Does domestic demand matter for firms' exports?

Paulo Soares Esteves, Miguel Portela and António Rua*

November 2019

Abstract

The existence of a link between exports and domestic demand challenges the standard theoretical assumption in international trade models and carries out important policy implications. In our empirical setup the estimated relationship between exports and domestic sales results directly from a monopolistic model of a firm selling to both domestic and external markets. We find a noteworthy negative relationship between domestic demand and firms' exports covering the manufacturing sector over the period 2009 – 2016. This result holds for almost all industries although with a heterogeneous magnitude. Additionally, there is also evidence that this effect is stronger for larger firms.

Keywords: international trade, firms, exports, domestic demand, foreign demand, panel data.

JEL Classification: *C23*, *C26*, *D21*, *D22*, *F14*, *F41*

*Esteves: Banco de Portugal, pmesteves@bportugal.pt. Portela: NIPE/Universidade do Minho & IZA, Bonn, mangelo@eeg.uminho.pt. Rua: Banco de Portugal & NOVA School of Business and Economics, antonio.rua@bportugal.pt. Acknowledgements. The opinions expressed in the article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors. The authors thank to Pedro Portugal for helpful comments on an earlier version of the paper. Miguel Portela acknowledges that this paper is financed by National Funds of the FCT – Portuguese Foundation for Science and Technology, projects UID/ECO/03182/2019 and PTDC/EGE-ECO/29822/2017 ("It's All About Productivity: contributions to the understanding of the sluggish performance of the Portuguese economy"). The data used in this paper are proprietary. The data is made available under an individual protocol between Statistics Portugal and the researchers. All Stata codes used to assemble the data and perform the empirical analysis are readily available from the authors.

1 Introduction

The empirical literature on the link between exports and domestic sales has been gaining momentum over the last years. Such a development represents a departure from standard international trade models where it is assumed a constant marginal cost as in the seminal work by Krugman (1979, 1980) and Melitz (2003). Such an assumption implies that foreign and domestic markets can be treated independently.

However, based on several alternative approaches, there is by now some evidence suggesting that the firm decisions are affected by both markets.[1] Vannoorenberghe (2012) finds a negative relationship between exports and domestic sales for French firms, while, also for France, Berman et al. (2015) conclude that domestic sales are positively influenced by exports. Altomonte et al. (2013) consider four European countries namely France, Germany, Italy and the UK and find that domestic demand conditions are important in driving export market participation with firms more likely to export during a downturn of the domestic market. Blum and Horstmann (2013) document a negative relationship between exports and domestic sales for Chilean firms while Ahn and McQuoid (2017) find a negative correlation between domestic sales and exports for Indonesia. Drawing on data for Italian firms, Bugamelli et al. (2015) report a significant relationship between exports and domestic sales with the sign depending on the business cycle phase.

The paper is organized as follows. In Section 2, a theoretical model underlying the link between exports and domestic demand is presented. The dataset is described in Section 3 and the estimation strategy is discussed in Section 4. In Section 5, the main empirical results are reported while Section 6 explores the heterogeneity both across industries and firms size. Finally, Section 7 concludes.

(...)

2 Theoretical framework

We consider two markets, a foreign (F) and a domestic (D) market, which are assumed to be segmented so that different prices can be charged by the firm in each market. By assuming monopolistic competition, each firm i at time t faces a downward sloping demand curve in the foreign market, q_{it}^F, given as

[1] At the macro level, Esteves and Rua (2015) present strong evidence of a negative relationship between exports and domestic demand for Portugal while Bobeica et al. (2016) extend the supporting evidence to a panel of eleven Euro area countries.

$$q_{it}^F = \Phi_t^F z_{it}^F \left(p_{it}^F\right)^{-\eta} \tag{1}$$

where Φ_t^F represents the aggregate export market size, z_{it}^F is a firm-specific export demand shifter, p_{it}^F is the firm's export price and $\eta > 1$ is the price elasticity of demand (as in, for example, Aw et al., 2011 and Vannoorenberghe, 2012). Hence, the corresponding inverse demand function is given by

$$p_{it}^F = \left(\Phi_t^F z_{it}^F\right)^{\frac{1}{\eta}} \left(q_{it}^F\right)^{-\frac{1}{\eta}} \tag{2}$$

(...)

3 Data

3.1 Definitions and sources

Exports

Data for exports at the firm level are from the external trade database of Statistics Portugal (INE), the Portuguese national statistical office, classified according to the 2010 Combined Nomenclature (NC) (INE, Statistics Portugal, 2018). This database includes nominal values of internationally traded goods between Portugal and other Member States of the European Union (intra–EU trade) and between Portugal and non-EU countries (extra-EU trade). Data on extra-EU trade are collected from customs declarations, while data on intra–EU trade are collected through the Intrastat system. Each transaction record includes, among other information, the firm's identifier, product code (8 digits), the destination country, the value of the transaction in Euro.

(...)

3.2 Descriptive statistics

Several descriptive statistics are reported in Table 1. In particular, we provide a set of standard statistics for the following variables: exports, domestic sales, the ratio between

domestic sales and exports, and foreign demand. We report statistics for the year 2009,[2] the last year available for this type of data which is 2016 and for the whole period.

In Panel A, we consider all manufacturing firms leading to a sample of 21,749 observations and 3,996 firms. Looking at the figures for the ratio between domestic and exports sales, it is clear that this variable is being influenced by firms reporting a very small value for exports relatively to domestic sales. Therefore, in order to avoid the contamination of the results due to such extreme observations, another sample is considered. Firstly, all the firms reporting total sales less than one thousand Euro are excluded to avoid very small firms which are more prone to reporting errors. Secondly, firms are considered if exports represent at least one per cent of domestic sales or if domestic sales represent at least one per cent of exports. The idea is to narrow the analysis to firms that are effectively present in both markets. This sample has 19,381 observations and 3,655 firms (Panel B). Finally, a third sample is analysed (Panel C). As the theoretical model considered does not deal explicitly with the entry and exit of firms, the sample was further restricted to firms that are present in both markets in all periods as robustness analysis. This sample has 8,784 observations and 1,098 firms.

[2]The year 2009 is the first year considered for estimation purposes due to the use of an instrumental variables procedure that makes use of lagged values of specific variables.

Table 1: Descriptive statistics

Variables	$Mean$	$s.d.$	P_{10}	P_{50}	P_{90}
Panel A: full sample					
		Year 2009 $N = 2,014$			
Exports ($X_{i,t}$)	5,547	21,776	29	1,178	11,137
Domestic Sales ($DS_{i,t}$)	6,876	26,555	89	1,256	13,457
Ratio $DS_{i,t}/X_{i,t}$	316	8,267	0	1	59
Foreign Demand ($FD_{i,t}$)	304,963	680,887	1,006	68,789	840,613
		Year 2016 $N = 3,064$			
Exports ($X_{i,t}$)	8,121	39,542	31	1,328	14,052
Domestic Sales ($DS_{i,t}$)	6,474	27,135	88	1,167	12,172
Ratio $DS_{i,t}/X_{i,t}$	2,895	153,184	0	1	36
Foreign Demand ($FD_{i,t}$)	461,944	1,066,017	2,650	111,290	1,188,191
		All years $N = 21,749$ $firms = 3,996$			
Exports ($X_{i,t}$)	7,286	37,639	38	1,298	13,107
Domestic Sales ($DS_{i,t}$)	6,530	26,676	84	1,157	12,121
Ratio $DS_{i,t}/X_{i,t}$	677	58,577	0	1	34
Foreign Demand ($FD_{i,t}$)	448,014	1,057,308	3,111	100,624	1,157,586
Panel B: drop observations if ratio < 0.01 or > 100					
		Year 2009 $N = 1,726$			
Exports ($X_{i,t}$)	6,033	23,354	76	1,353	12,084
Domestic Sales ($DS_{i,t}$)	7,044	28,111	136	1,278	13,473
Ratio $DS_{i,t}/X_{i,t}$	7	15	0	1	19
Foreign Demand ($FD_{i,t}$)	308,245	685,833	2,508	76,417	813,648
		Year 2016 $N = 2,704$			
Exports ($X_{i,t}$)	8,082	39,967	78	1,426	13,831
Domestic Sales ($DS_{i,t}$)	6,621	27,115	134	1,257	12,362
Ratio $DS_{i,t}/X_{i,t}$	6	13	0	1	16
Foreign Demand ($FD_{i,t}$)	472,918	1,083,265	5,124	116,852	1,206,248
		All years $N = 19,381$ $firms = 3,655$			
Exports ($X_{i,t}$)	7,364	38,806	83	1,362	12,885
Domestic Sales ($DS_{i,t}$)	6,620	26,545	127	1,225	12,283
Ratio $DS_{i,t}/X_{i,t}$	6	14	0	1	16
Foreign Demand ($FD_{i,t}$)	457,465	1,076,704	5,383	105,835	1,173,118
Panel C: drop observations if ratio < 0.01 or > 100 & firms in all periods					
		Year 2009 $N = 1098$			
Exports ($X_{i,t}$)	7,398	23,805	174	1,724	16,452
Domestic Sales ($DS_{i,t}$)	9,121	34,195	227	1,859	16,650
Ratio $DS_{i,t}/X_{i,t}$	5	12	0	1	15
Foreign Demand ($FD_{i,t}$)	331,861	775,894	5,148	78,588	835,320
		Year 2016 $N = 1098$			
Exports ($X_{i,t}$)	12,518	42,578	401	3,193	27,073
Domestic Sales ($DS_{i,t}$)	9,224	33,265	249	1,985	18,252
Ratio $DS_{i,t}/X_{i,t}$	3	8	0	1	7
Foreign Demand ($FD_{i,t}$)	424,925	909,002	10,165	109,854	1,158,784
		All years $N = 8,784$ $firms = 1,098$			
Exports ($X_{i,t}$)	10,534	36,636	371	2,534	22,371
Domestic Sales ($DS_{i,t}$)	9,187	33,475	237	1,919	17,432
Ratio $DS_{i,t}/X_{i,t}$	3	8	0	1	8
Foreign Demand ($FD_{i,t}$)	422,984	944,244	9,562	106,645	1,107,321

Notes. The information used in the regressions spans over the period 2009 – 2016 (the data is available since 2006, but we loose three periods once we build the two instruments defined in Section 4). Labels: *s.d.*, standard deviation; N, number of observations; $firms$, number of firms; P_{10}, P_{50}, and P_{90}, percentiles 10, 50 and 90. Monetary units are in Euro $\times 1000$.
Source: Own computations.

4 Estimation strategy

The model to be estimated corresponds to equation

$$X_{it} = \beta_{i0}\, FD_{it}^{\beta_1} \left(1 + \frac{DD_{i,t}}{FD_{i,t}}\right)^{\beta_2} \tag{3}$$

where X_{it} is exports by firm i in period t, β_1 is expected to be positive and β_2 negative as discussed earlier. An important feature of this specification is that exports depend on the relative importance between both markets. As it is clear, the elasticity of exports to domestic demand is not constant, depending on the relative dimension between the two markets which can differ across firms and over time. More formally, one can show that using equation (3), the exports elasticities to foreign demand, $\varepsilon_{x,fd}$, and domestic demand, $\varepsilon_{x,dd}$, are given, respectively, by

$$\varepsilon_{x,fd} = \beta_1 - \beta_2 \frac{R}{1+R} \tag{4}$$

and

$$\varepsilon_{x,dd} = \beta_2 \frac{R}{1+R} \tag{5}$$

where R stands for the ratio between domestic (DD_{it}) and foreign (FD_{it}) demands. Figure 1 depicts the relation between the model coefficients β_1 and β_2 and the above elasticities considering that $\beta_1 > 0$ and $\beta_2 < 0$. As the domestic market becomes more important, in relative terms, the elasticities of exports to foreign demand and domestic demand asymptotically converge towards $\beta_1 - \beta_2$ and to β_2, respectively.

Intuitively, in the case of $\varepsilon_{x,dd}$, a percentage decrease in domestic sales that ends up being reoriented to the export market, will translate into a large (small) elasticity, in absolute terms, if domestic sales are large (small) in relative terms. Naturally, if there are no domestic sales, then no reorientation is possible and the elasticity is zero. In the case of $\varepsilon_{x,fd}$, if there are no domestic sales, the elasticity is given by β_1. As the domestic market gets more important, there is scope for reorientation, and the elasticity is higher.

(...)

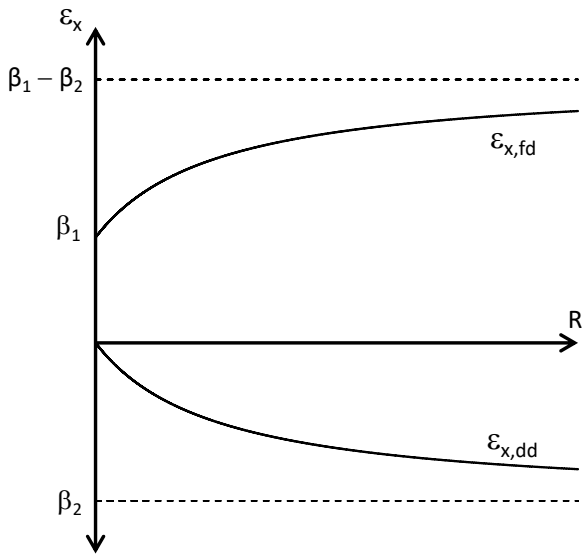

Figure 1: Exports elasticities

5 Empirical results

5.1 Main results

The estimations are reported in Table 2. The design of the different specifications and estimators is the following. First, we estimate the 'traditional' log-linear model by fixed-effects, column '$ln\,(X_{it})$ (FE)'. The dependent variable is the natural log of firms' exports. We assume the fixed-effects procedure is able to tackle all endogeneity issues associated with this specification. Second, following the discussion in Silva and Tenreyro (2006) and in Egger et al. (2015), we account for heteroskedasticity and implement a (pseudo-maximum-likelihood) fixed-effects Poisson estimator. The dependent variable is now firms' exports (in levels), as described in equation (3). The results are shown under column 'X_{it} (FE Poisson)'.

(...)

5.2 Robustness analysis

Beyond the analysis conducted above, two additional robustness checks are made to check if the results are affected by endogeneity and autocorrelation issues.

(...)

Table 2: Determinants of firms' exports: FE & Poisson

	Panel A		Panel B		Panel C	
	$ln(X_{it})$ (FE)	X_{it} (FE Poisson)	$ln(X_{it})$ (FE)	X_{it} (FE Poisson)	$ln(X_{it})$ (FE)	X_{it} (FE Poisson)
$ln(FD_{it})$	0.477***	0.386***	0.406***	0.349***	0.416***	0.304***
	(0.011)	(0.043)	(0.013)	(0.040)	(0.020)	(0.044)
$ln\left(1+\frac{DS_{i,t-1}}{X_{i,t-1}}\right)$	-0.137***	-0.237***	-0.125***	-0.183***	-0.256***	-0.277***
	(0.024)	(0.045)	(0.013)	(0.040)	(0.027)	(0.057)
R^2 within	0.50		0.37		0.46	
Log-likelihood		-5436254		-4544774		-2455400

Notes. The dependent variable $ln(X_{it})$ denotes the (natural) log of exports for firm i in period t. $ln(FD_{it})$ stands for the log of Foreign Demand; DS stands for Domestic Sales. FE corresponds to the linear fixed-effects estimator; FE Poisson reports fixed-effects Poisson estimates. The fixed-effects are at the firm level. Robust standard-errors in parenthesis (clustered by firm). Significance levels: 1%, ***; 5%, **; 10%, *. All models include time dummies (which are jointly statistically significant in all estimations). The models are estimated for three samples, panels A, B and C, respectively. Panel A corresponds to the full sample. In Panel B we drop observations if ratio < 0.01 or > 100, while in Panel C we drop observations if ratio < 0.01 or > 100 and keep just the firms that are in all periods. The first sample has 21,749 observations, corresponding to 3,996 firms. The second sample uses 19,381 observations and 3,655 firms, while the third sample has 8,784 observations and 1,098 firms. See Section 3.2 for a description of the data and Section 4 for a discussion on the estimation strategy. *Source*: Own computations.

	OLS	RE	FE	IV	FE$_I V$	RE$_I V$	FE$_c luster$
Education	0.1071***	0.0664***	0.0623***	0.0551***		0.0562***	0.0623***
	(0.0010)	(0.0009)	(0.0010)	(0.0166)		(0.0095)	(0.0010)
Exper	0.0133***	0.0046**	0.0252***	0.0150	0.0570***	0.0045**	0.0252***
	(0.0022)	(0.0019)	(0.0010)	(0.0092)	(0.0013)	(0.0018)	(0.0010)
Exper2	-0.0003***	0.0000	0.0000	-0.0006	-0.0000	-0.0000	0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0005)	(0.0000)	(0.0000)	(0.0000)
R^2	0.75	.	0.94	0.52	.	.	0.94
RMSE	0.24	0.05	0.05	0.30	.	.	0.04
N	4,999	4,999	4,999	495	4,999	4,999	4,999

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

6 Heterogeneity across industries and firm size

There are reasons to believe that the link between domestic demand and exports could be different across firms.

(...)

7 Concluding remarks

The link between exports and domestic sales has been fuelling recent economic literature and the policy debate. In particular, the presence of a negative relationship may constitute an additional economic adjustment channel, in particular in the Euro area countries, where a common currency in a low inflation environment leads to the rigidity

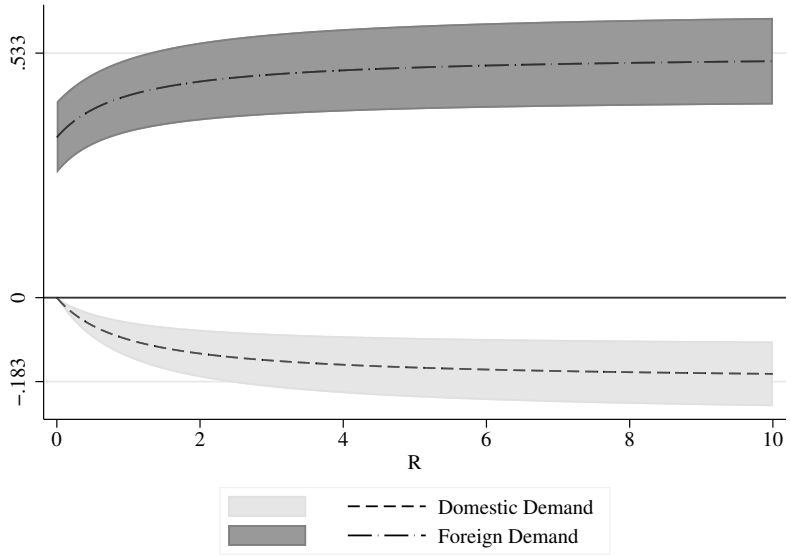

Figure 2: Estimated exports elasticities

of real exchange rates.

(...)

References

Ahn, J. and McQuoid, A. F. (2017). Capacity constrained exporters: identifying increasing marginal cost. *Economic Inquiry*, 55(3):1175–1191.

Altomonte, C., Sono, T., and Vandenbussche, H. (2013). Firm-level productivity and exporting: diagnosing the role of financial constraints. In *Product Market Review*, chapter 2, pages 1–16.

Aw, B. Y., Roberts, M. J., and Xu, D. Y. (2011). R&D investment, exporting, and productivity dynamics. *American Economic Review*, 101(4):1312–44.

Berman, N., Berthou, A., and Héricourt, J. (2015). Export dynamics and sales at home. *Journal of International Economics*, 96(2):298–310.

Blum, B., C. S. and Horstmann, I. (2013). Occasional vs perennial exporters. *Journal of International Economics*, 90(1):65–74.

Bobeica, E., Esteves, P. S., Rua, A., and Staehr, K. (2016). Exports and domestic demand pressure: a dynamic panel data model for the euro area countries. *Review of World Economics*, 152(1):107–125.

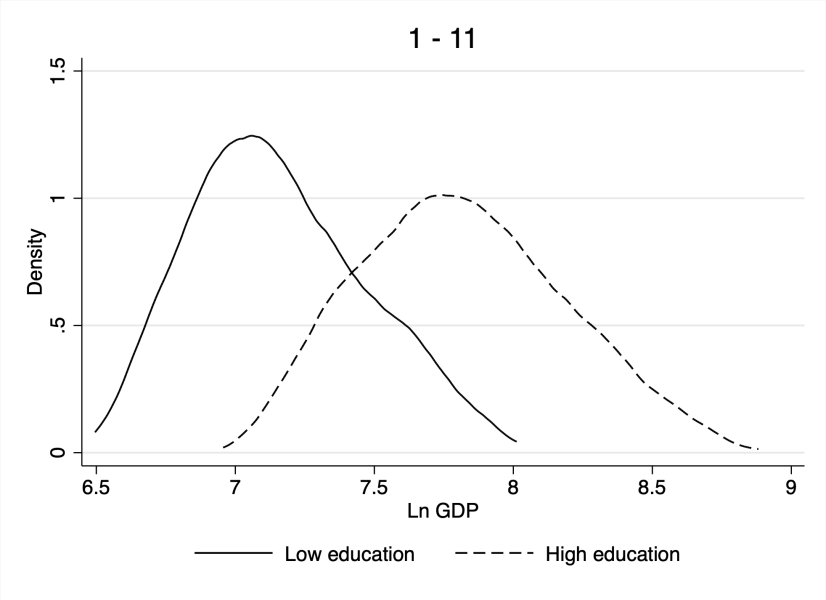

Figure 3: Wages vs. Education

Bugamelli, M., Gaiotti, E., and Viviano, E. (2015). Domestic and foreign sales: complements or substitutes? *Economics Letters*, 135:46–51.

Egger, P., Baltagi, B. H., and Pfaffermayr, M. (2015). Panel data gravity models of international trade. In *The Oxford Handbook of Panel Data*, pages 608–641. Oxford University Press.

Esteves, P. S. and Rua, A. (2015). Is there a role for domestic demand pressure on export performance? *Empirical Economics*, 49(4):1173–1189.

INE, Statistics Portugal (2018). *Comércio Internacional (CI)*. Instituto Nacional de Estatística: Lisboa.

Krugman, P. (1979). Increasing returns, monopolistic competition, and international trade. *Journal of International Economics*, 9(4):469–479.

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. *The American Economic Review*, 70(5):950–959.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725.

Silva, J. S. and Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658.

Vannoorenberghe, G. (2012). Firm-level volatility and exports. *Journal of International Economics*, 86(1):57–67.

Wooldridge, J. M. (1999). Distribution-free estimation of some nonlinear panel data models. *Journal of Econometrics*, 90(1):77–97.