continue to be negatively affected by systemic shock, but the effect is higher (both, in absolute and relative terms) on large firms. For example, in low-techs, small firms present a relative effect of -8% versus -12,7% on large ones. In the Medium-low tech sector smaller firms have an effect of about -11%, which is well below the -22.5% for the larger SMEs.

Second, the medium-high technology sector, which had a weak and imprecise effect when firms were not discriminated between large and small (see previous subsection), it presents a statistically and economically significant negative effect for the group of small scale firms (-1.31 in levels and -12.4% relative to the average).

Table 4.7. *Sector and scale heterogeneity under a systemic negative shock*
Small firms (left panel) and large firms (right panel)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low	Med-low	Med-high	High	Low	Med-low	Med-high	High
Ln employment, T-1	1.86***	1.41***	1.86***	3.98***	2.25	3.91***	1.39	5.16
	(0.625)	(0.42)	(0.67)	(1.16)	(1.41)	(1.20)	(1.56)	(3.73)
Ln sales, T-1	2.17***	0.54***	1.33***	-0.5	-0.53	0.09	1.07**	-1.42***
	(0.333)	(0.180)	(0.39)	(0.56)	(0.482)	(0.268)	(0.542)	(0.74)
D.[2007-2011]	-1.48***	-0.84***	-1.31***	-1.14	-2.5***	-2.63***	-1.324	-1.19
	(0.436)	(0.285)	(0.50)	(0.81)	(0.655)	(0.625)	(0.846)	(1.79)
Number of employees	< 54	< 48	< 43	< 51	>= 54	>= 48	>= 43	>= 51
Observations	2174	1275	959	280	586	327	288	108
Groups	909	556	418	135	239	153	117	54
Mean exports/sales (%)	18.4	7.7	10.6	11.7	19.7	11.7	15.4	18.1
Effect as % sector average	-8%	-11%	-12.4 %	0%	-12.7%	-22.5 %	-0%	0%

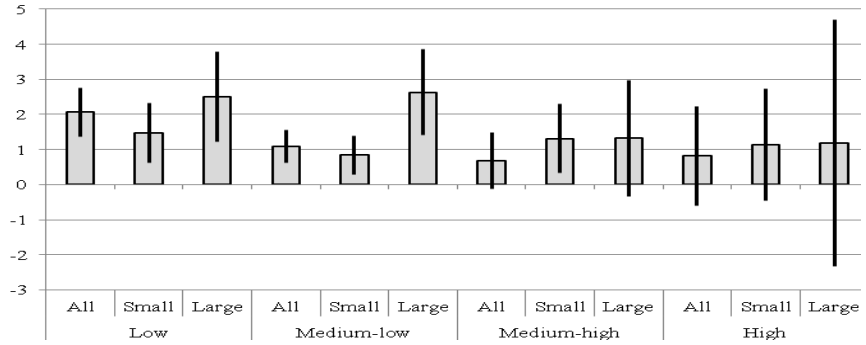
Note: Sectors include: Low (low-tech sector), Med-low (medium-low tech sector), Medium-High (medium-high tech sector), High (High Technology Sector). Dependent variable: exports over total sales. Log employment T-1: natural logarithm of the number of employees in T-1. Log sales T-1: natural logarithm of the nominal amount (invoiced) of sales in T-1. Standard errors in parentheses with * p <.10, ** p <.05, *** p <.01. Method: Tobit PD (estimation method for censored panel data, with random effects). Marginal effects reported. Source: SME Observatory Foundation, www.observatoriopyme.org.ar.

Third, high-tech firms are not affected by the negative shock in both scale levels, while the mid-high technological sector only for the large firm segment. Small scale firms are negatively affected by -12.4% relative to the sector average for mid-high technological intensity firms.

Finally, the control variables for scale of production and labor intensity have a higher and more significant impact for small size firms.

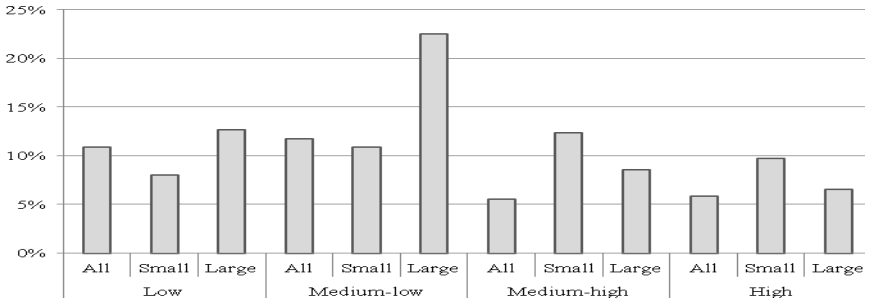
As a conclusion for this subsection, the technological intensity affects firms export bias buffering negative persistent shocks, but this effect varies with the size of the firm non-linearly. Larger firms are benefited in the high technological sectors, particularly in the med-high segment, but are adversely affected if they belong to those with lower technological intensity. In the same line, the high technological sector is not affected by the shock, independently of the firms' scale in the segment.

Graph 4.3. *Estimated effects of the systemic shock on expo (exports to sales) by technological intensity and scale level*



Note: Sector classification based on the OECD classification criterion described in "*OECD Science, Technology and Industry Scoreboard 2005*". Vertical lines represent confidence intervals at the 5% level, centered on the estimated effect.

Graph 4.4. *Estimated effects relative to the average of exports to total sales by sector and scale*



Note: Sector classification based on the OECD classification criterion described in "*OECD Science, Technology and Industry Scoreboard 2005*". The effect is computed using the absolute value of the estimated effect over the dependent variable from the previous graph (expo) and then dividing it by the average value of expo for the corresponding region and scale segment.

5. Final comments

In this paper, we explore the effects of deterioration of the real exchange rate, on the export intensity (IE) of industrial SMEs in the Argentina, during the 2004-2011 period.

The analysis focused on the estimation of the effect on the export intensity of the SME sector in this context, and on its relation to geographic regions and technology sectors. Finally, we extended the analysis to open up the effects of both decompositions in terms of firms' scale.

Results point to two general lines. First, industrial SMEs present a general contraction and reorientation of production and sales to the internal market; this pattern is accentuated in the sub-period 2007-2011, after the commodity price boom. Second, the decomposition of the general contraction along geographic, sector and scale dimensions brings about important insights on how the shock affects differentially firms' performance.

Further, the results are consistent with those derived from our theoretical framework. From a geographic point of view, regions with lower agglomeration levels are more vulnerable and are the most negatively affected in the export intensity performance, both in relative and absolute terms. In particular, the NEA (North East) region presents the most robust and negative effect in all specifications.

From a technological-intensity perfective, SMEs firms in the low and med-low sectors are those that more reorient their sales to the internal market, especially those with labor intensive technologies. On the other hand, firms in high or med-high sectors, did not show a contraction in their exports in relation to total sales.

The results constitute a useful source of information. A systemic aggregate shock does not have a pure, neutral average effect in a given heterogeneous economic structure. It affects regions, sectors, employment differentially. This is useful then to the evaluation of macro policies in response to general pressures over the real exchange rate. It is also useful to design sector policies and programs, oriented to weaken the adverse effects of general over the diversification and employment structure of vulnerable SMEs.

The results are of particular interest given the role of SMEs in promoting employment innovation and diversification of economic structure, especially in peripheral regions.

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Annex

	Trigo	**Maiz**	**Poroto de soja**	**Terms of Trade**				Base 2006			**Terms of Trade**
	US$ por tn	*US$ por tn*	*US$ por tn*	**Indice de Precios**	*Soja*	*Maiz*	*Trigo*	*Soja*	*Maiz*	*Trigo*	**Indice de Precios**
	HRW G.	*Amarillo*	*Amarillo*	**de Expor**	*Indice*	*Indice*	*Indice*	*Indice*	*Indice*	*Indice*	**de Expor**

	Méxi co	*N°2 G. Méxi co*	*N°2 Futur o Chica go*	**tación**						**tación**
1991	128,7	107,5	208,8	92,5	90,71	105,32	91,75	96,01	88,39	67,10	76,5
1992	151,2	104,2	209,8	97,2	91,16	102,12	107,80	96,48	85,70	78,84	80,4
1993	140,2	102,0	230,1	100,0	100	100	100	105,83	83,92	73,13	82,8
1994	149,8	107,8	229,5	101,2	99,72	105,62	106,82	105,54	88,64	78,12	83,8
1995	177,0	123,5	224,0	101,4	97,33	120,98	126,20	103,01	101,53	92,30	83,9
1996	207,1	164,5	277,5	109,4	120,56	161,23	147,73	127,59	135,31	108,04	90,5
1997	159,7	117,2	280,6	108,5	121,92	114,82	113,87	129,04	96,36	83,27	89,8
1998	126,1	101,6	223,3	102,3	97,02	99,58	89,93	102,68	83,57	65,77	84,7
1999	112,0	90,3	174,9	96,5	76,00	88,48	79,91	80,43	74,26	58,44	79,8
2000	114,0	88,2	183,1	106,0	79,53	86,45	81,30	84,17	72,55	59,46	87,7
2001	126,8	89,6	168,8	105,5	73,32	87,81	90,43	77,60	73,69	66,14	87,3
2002	148,5	99,3	188,9	105,1	82,06	97,34	105,93	86,85	81,69	77,47	87,0
2003	146,1	105,2	233,2	114,8	101,33	103,08	104,22	107,24	86,51	76,22	95,0
2004	156,9	111,8	276,7	116,4	120,23	109,54	111,88	127,24	91,93	81,82	96,3
2005	152,4	98,4	223,1	113,8	96,95	96,43	108,72	102,61	80,93	79,51	94,2
2006	191,7	121,6	217,5	120,8	94,48	119,15	136,73	100	100	100	100,0
2007	255,2	163,3	317,3	126,5	137,88	159,99	182,01	145,92	134,27	133,11	104,7
2008	326,0	223,3	453,3	140,9	196,98	218,78	232,50	208,47	183,61	170,03	116,6
2009	223,3	165,7	378,5	140,8	164,46	162,35	159,28	174,05	136,25	116,48	116,5
2010	223,7	185,8	385,1	140,4	167,31	182,04	159,53	177,07	152,77	116,67	116,2
2011	316,2	291,8	484,2	149,0							

	Export. Soja (miles Tn)	Export. Trigo (miles Tn)	Export. Maíz (miles Tn)	Total	Indice Soja	Indice Trigo	Indice Maíz
1991	4469	5592	4000	14061	61,6498827	58,0384017	42,2654269
1992	3213	5780	6070	15063	44,3233549	59,9896212	64,1377853
1993	2211	5850	4749	12810	30,5007587	60,7161391	50,1796281
1994	3023	5009	4100	12132	41,7023038	51,9875454	43,3220626
1995	2581	7318	5782	15681	35,604911	75,9522574	61,0946746
1996	2103	4483	7494	14080	29,0108981	46,5282823	79,1842773
1997	757	10198	10828	21783	10,4428197	105,84328	114,412511
1998	2821	11151	12222	26194	38,9157125	115,734302	129,142012
1999	3061	8573	7882	19516	42,226514	88,9776855	83,2840237
2000	4125	11608	11923	27656	56,9044006	120,477426	125,982671
2001	7304	11325	9676	28305	100,758725	117,540218	102,240068
2002	5960	10284	10864	27108	82,218237	106,735859	114,792899
2003	8624	6798	11199	26621	118,968134	70,5552673	118,332629
2004	6741	9466	10944	27151	92,9921368	98,2459782	115,638208
2005	9568	11898	14574	36040	131,990619	123,487286	153,994083
2006	7249	9635	9464	26348	100	100	100
2007	9560	10721	15309	35590	131,880259	111,271406	161,760355
2008	13839	11209	14798	39846	190,909091	116,336274	156,360947
2009	5590	6767	10318	22675	77,1140847	70,2335236	109,023669
2010	7500	4000	13000	24500	103,462547	41,5153088	137,362637
2011	12500	7000	14000	33500	172,437578	72,6517903	147,928994