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by

Francisco Requena
Guadalupe Serrano
And
Raúl Mínguez

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VNIVERSITAT DE VALÈNCIA

Departamento de Estructura Económica (Economía Aplicada II), Facultad de Economía, Universitat de València
Avda dels Tarongers, s/n, 46022 – Valencia, Spain
Phone +34 96 382 83 49 / Fax +34 96 382 83 54
http://www.estructuraeconomica.es
e-mail: investigacion.estructura@uv.es

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The role of imports in the intensive margin of exports

Francisco Requena, Universitat de València, Valencia, Spain

Guadalupe Serrano, Universitat de València, Valencia, Spain

Raúl Mínguez, Chamber of Commerce of Spain & Universidad Nebrija, Madrid, Spain

Abstract

We investigate the impact of imports of intermediate inputs on export value and scope among Spanish regular two-way trade manufacturing firms over the period 1997-2018. After controlling for firm characteristics and addressing endogeneity using an IV strategy, we find that firms that import intermediate inputs from non-EUEFTA countries enhance the volume and scope of their EU15 exports. The impact was higher when firms imported intermediate inputs from the high-income non-EUEFTA countries before the 2008 financial crisis. However, since 2008, purchase of intermediate inputs from the low-income non-EUEFTA countries become as relevant as those from high income countries. We interpret this apparently surprising result as the optimal response of Spanish firms to diversify their import portfolio as a consequence of an increase in the product upgrading and quality improvement of cheaper intermediate inputs from developing countries after the crisis.

Keywords: Firm-level data, exports value, firm scope, imports of intermediate inputs, origin of imports, pre and post-crisis.

JEL-classification F23, F14, L25

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1. Introduction

The empirical literature using micro-level trade has found three empirical regularities on the relationship between exports and imports among manufacturing firms. First, most companies that export also import (Mûuls y Pisu, 2008; Castellani et al., 2010; Aristei et al., 2013). Second, companies that buy directly foreign inputs are more productive than those that do not (Amiti y Koning, 2007; Kasahara and Rodrigue, 2008; Vogel and Wagner, 2010; Golberg et al., 2010; Topalova and Khandelwal, 2011; Kasahara and Lapham, 2013; Halpern et al., 2015; Forlani, 2017). Third, companies that import exhibit a better export performance (Kugler and Verhoogen, 2009; Bas, 2012; Lo Turco and Maggioni, 2013; Bas and Strauss-Kahn, 2014; Feng et al., 2016; Edwards et al., 2018; Mañez et al., 2020).

The argument of "importing to export" gains strength in the face of these three empirical regularities: companies that import are more productive than those that do not import because imports of intermediate inputs allow the acquisition of technology and knowledge from abroad (Helpman and Grossman, 1991) as well as permit quality upgrading (Bas and Strauss-Kahn, 2015). Thus, imports of intermediate inputs increases the productivity of the company, which increases the probability of exporting, of becoming a regular exporter and of obtaining a good export performance in terms of more sales or number of products. In addition, importing a greater variety of inputs or higher quality inputs is a direct way used by many companies to improve their final products and thus be able to access foreign markets that are more difficult or demanding than the domestic one.

In this paper we investigate empirically the enhancing effect of imported intermediate inputs on firm's exports for the case of Spain. In particular, we examine the import-export link using the universe of regular two-way trade firms operating in the manufacturing sector over the period 1997-2018. We rely on exogenous changes in the relative costs of foreign inputs, including intermediate input import tariff changes and exchange rate movements, together with variation in world export supply of intermediate inputs, to instrument for firm changes in the use of imported inputs, thus identifying the causal effect of increased use of imported intermediate inputs on firm export performance.

We provide first-time evidence for Spain of a direct positive connection between imported input use and firm exports sales and portfolio size among regular two-way trade manufacturing firms. For Spain, we complement the findings of Mañez et al. (2020) that found that importing directly intermediate inputs increased the likelihood of becoming an exporting firm. Our results confirm previous findings by Bas and Strauss-Kahn (2014) for France and Feng et al. (2016) for China. We combine the best identification strategies of the two papers in our analysis for Spain. As in Feng et al. (2016) we construct industry-level instruments using the information provided by all Spanish firms operating in the same industry. As in Bas and Strauss-Kahn (2014), we select the universe of firms that export to the EU15 market and import intermediate inputs from non-EUEFTA countries to mitigate possible reverse causality or endogeneity problems, and to control for observable firm characteristics such as employment size and apparent labor productivity to consider the indirect impact of imports on exports through costs; so we can isolate the direct impact of imports on exports through the demand channel only.

Our analysis shows that Spanish firms that increased their use of imported intermediates coming from non-EUEFTA countries increased their exports to the EU15 market, an effect we observe whether the firm´s import activity is measured by an increase in expenditure or in the number of imported inputs. However, the effects are economically modest. For example, the baseline IV estimates demonstrate that a 1% increase in the value of imported inputs boosted a firm's export value by 0.07%; a 1% increase in the scope of imported inputs boosted a firm's export value by 0.12%; and a 1% increase in the scope of import portfolio of imported inputs boosted a firm's export portfolio scope by 0.13%.

To gain further insights into the import-export link, we analyze the benefits of buying foreign inputs from different source countries. In particular, if improved access to imported inputs enables firms to upgrade their products for export and to increase their range of exported products, we expect that imported inputs from technologically developed countries will provide the strongest benefits to exports to the demanding EU15 market. In support of the technological conjecture, we document that imported inputs from high-income non-EUEFTA countries had the greatest effect in boosting firm exports to customers in the EU15 market over the period 2000-2007. However, the results for the period 2008-2018 do not support the technological conjecture since imported inputs from low-income non-EUEFTA countries have had the same or

even greater effect in boosting firm exports to customers in the EU15 market than imported inputs from high-income non-EUEFTA countries. A plausible explanation, in line with the argument of Puga and Trefler (2010), is that the rise of incremental innovation from developing countries has allowed these economies to experience a technological catching up in the production of many intermediate inputs so Spanish firms have opted for new emerging countries as a source country of intermediate inputs since 2008.

The rest of this paper is organized as follows. Section 2 presents the dataset and a description of the firm-level import-export connection in Spain over the period 1997-2018. Section 3 describes our empirical strategy, which is followed by our empirical results in Section 4. To demonstrate the robustness of the results, Section 5 describes our work with several alternative specifications which investigate alternative explanations for our findings. Section 6 concludes.

2. Data

In order to analyze the import-export link, we use Spanish firm-level dataset that combines information on firm import-export activities and on firm attributes over the period 1997-2018. Annual export and import values for the triplet firm-product-country are obtained from Spanish Custom database. Products are defined at 6-digit level of the Harmonized System (1992 classification). Firm characteristics such as sales, employment and primary sector of activity are obtained from SABI database. Our dataset is the result of merging both databases after applying the following steps. First, we select from Custom database all the firms exporting and importing simultaneously at least four years over the period 1997-2018. Second, we restrict the sample to firms exporting to EU15 countries and importing from non-EUEFTA countries.[1] Third, we consider only imported intermediate inputs based on the BEC classification. Forth, we use SABI database to identify firms whose main activity is manufacturing. Finally, we restrict the sample to firms with at least 10 workers during period the firm trade in foreign markets.

Our sample consists of 6,621 firms.[2] Table 1 illustrates the importance of those firms in Spanish aggregate exports and imports over the period 2000-2018. Our sample accounts for 51.3 percent of total Spanish exports (57.3% of Spanish exports to the EU15) and 65.1% of Spanish imports of intermediate inputs. Previous studies have examined the pre-crisis period. Since we are interested in whether the post financial crisis period implied a change in the import-export relationship, we split the whole period into the pre-crisis 2000-2007 and the 2008-2018 period. On average, the number of firms and their value of exports and imports have increased between periods, though the shares of these firms in aggregate exports and imports remain stable over time.

<INSERT TABLE 1 HERE>

Table 2 presents some characteristics of the firms in the sample. Regular two-way trading firms tend to be large, with average employment size of 147 workers, exporting on average each year

[1] We select imports from non-EUEFTA countries in order to be able to construct our instruments based on the variation of EU tariff rates and EURO exchange rates. As in Bas and Strauss-Khan (2014) we also restrict the destination of exports to EU15 countries to attenuate endogeneity issues resulting from exporter-importer relationships originated in the same country.

[2] We loss a substantial number of firms because SABI database do not report information on employment for many firms. In addition, we also trim data eliminating those firms whose labour productivity is extreme (±1%).

17.1 million euros to the EU15, with a portfolio of 17 product-country combinations. The value of imports on intermediate inputs coming from non-EUEFTA countries is on average 10.1 million euros with a portfolio of 7 product-country combinations. While import portfolio scope is dominated by products coming from high-income non-EUEFTA countries (40%) and low income non-EUEFTA countries (41%), the main of origin of imports in terms of value comes from middle income non-EUEFTA countries (55%). On average a typical two-way trade manufacturing firm exports 16 years to the EU15, was borne in 1980 and has a 17 percent probability of being foreign owned.

<INSERT TABLE 2 HERE>

Three further datasets used in the paper are those used to obtain tariffs, real exchange rates and EU15 demand and non-EUEFTA supply of products. First, we use data for the most-favored-nation (MFN) tariff rates applied by the EU over the period 1997-2018 from UNCTAD's TRAINS database. Data are harmonized across products at 6-digit level of the Harmonized System (HS) 1992 classification. Second, we use data from IMF database to calculate the bilateral real exchange rate of Euro, $rer_{ct} = E_{EUR/cou,t} * \frac{CPI_{cou,t}}{CPI_{Spain,t}}$, where $E_{EUR/cou,t}$ is the exchange rate index of euros per unit of foreign currency, expressed as an index (2010=100), and CPI is the consumer price index of Spain and the trading partners (2010=100). Therefore, an increase in the value of rer indicates a real depreciation of the Euro currency, so Spanish exports become cheaper and Spanish imports become more expensive. Third, we use COMTRADE database to obtain the annual value of EU imports (excluding Spain) from non-EUEFTA countries and the annual value of non-EUEFTA exports to the EU (excluding Spain) for each product at 6 digit of HS 1992.

3. Empirical model

We investigate the import-export connection using an empirical equation that relates a measure of export performance (value and portfolio scope) with an indicator of import experience (value and portfolio scope). More specifically, we estimate the following equation:

$$ln(exp_{it}) = \beta \ln(imp_{it-1}) + \gamma_1 \ln(employment_{it-1}) + \gamma_2 \ln(productivity_{it-1}) + \\ + \gamma_3 \ln(demand_{it-1}) + \alpha_i + \delta_t + \varepsilon_{it} \quad (1)$$

Where the dependent variable, $ln(exp_{it})$, is the log of firm i's exports value (or the log of the number of product-country combinations in the export portfolio) to the EU15 countries in year t; the main explanatory variable, $\ln(imp_{it-1})$, is the log of firm i´s import value (or log of the number of product-country combinations in the import portfolio) of intermediate inputs from non-EUEFTA countries.

As control variables, we include two time-varying firm characteristics: $employment$ is the number of employees as a measure of firm size and $productivity$ is the firm's labor productivity calculated as total sales divided by the number of workers. Productivity and size account for indirect effects of imports on firm's exports both through the diffusion of new technologies embodied in imported intermediates and through scale economies from combining more varieties of imported intermediate inputs. The explanatory variables have been lagged one year to alleviate potential reverse causality. We also include a measure of the potential demand of products exported by each firm, which is constructed as following:

$$demand_{it-1} = \sum_p \frac{exp_{p,it-1}}{exp_{it-1}} IMP^{*\,EU\ from\ world}_{p,t-1}$$

In words, $demand_{it-1}$ is the weighted average of EU imports (without Spain) of all products p exported by firm i in t-1, where the weight is the share of each product p in firm i's exports in t-1. Firm´s exports (exp) are obtained from Spanish Customs database and EU imports (IMP*) are obtained from COMTRADE database (IMP*, in capital letters and with superscript *).

Eq. (1) includes a full set of firm dummies (α_i) and year dummies (δ_t) to control for unobserved time-unvarying firm characteristics and time-varying macroeconomic factors, respectively. Finally, in all the regressions we use standard errors clustered at the firm level to account for firm-level heteroskedasticity and within-firm autocorrelation.

Instruments

To address possible endogeneity in the export-import connection, we adopt an instrumental variables (IV) approach to estimate the causal effect of imports on exports. The instruments set includes firm's lagged imported intermediates, the potential international supply of intermediate inputs available to the firm, and two exogenous changes in the relative costs of foreign inputs, approximated by the import tariff and the import real exchange rate in the industry where the firm operates.

The potential international supply of inputs available to the firm i in year t is a weighted average of the exports of intermediate inputs from non-EUEFTA countries in year t, excluding sales to Spain (EXP^*_{pct}), obtained from COMTRADE, and the weights are the firm i's shares of the value of imports of intermediate products (imp^{ini}_{pci}) over firm i's total intermediate imported inputs at the beginning of firm's import activity,

$$supply_{it} = \sum_{p=1}^{P_i^M} \sum_{c=1}^{C_i^M} \frac{imp^{ini}_{pci}}{\sum_{p=1}^{P_i^M} \sum_{c=1}^{C_i^M} imp^{ini}_{pci}} EXP^*_{pct}$$

The next two instruments for intermediate inputs imported by a firm are constructed at industry level, considering the industry in which the firm operates, following Feng et al (2016). The tariff in industry j is computed as a weighted average of EU tariffs applied to the *p* products imported by Spanish firms in each industry *j* (NACE 4-digit) from non-EUEFTA countries in year *t*, TAR_{pt}. The weights are the shares of imports of each product p, IMP_{pj}, belonging to the set of products imported by firms operating in industry *j*, P_j^M at the beginning of the period, in 1997.

$$tariff_{jt} = \sum_{p=1}^{P_j^M} \frac{IMP^{1997}_{pj}}{\sum_{p=1}^{P_j^M} IMP^{1997}_{pj}} TAR_{pt}$$

Similarly, the real exchange rate in industry *j* is computed as the weighted average of real exchange rates applied to imports of intermediate products from non-EUEFTA country c, RER_{ct}. The weights are the shares of imports of intermediate inputs sourced from each non-EUEFTA country c, IMP_{cj}, in the set of importing source non-EUEFTA countries of industry j, C_j^M , in 1997:

$$rer_{jt} = \sum_{c=1}^{C_j^M} \frac{IMP^{1997}_{cj}}{\sum_{c=1}^{C_j^M} IMP^{1997}_{cj}} RER_{ct}$$

We expect that the cost of importing intermediates inputs to be lower when the potential supply of imports ($supply_{it}$) is higher, the import tariffs ($tariff_{jt}$) is lower and the real exchange rate appreciates (rer_{jt}). Therefore, we should observe a positive correlation between imports of foreign intermediate inputs and the potential non-EUEFTA supply of inputs, and a negative correlation between imports and tariffs and real exchange rate. Table 3 shows that these variables are potentially good instruments because they exhibit the expected significant correlation with our variable of interest once we control for firm and year fixed affects and considered robust standard errors clustered by firm.[3]

<INSERT TABLE 3 HERE>

4. Estimation results

4.1. Baseline results

We start estimating equation (1) using the value of exports and the number of product-countries combinations in the export portfolio (exports scope) and symmetrically considering as our interest explanatory variable the value of imports or imports scope to investigate whether imports enhance export performance. Table 4 shows the main results using the OLS and IV estimators.[4] Column (1) shows the OLS estimation results including firm and year fixed effects. The results point to a significantly positive effect of imports of intermediate goods on firm's export value. Column (2) includes firm size and productivity as additional control variables. Both control variables have a positive and significant impact on firms' export value, while the impact of international demand is positive but not statistically different from zero. Therefore, firm size and productivity are controlling for the indirect effects that imports have on export performance through productivity gains and scale economies. The coefficient on imports remains positive and significant but the magnitude falls from 0.109 to 0.052. Therefore, the estimated direct effect of imports on exports is significantly positive but small: a 1 percent increase in import values leads to a 0.05 percent increase in export values. Column (3) shows the IV estimation results. We report the corresponding validation tests: the weak instruments F-test, the Hansen's overidentification J-test for the validity of instruments and the endogeneity test for our regressor of interest [5]. The validity of our set of instruments is supported by the rejection of the null hypothesis of weak instruments and the non-rejection of the Hansen's J test of overidentifying restrictions. Using this set of instruments, we test for the endogeneity of the intermediate imports regressor. We reject the null hypothesis of weak exogeneity of imports at

[3] We obtained the expected significant correlations between our interest variable and the set of instruments. Nevertheless, the first stage of the IV estimation is the estimation of a reduced form equation depending on all the exogenous or pre-determined variables in the model (thus accumulating both the direct and indirect effects due to forward and backward linkages in the system). Therefore, this first stage estimates cannot be interpreted in terms of structural model relationships.

[4] Our results are robust to different sample dimension considering information available on firms' characteristics and information available on instruments. IV estimations loss about 10% of the sample observations because some firms do not report or change their NACE sector so we lack of their industry input tariffs or because there is missing data for some two period lagged instruments.

[5] The endogeneity test is a C-type test statistic. Under the null hypothesis that the endogenous regressors can be treated as exogenous, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested. In Stata, we use the command ivreg2, endog().

10% of significance, so imports are an endogenous regressor. Since we find an endogeneity problem, we focus on consistent IV estimations in column (3). We obtain that a 1 percent increase in the value of imported intermediate inputs leads to a 0.07 percent increase in firms´ export value.

We next consider that diversification of imports may lead to higher exports since the use of a larger set of input varieties may improve the quality and market adequacy of firm's product. Table 4 columns (4) to (6) show our model's OLS and IV estimation results considering the effect of firm's imports scope (portfolio dimension) on firm's exports value. The results are in line with the previous ones. When including firm's size and productivity the direct effect of intermediate inputs portfolio scope on exports value remains positive and significant but decreases to a half, with an estimated elasticity of 0.074. Nevertheless, according to validation tests in column (6), we reject the null of weak exogeneity of imports scope using valid instruments, thus, only the IV estimator is consistent. Based on IV estimation results, the response of firm's exports value to changes in its imports scope is positive and statistically significant, but in this case with a higher estimated elasticity of 0.12 percent.

Columns (7) to (9) in Table 4 analyze the intensive margin of the import-export relationship in terms of portfolio dimension to explore whether import diversification increases the scope of export portfolio. According to the validation tests results -valid instruments for the endogenous regressor intermediate inputs scope- we focus on the IV estimation results. Column (9), our preferred specification, shows that it is very important to account for firm size and firm productivity to control for the positive indirect effects that imports have on export performance through productivity gains and scale economies. Firm's potential demand from EU countries also positively and significantly determines firm's export scope. The higher the potential demand the higher the number of varieties exported by the firm, enhancing firm's export diversification. We conclude that there is a positive and significant direct causal effect of import scope on export scope: a 1 percent increase in the import portfolio scope leads to a 0.13 percent increase in export portfolio scope.

<INSERT TABLE 4 HERE>

We next consider the structural stability of the import-export relationship since we have a long period of analysis, including the trade collapse and financial crisis that impacted negatively on the Spanish economy from 2008 to 2012 and the posterior recovery from 2013 to 2018. The change in the model's parameters is evaluated by including differential effects in the impact of all the explanatory variables, through the interaction of each regressor with a time-dummy variable taking value 1 for years in the 2008-2012 period, that is the crisis period, 0 otherwise; and with a second time-dummy variable that takes value 1 for years in the 2013-2018 period, that is the post-crisis period, 0 otherwise. Additionally, this analysis allows us to compare our results with those of previous research for other economies over the pre-crisis period.

Table 5 reports the causal direct effect of imports on exports and the differential effect on such effect. The validation tests reported in columns (2), (4) and (6) point to the validity of instruments and the endogeneity of imports. Thus, we focus on the consistent IV estimation results. In all the three specifications we do find a significant positive effect of intermediate inputs imports from non-EUEFTA countries on firm's exports to EU15 countries. Firm imports of

intermediate inputs stimulated firm exports especially in terms of imports scope: a 1 percent increase in import value leads to a 0.08 percent increase in export value, and a 1 percent increase in intermediate inputs import scope leads to a 0.14 percent increase both in export values and in export scope. Nevertheless, neither the differential effect on this direct impact of imports on exports considering the financial crisis period (2008-2012), nor the differential effect referred to the post-crisis period (2013-2018) are significantly different from zero. Thus, our results suggest that the magnitude of the impact of non-EUEFTA intermediate inputs imports on export to the EU15 was not affected by the business cycles. Additionally, our point estimated coefficient for the 2000-2007 period are similar to the ones estimated by Bas and Strauss-Khan (2014) using French data (0.105) but much smaller than the ones reported by Feng et al. (2016) using Chinese data (0.949-1.653).

<INSERT TABLE 5 HERE>

4.2. Import source and export performance

So far, we have found a robust positive connection between imports of intermediate inputs and exports. Next, we explore whether the origin of imports matters. Imported inputs may differ in terms of quality (superior technology) and prices. Some firms may import expensive intermediate inputs to incorporate higher quality inputs in order to satisfy market quality requirements; others may simply import cheaper inputs in order to reduce costs. As we do not have specific information on the technology or quality level embedded in intermediate imported inputs by Spanish firms, we use the level of income of the sourcing country to approximate inputs quality, in line with previous research (Lo Turco and Maggioni, 2013; Bass and Strauss-Khan, 2014; Feng et al. 2016). We assume that imports from high-income sourcing countries provide high-technology or quality inputs than imports from low-income countries, while low-income sourcing countries provide cheaper inputs to firms seeking to reduce costs. In our empirical exercise we distinguish three groups of countries according to the income per capita in 2002: high-income sourcing countries (>$20,000); medium-income sourcing countries (between $8,000 and $20,000); and low-income sourcing countries (< $8,000). Accordingly, we split firm's total imports of intermediate inputs into three variables: imports of intermediate inputs from high-income, medium-income and low-income non-EUEFTA sourcing countries.[6]

<INSERT TABLE 6 HERE>

Table 6 reports the estimations once we allocate the value or scope of the imported intermediate inputs by sourcing country according to their income level. Columns (1) and (2) examine the import value - export value connection. The Hansen's J test points out the validity of instruments and the weak exogeneity of imports cannot be rejected. Therefore, both OLS and IV estimates are consistent, but the former is more efficient. OLS estimation results point to the relevance of imports of intermediate inputs independently of the sourcing country since the

[6] Notice that we also calculate the corresponding instruments for each imports of intermediate inputs by sourcing country.

equality of imports coefficient estimates is not rejected in column (1). The IV estimated coefficients of imports from high income countries (0.033) and from low-income countries (0.018) are positive and statistically significant, while the one from medium income countries is not statistically different from cero. However, the difference in the magnitude of the coefficients is not statistically significant (p-value=0.15) in column (2). The same result is obtained in columns (3) and (4) when analyse the import scope - export value nexus. Validation tests shown at the bottom of column (4) point to the consistency and efficiency of the OLS estimator. Consequently, based on results shown in column (3) we find again that there are not significant differences in the enhancing effect of imports scope through the quality channel or the price channel on export values.

Finally, in columns (5) and (6) we examine the imports scope - exports scope link. Validation tests shown at the bottom of column (6) point to an endogeneity problem of the import variables in the OLS estimation since we reject the null hypothesis of import variables' exogeneity using valid instruments (Hansen J test's null hypothesis is not rejected). Thus, based on the consistent IV estimation results shown in column (6) our conclusions remain unaltered. Considering the whole sample period, 2000-2018, we do not find any significant difference in the enhancing effect of imports on exports through the quality channel or the prices channel - the coefficient estimates for import scope from high-income sourcing countries and low-income sourcing countries are positive and statistically significant but the difference in estimated magnitudes is not statistically different from zero.

We conclude that the enhancing effect of imports of intermediate inputs from non-EUEFTA countries on manufacturing firm's exports to EU15 countries is not affected differently by the country of origin of imports over the period 2000-2018. This result contradicts previous research by Lo Turco and Maggioni (2013), Bass and Strauss-Khan (2014) and Feng et al. (2016) that found a higher effect of imports from high-income countries on firm's exports over the period 2000-2006, providing evidence supporting the quality channel for Italian, French, and Chinese exporting firms. Since our data cover a long period of time (2000-2018), we examine the import-export connection for the period 2000-2007 and the period 2008-2018, separately. This approach allows us the comparison of our results with previous research and a further analysis of the impact of the financial crisis on the import –export relationship at the firm level in Spain.

<INSERT TABLE 7 HERE>

In Table 7 we select the pre-crisis period, 2000-2007. Columns (1) and (2) examine the import value – export value connection. Validation tests results at the bottom of column (2) indicate the endogeneity problem of the import variables that must be addressed by using an IV estimator. Thus, based on column (2) estimation results, we obtain a positive and significant effect of imports of intermediates from high-income sourcing countries. Thus, our results are in line with previous studies pointing to the quality channel as the mechanism enhancing firm's exports. The same results are obtained when we examine the import scope – export value nexus. in columns (3) and (4). In column (4) Hansen's J test null hypothesis is not rejected at 5% significant level while the null hypothesis of imports exogeneity is rejected at 5%. Finally, validation tests shown at the bottom of column (6) point to the consistency of the IV estimator for the model specification that examines the import scope-export scope link. Thus, IV estimation results confirm a positive and significant effect of imports from high-income non-

EUEFTA countries on firm's exports. Notice that in three specifications, imports originating from medium and low income countries have no statistically significant coefficients. Therefore, the 2000-2007 pre-crisis period provides evidence supporting the relevance of the quality channel: the higher the quality of imported inputs, the stronger the effect on firm exports to EU countries, while the cost-saving channel is not relevant.

<INSERT TABLE 8 HERE>

Table 8 shows the results for the post-crisis period, 2008-2018. Columns (1) and (2) report the coefficient estimates of the model specification in terms of import values determining export values. Validation tests results at the bottom of column (2) point to the absence of an endogeneity problem in the import variables. Therefore, both OLS and IV estimates are consistent but OLS is more efficient. Thus, based on column (1) estimation results, we obtain the highest positive and significant effect of imports of intermediates from low-income sourcing countries: an estimated elasticity of 0.021 for imports from low-income countries, 0.014 for those from medium-income countries and 0.011 for those from high-income countries. Thus, in the post-crisis period our results are reversed and revealed cost saving as driving mechanism for increasing exports. The same results are obtained when import variables are measured in terms of portfolio size in columns (3) and (4). In column (4) Hansen's J test null hypothesis of instruments validity is not rejected at 5% significant level while the endogeneity tests results point to the weak exogeneity of imports. Therefore, we select the consistent and efficient OLS estimation results in column (3). Import scope affects positive and significantly export values, with imports from low-income sourcing countries exhibiting the largest positive impact. Nevertheless, while the point estimates clearly show the relevance of the cost-saving mechanism in this post-crisis period, interval estimates do not allow rejecting the equality in the enhancing effect of imports of intermediate inputs through the price and quality channels.

The different impact of imports seeking access to superior technology (quality channel) or cost savings (price channel) on exports is clearly observed in the model specification that examines the imports scope - exports scope nexus. Validation tests shown at the bottom of column (6) point to the consistency of the IV estimator, which reveal a positive and significant effect of imports scope from low-income countries on firm's exports scope, while imports from high income countries shows a non-significant effect: a 1 percent increase in the diversification of imports portfolio coming from low income non-EUEFTA countries leads to an increase of 0.13 percent in the range of EU-exports portfolio, doubling the impact of that coming from high income non-EUEFTA countries. Therefore, only the diversification of import portfolio of intermediate inputs from low-income non EUEFTA countries stimulated exports scope to the EU after 2008.

This is an interesting, and perhaps surprising, result. We provide first time evidence supporting the relevance of the cost-saving argument for the period 2008-2018, comparable to the relevance of the imports of high quality and technologically superior inputs to increase exports values and export scope for the period 2000-2007. This switch in the importance of the imports' sourcing country from high-income to low-income sourcing countries in the imports-exports connection after 2008 may be explained for several reasons. First, there has been an increase in the availability of cheaper intermediate inputs from low-income countries as global value chains continue geographically expanding. Second, low-income countries keep upgrading technology

and gradually climbing the quality ladder in the production of some key intermediate inputs in the manufacturing sector.

5. Robustness Analysis

In this section we examine the robustness of the enhancing effect of imports on exports, changing the dependent variable and selecting different samples of firms (Table 9) and constructing different sets of instruments (Table 10). We will compare our robustness results with those obtained in our preferred specification. Baseline results are obtained from our IV estimations in Table 4 and are now organized as three panels in the same column in Tables 9 and 10: Panel A refers to the imports value and export values specification (Table 4, column 3), Panel B refers to the imports scope and exports values specification (Table 4, column 6) and Panel C refers to imports scope and exports scope specification (Table 4, column 9).

Alternative endogenous variable and different subsamples.

We begin considering a wider and less restrictive export market, including countries belonging to EUEFTA rather than EU-15 in the definition of our endogenous variable. Results in Table 9 column (2) are almost identical to the baseline ones. [7]

Columns (3) to (9) in Table 9 show the results using alternative firm subsamples, using different criteria according to several firm characteristics. In column (3) we exclude the 10% top exporters in our sample and in column (4) we exclude the top 10 exporters in each industry, reducing 25% the sample size (about 13.000 observations). Comparing these estimation results with those in the baseline, we find very similar results both in the significance and in magnitude of the coefficient estimates, suggesting that the import - export connection is unaltered by the volume of exports of the firms. When we restrict our sample to domestic-owned firms (column 5), to firms that do not export more than 10 years over the entire period 2000-2018 period (column 6), or to firms born after 1992 (column 7), the key results remain unaltered.

To complete this robustness check we restrict the samples of two-way traders to those exporting exclusively to EU15 (column 8) and to those buying the majority of their intermediate inputs from the EUEFTA countries (column 9). In the first sample, with only 747 firms, the point estimates of import-export elasticities are similar to the baseline ones with one exception in panel B for the imports scope – exports value connection that is not statistically different from zero. In the second sample, with 1992 firms, all the point estimates are slightly higher in magnitude but the interval estimates indicate that the coefficient estimates are not different from the baseline. Overall, the results in Table 9 confirm that the enhancing effect of imports on exports is valid for different samples of firms.

Alternative instruments

[7] The results were also the same when we restricted the sample of destination countries to the EURO zone.

We finish this robustness section presenting new regression using the IV estimator with alternative instruments. First, we use the third lag rather than the second lag of all the instruments. As expected, IV estimations include less observations than the baseline (Table 10, column 2). The set of instruments is still valid and the results are in line with our baseline ones (column 1).

Second, we use the definition of tariff and exchange rates instruments proposed by Bas and Strauss-Khan (2014). These two alternative instruments for intermediate inputs imported by a firm are constructed at firm level, by using firm's shares, rather than at industry level as in our preferred specification. The tariff in product p is computed as a weighted average of EU tariffs, TAR_{pt}, applied to the *p* products imported by Spanish firm i from non-EUEFTA countries. The weights are the shares of imports of each product p imported by firm i, IMP_{pi}, belonging to the set of products imported by firm i, P_i^M, in its initial year of activity.

$$tariff_{it} = \sum_{p=1}^{P_i^M} \frac{IMP_{pi}^{ini}}{\sum_{p=1}^{P_i^M} IMP_{pi}^{ini}} TAR_{pt}$$

Similarly, the real exchange rate for firm *i* is computed as the weighted average of real exchange rates applied to imports of intermediate products from non-EUEFTA country c, RER_{ct}. The weights are the shares of firm's imports of intermediate inputs sourced from each non-EUEFTA country c, IMP_{ci}, in the set of sourcing Non-EUEFTA countries of firm i's imports, C_i^M, in its initial year of activity:

$$rer_{it} = \sum_{c=1}^{C_i^M} \frac{IMP_{ci}^{ini}}{\sum_{c=1}^{C_i^M} IMP_{ci}^{ini}} RER_{ct}$$

Table 10, column (3) shows the IV estimation results. Validation tests provide evidence on the validity of this alternative set of instruments (the Hansen's J test null is not rejected), while the imported intermediate inputs regressor is endogenous in all the three specifications. Based on these alternative instruments, we obtain almost identical positive and significant impact of imports of intermediate inputs on firm exports to our baseline estimates.

Finally, we consider an alternative definition of imports of intermediate inputs based on Feenstra and Hanson (1996). We consider firm's main sector of activity (at the HS4 level). Firm's imports belonging to the same HS4 category than the firm's exports are final goods whereas imports from any other category are intermediate inputs. The results are shown in Table 10 column (4). Hansen's J test null hypothesis is rejected in panel A and Panel B. Only validation tests in Panel C indicate the validity of the set of instruments at 5% of significance level and the endogeneity of intermediate imports scope, thus supporting the consistency and efficiency of our IV results that are in line with our main results.

Overall, the enhancing effect of imports of intermediate inputs on firm's exports by Spanish firms is robust to sample selection, the definition of the dependent variable and the use of alternative instruments.

6. Conclusions

This is the first paper that measures the impact of importing intermediate inputs on the export value and scope of Spanish manufacturing firms over the period 1997-2018. To alleviate endogeneity problems in the import-export link and to construct valid instruments for imports

based using tariffs and exchange rates, we use the universe of firms that regularly export to the EU15 market and import intermediate inputs from non-EUEFTA markets. In addition, we use an IV estimation strategy, using instruments such as potential supply for firm's imports, input import tariffs and input imports real exchange rates as exogenous measures of firm's import costs. Moreover, we control for observable firm characteristics such as employment size and apparent labour productivity to consider the indirect impact of imports on exports through costs, so we can isolate the direct impact of imports on exports through the demand only.

We find robust evidence on the causal enhancing effect of importing intermediate inputs on firm´s exports. The higher the value of imports of intermediate inputs the higher the value exports. Similarly, the higher the firm's import scope, the higher the exports values and scope. Moreover, this direct causal effect of imports on exports is stable over time.

We further disentangle the channel through which this causal link operates. We consider high quality imports as a source of firm's exports improvement to satisfy more difficult or demanding markets imports, where high-quality imports are proxied by inputs purchased from high-income countries. Alternatively, cost-saving or low-price intermediate imports may increase expected export returns and thus stimulate exporting more, where low price intermediate inputs are proxied by inputs purchased from low-income sourcing countries. On average over the whole sample period, 2000-2018, we do not find any significant difference in the enhancing effect of imports on exports through the quality channel or the prices channel. However, once we consider the 2008 financial crisis breakpoint, we obtain that in the pre-crisis years, 2000 to 2007, intermediate input imports from high-income non-EUEFTA countries increase the value and portfolio size of exports to the exigent EU15 market, providing support to the quality upgrading argument. However, after the financial crisis of 2008, the price channel is also relevance since increasing intermediate inputs imports from low-income non-EUEFTA countries also enhances the value and scope of exports to the EU market.

7. References

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Table 1. Descriptive of database

Period	Firms (N)	Export value (th. mill. eur)	Share in Spanish exports (%)	Exports value to EU15 (th. mill. eur)	Share in Spanish exports to EU15 (%)	Value of interm. inputs imports from no-EUEFTA (th. mill. eur)	Share in Spanish interm. inputs imports from non-EUEFTA (%)
Total							
2000-2018	6621	1603.4	45.1	1083.4	48.6	608.5	26.9
Annual average							
2000-2007	3030	63.7	43.4	45.1	44.2	21.4	21.2
2008-2018	3274	99.4	45.9	61.0	46.1	39.7	29.2

Notes: Calculations based on information of Table A.1

Table 2. Firm-year descriptives (2000-2018)

	mean	sd	P10	P50	P90
Export value EU15	17121	136147	185	1924	23132
Export scope EU15	17	29	3	10	37
Interm. import value no EU-EFTA	10099	217508	13	265	5208
share of high-income countries	16%				
share of medium-income countries	55%				
share of low-income countries	29%				
Interm. import scope no EU-EFTA	7	12	1	4	15
share of high-income countries	40%				
share of medium-income countries	19%				
share of low-income countries	41%				
Employment	174	560	17	57	335
Labour productivity	292210	542955	87000	190878	518795
Number of years exporting to EU15	16.65	5.30	8	19	22
Year of birth	1980	16.18	1961	1985	1996
Foreign ownership status	0.175	0.38	0	0	1

Notes: The sample has 60253 firm-year observations. Value is expressed in thousand euros and scope is the number of product-country pairs. See Table A3 in Appendix for classification of countries by level of income.

Table 3. Correlations between intermediate imported inputs and instruments.

Instruments	(1) Import value (t-1)	(2) Import value (t-1)	(3) Import value (t-1)	(4) Import value (t-1)	(5) Import scope (t-1)	(6) Import scope (t-1)	(7) Import scope (t-1)	(8) Import scope (t-1)
Supply (t-2)	0.164***			0.152***	0.0800***			0.0684***
	(0.0237)			(0.0235)	(0.0119)			(0.0115)
Tariff (t-2)		-9.265***		-5.773***		-5.320***		-2.751***
		(2.236)		(2.195)		(1.105)		(1.058)
RER (t-2)			-1.120***	-0.437			-1.006***	-0.694***
			(0.299)	(0.298)			(0.151)	(0.146)
Observations	40,106	40,106	40,106	40,106	40,106	40,106	40,106	40,106
R-squared	0.826	0.825	0.824	0.826	0.774	0.773	0.773	0.774

Notes: All variables are in logs. All regressions include firm fixed effects and year fixed effects. Robust clustered by firm standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

TABLE 4. Main regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Export value	Export value	Export value	Export value	Export value	Export value	Export scope	Export scope	Export scope
	OLS	OLS	IV	OLS	OLS	IV	OLS	OLS	IV
Import value (t-1)	0.109***	0.0524***	0.0739***						
	(0.00715)	(0.00675)	(0.0141)						
Import scope (t-1)				0.166***	0.0742***	0.124***	0.0975***	0.0629***	0.130***
				(0.0124)	(0.0109)	(0.0300)	(0.00713)	(0.00652)	(0.0186)
Employment (t-1)		0.860***	0.860***		0.876***	0.875***		0.356***	0.333***
		(0.0363)	(0.0417)		(0.0361)	(0.0418)		(0.0187)	(0.0210)
Labour productivity (t-1)		0.563***	0.536***		0.587***	0.566***		0.162***	0.143***
		(0.0370)	(0.0424)		(0.0367)	(0.0409)		(0.0163)	(0.0178)
Potential demand (t-1)	0.0490***	0.0128	0.0145	0.0508***	0.0128	0.0142	0.0397***	0.0260***	0.0249***
	(0.0158)	(0.0154)	(0.0164)	(0.0160)	(0.0155)	(0.0166)	(0.00867)	(0.00839)	(0.00911)
Observations	47,462	47,462	40,106	47,462	47,462	40,106	47,462	47,462	40,106
R-squared	0.877	0.888	0.115	0.876	0.888	0.112	0.866	0.872	0.059
Weak identification SW F Test			705.5			511.4			511.4
Hansen J p-value			0.632			0.589			0.530
Endogeneity test p-value			0.0610			0.0521			0.000

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 5. Structural change analysis with two break periods 2008-2012 (financial crisis) and 2013-2018 (recovery)

VARIABLES	(1) Export value	(2) Export value	(3) Export value	(4) Export value	(5) Export scope	(6) Export scope
	OLS	IV	OLS	IV	OLS	IV
Import value (t-1)	0.0509***	0.0803***				
	(0.00836)	(0.0161)				
Import value (t-1)*$D_{(2008-2012)}$	0.00714	-0.00743				
	(0.00881)	(0.0155)				
Import value (t-1)*$D_{(2013-2018)}$	0.00153	-0.00333				
	(0.0106)	(0.0153)				
Import scope (t-1)			0.0837***	0.146***	0.0670***	0.141***
			(0.0145)	(0.0353)	(0.00838)	(0.0216)
Import scope (t-1)*$D_{(2008-2012)}$			-0.0199	-0.0397	-0.0105	-0.0171
			(0.0167)	(0.0301)	(0.00930)	(0.0168)
Import scope (t-1)*$D_{(2013-2018)}$			-0.0105	-0.00361	-0.000940	-0.00121
			(0.0199)	(0.0312)	(0.0117)	(0.0188)
Observations	47,462	40,106	47,462	40,106	47,462	40,106
R-squared	0.889	0.115	0.888	0.112	0.872	0.059
Weak identific. SW F Test		240.1		170.1		170.1
Hansen J p-value		0.167		0.141		0.102
Endogeneity test p-value		0.0160		0.0461		0.000

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6. Analysis of the impact of imports on exports by income level of sourcing country, 2000-2018

VARIABLES	(1) Export value	(2) Export value	(3) Export value	(4) Export value	(5) Export scope	(6) Export scope
	OLS	IV	OLS	IV	OLS	IV
Imp. val. (t-1) high income	0.0207***	0.0339***				
	(0.00385)	(0.0103)				
Imp. val. (t-1) med. income	0.0110***	0.00542				
	(0.00369)	(0.00978)				
Imp. val. (t-1) low income	0.0183***	0.0186**				
	(0.00406)	(0.00864)				
Imp. scope (t-1) high income			0.0654***	0.124***	0.0472***	0.0816***
			(0.0129)	(0.0423)	(0.00744)	(0.0236)
Imp. scope (t-1) med. income			0.0324**	0.0189	0.0234***	0.0218
			(0.0127)	(0.0399)	(0.00787)	(0.0263)
Imp. scope (t-1) low income			0.0485***	0.0297	0.0524***	0.0788***
			(0.0130)	(0.0320)	(0.00784)	(0.0189)
Potential demand	0.0125	0.0140	0.0122	0.0138	0.0254***	0.0242***
	(0.0154)	(0.0165)	(0.0155)	(0.0166)	(0.00840)	(0.00912)
Employment	0.863***	0.872***	0.870***	0.879***	0.351***	0.339***
	(0.0365)	(0.0430)	(0.0363)	(0.0424)	(0.0186)	(0.0213)
Labour productivity	0.572***	0.556***	0.585***	0.571***	0.160***	0.149***
	(0.0369)	(0.0419)	(0.0366)	(0.0409)	(0.0162)	(0.0178)
Observations	47,462	40,106	47,462	40,106	47,462	40,106
R-squared	0.888	0.114	0.888	0.113	0.872	0.064
High-med.-low (p-value)	0.143	0.151	0.177	0.187	0.0175	0.199
weak identif. SW F Test		158.9		111.7		111.7
Hansen J p-value		0.307		0.283		0.576
Endogeneity test p-value		0.561		0.437		0.00230

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 7. Analysis of the impact of imports on exports by income level of sourcing country, 2000-2007

VARIABLES	(1) Export value	(2) Export value	(3) Export value	(4) Export value	(5) Export scope	(6) Export scope
	OLS	IV	OLS	IV	OLS	IV
Imp. val. (t-1) high income	0.0231***	0.112***				
	(0.00536)	(0.0354)				
Imp. val. (t-1) med. income	0.00533	0.0117				
	(0.00468)	(0.0328)				
Imp. val. (t-1) low income	0.0102**	0.0308				
	(0.00487)	(0.0189)				
Imp. scope (t-1) high income			0.0808***	0.706***	0.0355***	0.225**
			(0.0168)	(0.224)	(0.0102)	(0.107)
Imp. scope (t-1) med. income			0.0119	-0.231	0.0205**	0.0589
			(0.0169)	(0.211)	(0.0105)	(0.127)
Imp. scope (t-1) low income			0.0249	0.0565	0.0323***	0.0825
			(0.0171)	(0.0931)	(0.0101)	(0.0569)
Potential demand	0.0445*	0.0395	0.0451*	0.0356	0.0286**	0.0196
	(0.0234)	(0.0272)	(0.0235)	(0.0281)	(0.0124)	(0.0144)
Employment	0.762***	0.626***	0.762***	0.582***	0.276***	0.184***
	(0.0606)	(0.0804)	(0.0606)	(0.0946)	(0.0344)	(0.0458)
Labour productivity	0.585***	0.482***	0.590***	0.473***	0.145***	0.0852***
	(0.0524)	(0.0635)	(0.0524)	(0.0677)	(0.0245)	(0.0294)
Observations	16,115	12,047	16,115	12,047	16,115	12,047
R-squared	0.928	0.023	0.928	-0.114	0.910	-0.021
High-med.-low (p-value)	0.0428	0.0858	0.00801	0.0160	0.576	0.545
Weak identif. SW F Test		7.713		2.931		2.931
Hansen J p-value		0.149		0.113		0.921
Endogeneity test p-value		0.0462		0.0356		0.0536

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 8. Analysis of the impact of imports on exports by income level of sourcing country, 2008-2018

VARIABLES	(1) Export value	(2) Export value	(3) Export value	(4) Export value	(5) Export scope	(6) Export scope
	OLS	IV	OLS	IV	OLS	IV
Imp. val. (t-1) high income	0.0114***	0.0223				
	(0.00405)	(0.0148)				
Imp. val. (t-1) med. income	0.0141***	-0.00273				
	(0.00387)	(0.0126)				
Imp. val. (t-1) low income	0.0209***	0.0285**				
	(0.00438)	(0.0118)				
Imp. scope (t-1) high income			0.0425***	0.0853	0.0335***	0.0529
			(0.0141)	(0.0685)	(0.00768)	(0.0342)
Imp. scope (t-1) med. income			0.0450***	0.0552	0.0242***	0.0331
			(0.0143)	(0.0618)	(0.00841)	(0.0367)
Imp. scope (t-1) low income			0.0712***	0.0924**	0.0565***	0.130***
			(0.0130)	(0.0470)	(0.00793)	(0.0265)
Potential demand	0.0128	0.0158	0.0114	0.0141	0.0198**	0.0225**
	(0.0185)	(0.0201)	(0.0186)	(0.0202)	(0.00907)	(0.00957)
Employment	0.746***	0.772***	0.748***	0.762***	0.307***	0.286***
	(0.0469)	(0.0537)	(0.0467)	(0.0521)	(0.0199)	(0.0230)
Labour productivity	0.466***	0.467***	0.476***	0.472***	0.121***	0.106***
	(0.0411)	(0.0476)	(0.0411)	(0.0460)	(0.0176)	(0.0193)
Observations	30,767	27,448	30,767	27,448	30,767	27,448
R-squared	0.914	0.079	0.914	0.079	0.901	0.038
High-med.-low (p-value)	0.227	0.189	0.244	0.904	0.00916	0.0970
Weak identif. SW F Test		51.55		45.17		45.17
Hansen J p-value		0.344		0.361		0.452
Endogeneity test p-value		0.431		0.463		0.000599

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Robustness analysis with different endogenous variable and samples of firms

	(1) baseline	(2) new endog. vble exports to EUEFTA countries	(3) excluded 10% top exporters	(4) excluded top 10 firms of each industry	(5) excluded foreign-owned firms	(6) excluded firms exporting all the period	(7) excluded firms borned before 1992	(8) only firms 100% exports to EU	(9) firms importing mainly from non-EUEFTA
Number of firms	4884	4884	3665	3610	4083	2462	1531	747	1992
Number observations.	40,106	40,106	27,054	27,159	32,235	15,061	10,595	5,330	16,013
Panel A. Export value									
Import value (t-1)	0.0739***	0.0730***	0.0779***	0.0828***	0.0628***	0.103***	0.101***	0.104**	0.123***
	(0.0141)	(0.0135)	(0.0176)	(0.0170)	(0.0146)	(0.0296)	(0.0325)	(0.0459)	(0.0257)
R-squared	0.115	0.125	0.087	0.097	0.122	0.112	0.086	0.043	0.143
Weak identif. SW F Test	705.5	705.6	413.3	441.5	560.7	193.3	143.6	81.15	216.4
Hansen J p-value	0.632	0.641	0.853	0.618	0.939	0.587	0.0860	0.281	0.546
Endog. test p-value	0.0610	0.0541	0.0671	0.0291	0.106	0.183	0.718	0.103	0.0386
Panel B. Export value									
Import scope (t-1)	0.124***	0.128***	0.179***	0.163***	0.156***	0.192***	0.200***	0.134	0.198***
	(0.0300)	(0.0292)	(0.0395)	(0.0380)	(0.0318)	(0.0713)	(0.0752)	(0.0910)	(0.0495)
R-squared	0.112	0.122	0.082	0.094	0.119	0.108	0.080	0.044	0.135
Weak identif. SW F Test	511.4	511.5	276.4	308.5	406.3	110.3	80.64	69.96	191.1
Hansen J p-value	0.589	0.582	0.804	0.582	0.941	0.623	0.0664	0.238	0.514
Endog. test p-value	0.0521	0.0247	0.00166	0.00555	0.00257	0.116	0.227	0.218	0.00532
Panel C. Export scope									
Import scope (t-1)	0.130***	0.136***	0.136***	0.123***	0.132***	0.208***	0.233***	0.0945*	0.195***
	(0.0186)	(0.0190)	(0.0230)	(0.0224)	(0.0193)	(0.0383)	(0.0449)	(0.0566)	(0.0297)
R-squared	0.059	0.070	0.044	0.047	0.050	0.040	0.023	0.031	0.063
Weak identif. SW F Test	511.4	511.5	276.4	308.5	406.3	110.3	80.64	69.96	191.1
Hansen J p-value	0.530	0.708	0.499	0.370	0.896	0.957	0.506	0.289	0.613
Endog. test p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0967	0.000

Notes: All the variables are expressed in logs. All the estimations include firm and year fixed effects. In the IV estimations, the set of instruments includes the second lag of log supply, log rer, log tariff and log IMP. Robust standard errors clustered by firms in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. Robustness using alternative instruments and definition of intermediate inputs.

	(1) Baseline	(2) Instr. t-3	(3) Firm share	(4) Feenstra-Hanson
Observations	40,106	34,190	39,813	36,049
Number of firms	4884	4301	4847	4523
Panel A. Export value				
Import value (t-1)	0.0739***	0.103***	0.0726***	0.0417***
	(0.0141)	(0.0248)	(0.0141)	(0.0142)
R-squared	0.115	0.112	0.115	0.112
Weak identif. SW F Test	705.5	145.7	702.7	592.9
Hansen J p-value	0.632	0.614	0.567	0.0304
Endog. test p-value	0.0610	0.0549	0.0514	0.980
Panel B. Export value				
Import scope (t-1)	0.124***	0.0774	0.123***	0.0926***
	(0.0300)	(0.0558)	(0.0303)	(0.0345)
R-squared	0.112	0.112	0.113	0.111
Weak identif. SW F Test	511.4	131.3	508.7	412.2
Hansen J p-value	0.589	0.622	0.553	0.0270
Endog. test p-value	0.0521	0.963	0.0412	0.329
Panel B. Export scope				
Import scope (t-1)	0.130***	0.145***	0.129***	0.112***
	(0.0186)	(0.0350)	(0.0186)	(0.0209)
R-squared	0.059	0.053	0.059	0.060
Weak identif. SW F Test	511.4	131.3	508.7	412.2
Hansen J p-value	0.530	0.303	0.0117	0.0505
Endog. test p-value	0.000	0.000	0.000	0.000

Notes: All variables are in logs. All regressions include firm fixed effects and year fixed effects. Column (2) uses industry-level instruments lagged three periods. Column (3) uses firm-level instruments. Column (4) uses the definition of intermediate imported inputs proposed by Feenstra-Hanson. Robust clustered by firm standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix. Table A.1. Sample data (regular two way traders whose main activity is manufactures and employ 10 or more workers).

	Number firms	Total exports (th. million eur)	Share in total Spanish exports (%)	Exports to EU15 (th. million eur)	Share in Spanish exports to EU15 (%)	Intermediate imports from non-EUEFTA (th. million eur)	Share in Spanish intermediate imports from non-EUEFTA (%)
1997	1,158	20.6	23	14.6	23	4.9	11
1998	1,543	24.8	25	17.7	25	4.9	10
1999	1,851	26.7	26	19.5	26	5.8	10
2000	2,206	33.4	27	24.0	28	10.6	14
2001	2,429	45.2	36	34.1	37	11.3	14
2002	2,744	49.8	38	37.0	40	12.5	16
2003	3,084	63.2	47	45.8	47	17.6	22
2004	3,270	69.7	49	49.8	49	19.7	22
2005	3,438	74.2	49	51.1	49	26.4	26
2006	3,546	83.6	50	56.8	51	34.8	28
2007	3,519	90.6	51	61.9	52	38.5	28
2008	3,520	88.9	49	59.0	50	44.0	30
2009	3,444	70.9	46	47.1	47	25.7	26
2010	3,423	85.1	47	55.0	48	34.7	28
2011	3,448	98.3	48	61.0	48	47.0	33
2012	3,485	105.4	49	61.9	49	48.1	33
2013	3,464	107.1	48	61.5	47	49.4	35
2014	3,506	108.6	48	62.6	46	46.2	32
2015	3,550	117.0	49	70.4	49	36.9	27
2016	3,356	116.6	47	72.9	49	33.1	27
2017	2,656	102.6	39	62.4	39	34.4	25
2018	2,165	93.3	34	57.3	35	37.4	25

Source: Customs

Appendix. Table A.2. Descriptive statistics of database

Type variable (number lags)	Name of variable	N. Observ.	mean	s.d.	min.	max.
Dependent variable						
	(log) export value	47,462	7.73	1.95	0.41	15.58
	(log) export scope	47,462	2.37	1.01	0.00	6.79
Controls						
L1	(log) potential demand	47,462	13.99	1.52	7.88	19.24
L1	(log) employment	47,462	4.30	1.18	2.30	9.62
L1	(log) labour productivity	47,462	12.24	0.74	7.20	17.35
Main explanatory variable						
L1	(log) import value	47,462	5.85	2.25	0.41	16.47
L1	(log) import scope	47,462	1.50	1.00	0.00	5.89
L1	(log) imp. value from high-income countries	47,462	3.28	2.90	0.00	13.79
L1	(log) imp. value from medium-income countries	47,462	2.46	3.01	0.00	16.35
L1	(log) imp. value from low-income countries	47,462	3.80	3.06	0.00	15.71
L1	(log) imp. scope from high-income countries	47,462	0.94	0.88	0.00	5.17
L1	(log) imp. scope from medium-income countries	47,462	0.57	0.70	0.00	4.96
L1	(log) imp. scope from low-income countries	47,462	1.00	0.86	0.00	4.91
L1	(log) import value a la Feentra Hanson	43,773	5.46	2.29	0.41	16.36
L1	(log) import scope a la Feenstra-Hanson	43,773	1.27	0.96	0.00	5.74
Instruments						
L2	(log) potential supply	40,808	12.01	2.21	0.00	18.59
L2	(log) tariff (BEC-industry shares)	40,808	0.03	0.02	0.00	0.12
L2	(log) rer (BEC-industry shares)	40,808	0.70	0.04	0.48	1.47
L2	(log) tariff (BEC-firm shares)	40,808	0.03	0.02	0.00	0.24
L2	(log) rer (BEC-firm shares)	40,511	0.00	0.24	-6.23	2.15
L2	(log) potential supply a la Feenstra-Hanson	40,650	11.97	2.33	0.00	18.65

L2	(log)	tariff (Feenstra-Hanson - industry shares)	40,808	0.03	0.02	0.00	0.16
L2	(log)	rer (Feenstra-Hanson - industry shares)	40,808	0.69	0.08	0.15	2.03

Notes: L1(L2) means one-period (two-period) lagged variable. BEC-industry shares (baseline): definition intermediate according to BEC classification; industry-based import share at the year 1997. BEC-firm shares: definition intermediate according to BEC classification; firm-based import share at the beginning of export-import activity. Feestra-Hanson-industry shares: definition of intermediate inputs (excluded HS4 imports of main HS4 exports); industry-based import share at the year 1997.

Appendix Table A.3. Distribution of countries based on development level (GDP per head PPP 2000)

High-income No-EUEFTA countries (>20.000$)
AUS, CAN, HKG, ISR, JPN, KOR, NOR, NZL, SGP, TWN, USA
Medium-income countries (8.000-20.000$)
ARE, ARG, BHR, BHS, BLR, BRA, CHL, COL, CRI, DOM, DZA, GAB, GNQ, HRV, IRN, JAM, KAZ, KWT, LBN, MEX, MKD, MUS, MYS, OMN, PAN, QAT, RUS, SAU, SRB, SYC, THA, TTO, TUR, URY, VEN, ZAF
Low-income countries (<8.000$)
AGO, ALB, ARM, AZE, BEN, BFA, BGD, BOL, CHN, CIV, CMR, COD, COG, CPV, CUB, ECU, EGY, ETH, GEO, GHA, GIN, GTM, HND, HTI, IDN, IND, JOR, KEN, KGZ, KHM, LBR, LKA, MAR, MDA, MDG, MLI, MOZ, MRT, NAM, NER, NGA, NIC, NPL, PAK, PER, PHL, PRY, SDN, SEN, SLE, SLV, TGO, TUN, TZA, UGA, UKR, UZB, VNM, YEM, ZMB, ZWE

Source: World Development Indicators