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The Role of Imports for Exporter Performance in Peru

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Abstract

Using highly disaggregated firm-level customs transaction data for imports and exports in Peru over the 2000–2012 period, this paper explores the relationship between imports of intermediate inputs and firm export performance. The paper shows that greater use, variety, and quality of imported intermediate inputs is significantly correlated with higher exports, faster export growth, greater diversification of export markets, and higher quality exports (as measured by relative unit prices) at the firm level. This relationship is robust and persistent to controls for unobserved firm heterogeneity and year fixed effects. The use of imported inputs is also associated with higher productivity at the firm level. Considering the relationship between specific trade policy measures and the import performance of those exporters that are direct importers, the analysis shows that those exposed to higher tariffs and nontariff measures import less in total and exhibit lower import variety. The use of the advanced clearance procedure as the modality to clear customs for imports is favorable to the import performance of exporter-importers, in that the users of the modality import more and import a more diversified bundle of inputs than those that do not use it, even after controlling for firm size.

The Role of Imports for Exporter Performance in Peru

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1. Introduction

Supported by the commodities boom and a raft of policy liberalizations, Peru experienced a decade of unprecedented growth that contributed to a significant poverty reduction. Between 2000 and 2013, Peru's GDP per capita grew at 4.3 percent annually, a rate almost three times faster than the global average and 6 times faster than its average growth in the previous four decades. But as the commodity super-cycle unwinds, Peru faces a significant challenge of sustaining growth. In assessing the potential sources of growth, two engines stand out as being relatively unexploited: productivity and trade.

While productivity was an important contributor to Peru's growth in the boom period (accounting for close to 30 percent of per capita growth in the period 2000-2013), productivity levels remain significantly below regional and high–income country averages, and productivity convergence has been weak. From the trade perspective, Peru remains weakly integrated into regional and global networks. Even during the commodities boom, Peru's exports remained far below the levels predicted by its income level, and its import share of GDP (at 24.2 percent) was the 12th lowest in the world in 2013. Of course, from a static growth accounting perspective, imports are a drain on growth. But from a dynamic perspective, imports are critical for long-run growth, precisely through their effect via the productivity channel.

The importance of imported inputs for economic growth dates back to the endogenous growth theory, where improvements in technology foster long-term growth and imported inputs are a channel for the diffusion of technology (Romer, 1987; Romer, 1990; Aghion and Howitt, 1998). If new technology and a wider knowledge base are embodied in imported intermediate inputs or imported capital goods, importers can improve their technology by incorporating into their production processes these state-of-the-art inputs or machinery, which may not be available domestically (Grossman and Helpman, 1991).[1] Extending initial empirical evidence at the aggregate level that imports of intermediate inputs are positively correlated with aggregate productivity by Coe et al. (1997), a growing set of micro-level studies show that manufacturing firms benefit from their access to imported intermediate inputs in terms of significantly higher productivity (e.g., Amiti and Konings, 2007; Kasahara and Rodriguez, 2008; Halpern et al., 2010) and higher overall product scope (Goldberg et al., 2010). The rationale for these benefits is that imported intermediate inputs are of higher quality than domestic inputs, embody technology and

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[1] See Keller (2005) for a review of the literature on trade as a channel for the international transmission of technology.

knowledge leading to higher firm productivity, new product creation, improved quality of final products, and output growth.

Since imported inputs enhance firm productivity, they can also play a critical role for firm export performance. Recent empirical evidence shows that indeed expansions in the use of imported intermediate inputs - often as a result of trade liberalization reforms - facilitate firm entry into export markets and firm performance in those markets in terms of higher total exports, broader export scope, and higher export quality (Bas, 2012; Bas and Strauss-Kahn, 2014, 2015; Chevassus-Lozza et al., 2013; Feng et al., 2012; Fernandes and Lopez, 2015).

With increasing concentration of non-commodity trade in global production networks – where stages of production are separated and dispersed across locations – the role of imported inputs becomes ever more important, not only as a source of productivity-enhancing technology, but also a 'ticket' to participation in these global networks, or global value chains (GVCs). Indeed, from the perspective of GVCs, Peru remains a significant laggard, with its participation in GVCs being highly concentrated in forward links to its commodity exports, with limited potential for productivity-enhancing spillovers. By contrast, Peru's backward links in value chains – the degree to which it makes use of imported inputs in its export products – is among the lowest in the world. As Figure 1 shows, the share of foreign value added embedded in Peru's exports stood at just 14 percent in 2011 – this is just one-third the level in similar countries that are deeply integrated in GVCs, like Mexico and Malaysia.

Thus, in the context of weak productivity growth and declining performance of the export engine in recent years, this apparent failure to exploit the import channel may represent a barrier to firm-level productivity and competitiveness, and ultimately to aggregate economic growth. With this in mind, in this paper we explore the role of imported inputs for export performance in Peru. We evaluate this relationship on the overall export sector in Peru as well as in two leading non-minerals export sectors - *agribusiness*, where Peru has achieved a strong position in global retail supply chains and *apparel*, Peru's largest manufacturing export sector and among the most important sectors traded in GVCs.

Figure 1. Upstream and Downstream Intermediate Value Added as a Share of Gross Exports
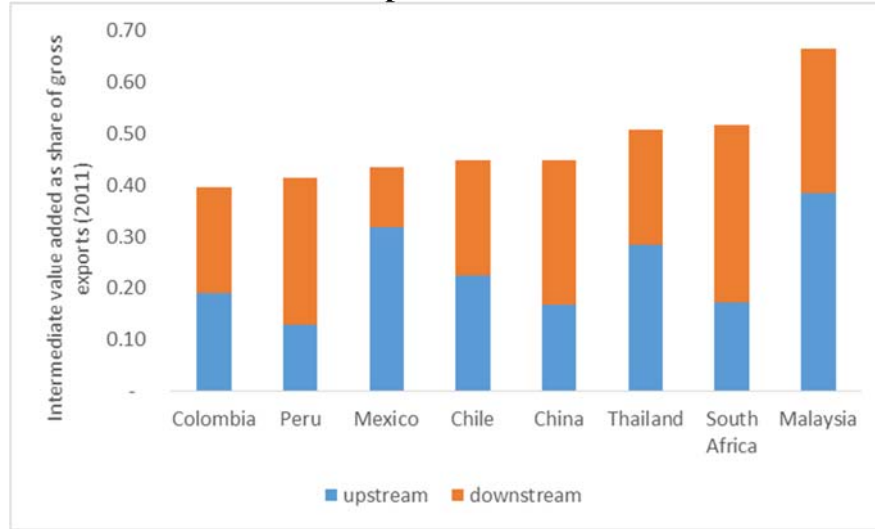
We use highly disaggregated exporter-level and importer-level customs transaction data for Peru over the period 2000-2012 to assess the relationship between imports of intermediate inputs and firm export performance, as measured by export size, export growth, market diversification, and export quality (relative unit prices). In particular, we compare the export performance of those exporting firms that are also direct importers versus that of those that are not. We also examine the effects of particular dimensions of intermediate inputs that capture the degree to which they embody foreign technology and the degree to which they represent increased variety and quality. As a complement to this analysis, we examine the impacts of importing on more general measures of firm performance including productivity, using complementary manufacturing firm-level data. We then seek to understand the factors that may explain why Peruvian firms on average make relatively limited use of imports. We do this by exploring the relationship between three specific policies – tariffs, non-tariff measures, and the use of an advanced clearance procedure as a modality to clear customs for imports – and the import performance of those exporters that are direct importers.

We find that a greater use, variety, and quality of imported intermediate inputs is positively and significantly correlated with a better export performance. This relationship is robust to controls for year fixed effects and for firm heterogeneity. More generally, we also find that the use of imported inputs is associated with higher productivity at the firm level.

In exploring policy-related determinants of importing, we find that increases in tariffs are detrimental to import growth of exporters overall in Peru, and in particular of those in the agribusiness sector. For the cross-section of exporter-importers in 2012—the year when non-tariff measures (NTMs) are available—we show that those that are subject to NTMs more intensively tend to import less intermediate inputs, not only in value but also in terms of numbers of products and varieties imported. Finally, the use of the advanced clearance procedure as the modality to clear customs for imports is favorable to the import performance of exporter-importers. Exporters who import intermediate inputs using this modality import more and import a more diversified bundle of inputs than those that do not use it. All these results are robust even after controlling for the fact that some firms are larger than others. Given the importance of import levels and variety for export and productivity performance, these findings lend support to Peru's path of extensive trade policy liberalization. They also underscore the importance of effective de facto implementation of trade policy measures and efficient trade facilitation procedures, and to ensuring that this is available to firms of all sizes across all sectors.

The remainder of the paper is organized as follows. Section 2 describes the data and provides descriptive evidence on the importance of imports for exports in Peru. Sections 3 and 4 present the results on baseline and further export performance premia for exporter-importers. Section 5 discusses general performance premia for importing firms in Peru. Section 6 explores the role of policies in explaining why Peruvian exporters do not import more. Section 7 concludes.

2. Data and Characterization of Exporter-Importers in Peru

2.1 Data Description

Our analysis uses transaction-level customs data for Peru covering the period 2000-2012 obtained from Peru's National Tax Administration (SUNAT) and collected by the Trade and Integration Unit of the World Bank Research Department as part of their efforts to expand the Exporter Dynamics Database described in Fernandes et al. (2015). The data cover the universe of Peruvian export and import transactions in the agricultural, mining—excluding HS Chapter 27 (hydrocarbons such as oil, petroleum, natural gas, coal, etc.)—and manufacturing sectors. The data include unique firm identifiers that allow us to follow firms over time and allow us to match across export and import transactions so as to generate a final data set at the firm-HS 6-digit product-

country (of origin or destination)-year level with information on value and quantity traded (exported or imported). The final data set includes an identifier to differentiate between firms that are only exporters and those that are exporters and importers simultaneously, that we designate as exporter-importers.[2] This exporter-importer status is time-varying. Additional details on the data are provided in the Appendix.

The final data set excludes annual export flows below 10,000 USD dollars as such small flows may represent the shipping of samples rather than merchandise sold as a true export venture. We will present our results focusing on exporting firms across all sectors in Peru (which we designate as *Overall* below) and then focusing on exporting firms in the two specific sectors agribusiness and apparel, whose coverage in terms of HS Chapters or 6-digit products is shown in Table 1. Note that an exporting firm is defined to be part of the agribusiness sector or part of the apparel sector if and only if the firm is an intensive exporter in the sector, that is, if that firm's total value exported of products from that sector accounts for 50 percent or more of the firm's total exports in a given year.

Table 1. Definition of Sectors

Agribusiness	Grapes, Asparagus (fresh and frozen), Avocados, Coffee, Cacao, Quinoa, Mangos, Bananas, Paprika, Tangerines and Mandarines (HS 080610, 080440, 070920, 071080, 090111, 180100, 100850, 100890, 080450, 080310, 080300, 080390, 090421, 090420, 090422, 080520)
Apparel	Chapters 60-63 of HS classification

To focus on the role of imported intermediate inputs for Peruvian firms' export performance, we follow the recent literature, namely Arkolakis et al. (2008) and Feng et al. (2012) and use the United Nations Broad Economic Classification (BEC) to identify which imports by

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[2] The data used for this analysis allows the identification of inputs and other goods imported directly by exporters. There may be other inputs and goods imported indirectly through third parties (e.g. distributors and traders); however, these transactions cannot be identified with the data available for the analysis. Importing indirectly may be an efficient strategy for small firms and for the import of non-core inputs as it can reduce fixed costs of establishing relationships with international buyers and may confer some scale-related cost benefits. However, for the purpose of analyzing the degree of integration of exporters into GVCs, transactions covering direct imports are the most critical— firms that are integrated into GVCs would normally source directly, as these sourcing relationships are critical from a quality and technology spillover perspective.
Also, since our focus in on export performance, for the purposes of our analysis, we eliminate from the final dataset the firms that are importers-only.

Peruvian firms are of intermediate inputs and capital goods and we consider only those imports in the rest of the analysis.[3] We designate them in what follows as 'imports of intermediates', or 'imports of intermediate inputs'.

We will consider for each exporting firm several measures of export performance in each year: total exports (in logarithms), growth in total exports (defined as the difference in logarithms between total exports in year t and total exports in year $t-1$), number of destination countries, and relative average unit values (defined as an export share weighted average of the ratio between the unit value for the firm-HS6 digit product in a year and the average unit value for that same HS6 digit product across all firms that export it in the same year). Appendix Table 2 shows summary statistics for all the dependent and independent variables from the customs data used in the analysis in Sections 3, 4, and 6.

2.2 Summary Statistics and Characterization of Exporter-Importers

Figure 2 shows the numbers of exporter-importers in Peru for all sectors as a whole and for agribusiness and apparel from 2000 to 2012 in Panel A; the participation of exporter-importers in the total number of exporters (relative to exporters only) in Panel B; and their share of total exports in selected years in Panel C. The key patterns identified are that the number of exporter-importers rose steadily in Peru from 2000 to 2012 and exporter-importers account for the bulk of total exports in all sectors. However, the share of importer-exporters in the total number of exporters is declining in importance, especially in apparel but also in agribusiness after 2006.

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[3] We use the BEC classification as provided in United Nations (2011) and concord the BEC categories to the HS 6-digit products imported by Peruvian firms using a concordance provided by the United Nations at http://unstats.un.org/unsd/trade/BEC%20Classification.htm. The BEC categories available are capital goods, intermediate goods, final goods and others. The category others includes all HS 6-digit products for which there is no correspondence to either capital, intermediate, or final goods.

Figure 2. Numbers and Shares of Exporter-Importers in Peru
Panel A. Number of Exporter-Importers
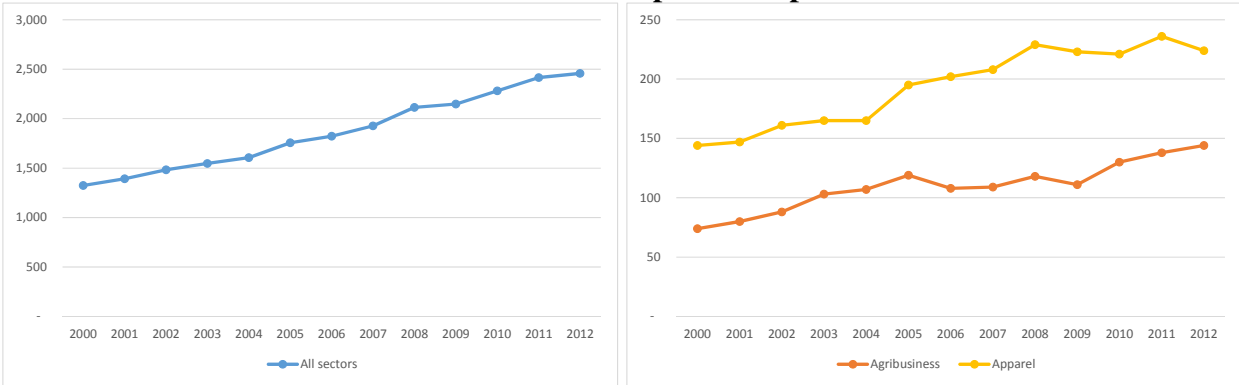
Panel B. Exporter-Importers vs. Exporters-Only
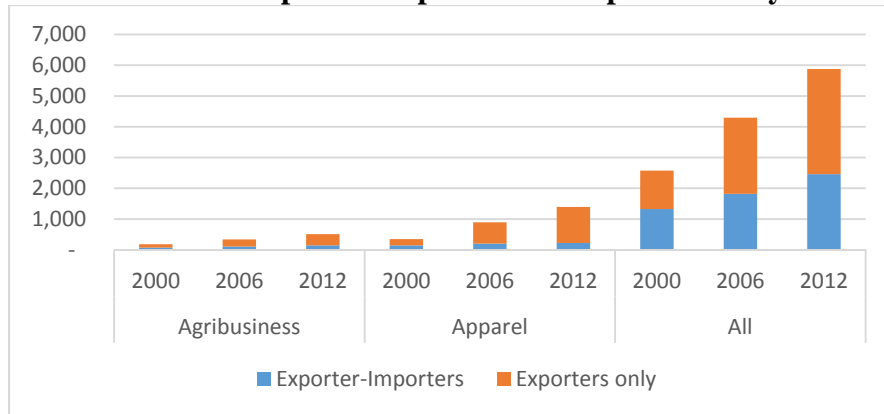
Panel C. Share of Exports by Exporter-Importers

	Agribusiness	Apparel	All
2000	86%	93%	93%
2006	78%	85%	92%
2012	79%	59%	87%

While the focus in our analysis is on imports of intermediates by Peruvian exporters, Panel A of Figure 3 shows for all exporter-importers and for exporter-importers in agribusiness and apparel in selected years the composition of their entire import portfolio in terms of the different categories of the BEC classification: capital goods, intermediates, final goods, and others. The same classification is applied to their export portfolio in Panel B. Exporter-importers import mostly intermediate goods. Considering all sectors, exporter-imports export a mixed portfolio of different types of goods, but in the agribusiness and apparel sectors, exporter-importers export mostly consumption (final) goods.

8

Figure 3. Type of Products Imported and Exported by Exporter-Importers in Peru
Panel A. Type of Products Imported
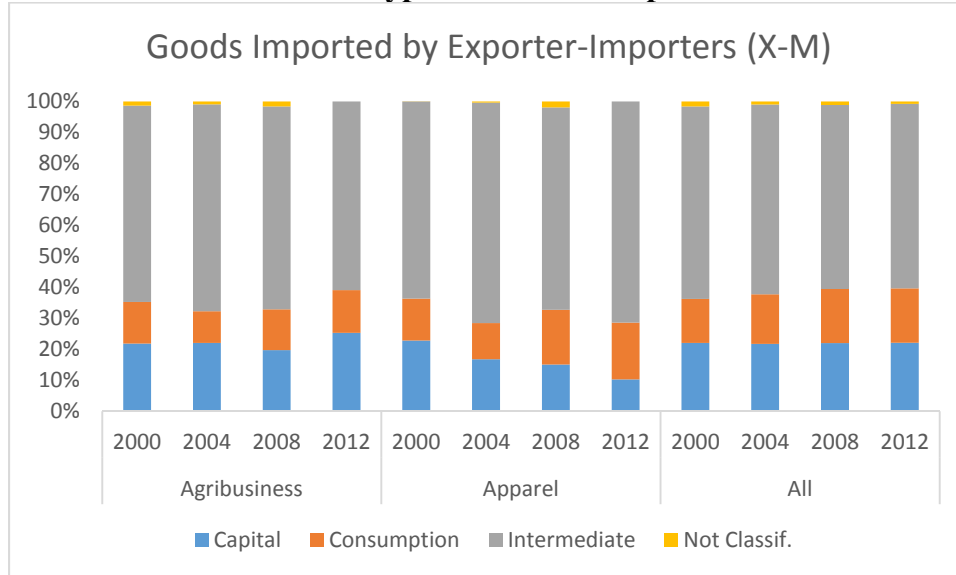
Panel B. Type of Products Exported

Next, focusing only on imports of intermediate inputs by Peruvian exporter-importers we show the portfolio of origin countries from which they source those inputs in selected years in Panel A of Figure 4. The portfolio of destination countries to which exporter-importers sell in selected years is shown in Panel B. Exporter-importers have a diversified portfolio of sourcing markets with the major ones being the United States (US), the European Union (EU), Japan, and Latin American countries. Over the 2000-2012 period China grows in importance as a source of imported intermediate inputs, especially for exporter-importers in apparel. Exporter-importers in

agribusiness sell mostly to the US, EU, and Japan while exporter-imports in all sectors as a whole and exporter-importers in apparel have a more diversified portfolio of destination markets.

Figure 4. Portfolios of Sourcing and Destination Markets for Exporter-Importers in Peru
Panel A. Portfolio of Sourcing Markets

Panel B. Portfolio of Destination Markets

3. Baseline Export Performance Premia for Exporter-Importers

To investigate the importance of imports of intermediate inputs for Peruvian exporters we follow the approach - initially proposed by Bernard and Jensen (1999) in studying the productivity

advantage of exporters in the U.S. - of estimating export performance premia regressions given by:

$$Y_{it} = \beta Exp\_Imp_{it} + I_t + I_i + \varepsilon_{it} \qquad (1)$$

where i stands for a firm (which may be an exporter-only or an exporter-importer), t stands for a year, Y_{it} is an export performance measure, I_t are year fixed effects, and ε_{it} is an independent and identically distributed (i.i.d.) error. Importantly, note that Eq. (1) includes firm fixed effects I_i which control for unobserved firm heterogeneity due to time-invariant firm characteristics which might be correlated with performance in export markets but also with the exporter-importer status. The coefficient of interest is that on the variable Exp_Imp which is in our baseline specifications a dummy variable for current exporter-importer status (1 if the firm exports and imports in year t, 0 else).[4] To ensure that the interpretation of the coefficient on the exporter-importer status dummy variable shows how export performance improves when a firm starts to import intermediate inputs – i.e., when it switches from being an exporter-only to being an exporter-importer - we drop from the estimating sample for all our specifications firms that stop being an exporter-importer and become an exporter-only. However note that the results are qualitatively similar if we include those firms in the estimating sample.

The evidence in Table 2 shows significant premia in all export performance measures for exporters that import intermediate inputs, relative to exporters that do not in Peru, overall across all sectors, as well as in the agribusiness and apparel sectors. The only exception is an insignificant premia in export growth for exporter-importers in the agribusiness sector. Exporter-importers are larger in terms of total exports, they grow faster, are more diversified in terms of destination markets, and their exported products have relatively higher quality than average. Column (1) indicates that exporter-importers have 55% higher total export values than exporters-only overall; this advantage is 64% and 65% in the agribusiness and the apparel sectors, respectively. Column (2) shows that exporter-importers growth faster overall and in apparel. Regarding diversification, column (3) shows that exporter-importers sell on average to almost 1 (0.7-0.9) additional destination country than exporters-only. Finally, Column (4) shows that exporter-importers sell products with higher unit values than exporters-only.

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[4] For export performance measures in logarithms the exporter-importer premium is computed from the estimated coefficient as $100*(\exp(\beta)-1)$ and shows the average percentage difference in a measure between exporter-importers and exporters-only.

Not only the fact of importing intermediate inputs can help exporters' performance but it is also important to investigate whether the amount imported matters. Table 2 also presents the results from estimating a variant of Eq. (1) where instead of the exporter-importer status dummy we include the logarithm of the value of imported inputs (plus one unit so as to keep exporters-only whose imports are zero in the regressions). The estimates show evidence of stronger export performance in terms of higher total exports, faster export growth, larger numbers of destination countries, and higher relative unit values for exporting firms that import relatively more intermediate inputs.[5]

Table 2. Baseline Export Performance Premia for Exporter-Importers

	Log (Export Value)	Export Growth	Nb. of Destinat.	Avg. Relative Unit Values of Exports	Log (Export Value)	Export Growth	Nb. of Destinat.	Avg. Relative Unit Values of Exports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All								
Dummy for Exporter-Importers	0.440***	0.154***	0.718***	0.161***				
	(0.023)	(0.026)	(0.062)	(0.022)				
Log (Import Value +1)					0.054***	0.022***	0.098***	0.021***
					(0.002)	(0.003)	(0.007)	(0.002)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53,881	33,663	53,881	53,881	53,881	33,663	53,881	53,881
R-squared	0.869	0.309	0.851	0.820	0.870	0.310	0.852	0.821
Agribusiness								
Dummy for Exporter-Importers	0.495***	0.056	0.776***	0.144***				
	(0.062)	(0.063)	(0.172)	(0.035)				
Log (Import Value +1)					0.053***	0.005	0.106***	0.018***
					(0.006)	(0.006)	(0.018)	(0.004)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,277	2,909	4,277	4,277	4,277	2,909	4,277	4,277
R-squared	0.841	0.420	0.808	0.782	0.842	0.420	0.810	0.783
Apparel								
Dummy for Exporter-Importers	0.503***	0.195***	0.943***	0.312***				
	(0.059)	(0.065)	(0.142)	(0.060)				
Log (Import value +1)					0.066***	0.026***	0.128***	0.044***
					(0.006)	(0.007)	(0.017)	(0.007)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,818	6,717	10,818	10,818	10,818	6,717	10,818	10,818
R-squared	0.857	0.420	0.828	0.934	0.859	0.421	0.830	0.934

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively.

One could be concerned that the premia in export performance in Table 2 reflect simply the size of the exporting firm and the conjecture would be that larger firms simply perform better,

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[5] Again the exception to the pattern is the insignificant export growth premia for exporter-importers in the agribusiness sector.

in particular in foreign markets. However, all the results presented above are obtained after controlling for firm fixed effects in all regressions, which helps to mitigate that concern.

4. Further Export Performance Premia for Exporter-Importers

Importing intermediate inputs and importing relatively higher amounts of intermediate inputs are associated with strong export performance for firms in Peru. But it is important to investigate further these premia and consider several dimensions of intermediate inputs that may better capture the degree to which they embody foreign technology and the degree to which they represent increased variety and quality, some of the key mechanisms predicted by the literature for the growth-enhancing role of imports of intermediates. To address this issue we estimate a variant of Eq. (1) where the sample is restricted to exporter-importers only and where the exporter-importer status dummy variable is replaced alternatively by the number of imported HS 6-digit products (in logarithms), the number of imported varieties defined as an HS 6-digit-origin country cell (in logarithms), and a dummy variable for exporter-importers that import more than 50% of their inputs from high-income countries.[6]

Table 3 shows the results from these specifications which reveal significantly higher export values, larger numbers of destination markets served, and relatively higher product quality than average for the exporter-importers that import more products, more varieties, and a larger share of imports from high-income countries. For example column (9) indicates that exporter-importers firms with more than 50% of imports of intermediates coming from high-income countries have 29% larger export values than exporter-importers with a lower percentage coming from high-income countries overall across all sectors (this premium is 49% and 34% in the case of agribusiness and apparel respectively.[7] These estimates provide evidence that the foreign technology embodied in imported intermediate inputs and their higher sophistication have a beneficial effect for the export performance of exporter-importers in Peru.

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[6] High-income countries are defined based on the World Bank income classification as of year 2010.
[7] These effects are obtained as $100*(\exp(\beta)-1)$ where β is the estimated coefficient.

Table 3. Further Export Performance Premia for Exporter-Importers

	Log (Export Value) (1)	Export Growth (2)	Nb. of Destinat. (3)	Avg. Rel. Unit Values of Exports (4)	Log (Export Value) (5)	Export Growth (6)	Nb. of Destinat. (7)	Avg. Rel. Unit Values of Exports (8)	Log (Export Value) (9)	Export Growth (10)	Nb. of Destinat. (11)	Avg. Rel. Unit Values of Exports (12)
						All						
Log Nb. Imported Products	0.273***	0.127***	0.597***	0.106***								
	(0.013)	(0.014)	(0.039)	(0.019)								
Log Nb. Imported Varieties (Product-Country)					0.268***	0.128***	0.603***	0.109***				
					(0.012)	(0.014)	(0.037)	(0.016)				
Dummy for Share of Imports from High-Income>50%									0.253***	0.069***	0.360***	0.073**
									(0.020)	(0.022)	(0.059)	(0.033)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53,881	33,663	53,881	53,881	53,881	33,663	53,881	53,881	53,881	33,663	53,881	53,881
R-squared	0.870	0.311	0.853	0.821	0.870	0.311	0.854	0.821	0.868	0.308	0.851	0.820
						Agribusiness						
Log Nb. Imported Products	0.218***	0.039	0.904***	0.153***								
	(0.037)	(0.037)	(0.138)	(0.026)								
Log Nb. Imported Varieties (Product-Country)					0.219***	0.044	0.899***	0.151***				
					(0.035)	(0.035)	(0.135)	(0.025)				
Dummy for Share of Imports from High-Income>50%									0.397***	0.085	0.640***	0.135***
									(0.060)	(0.063)	(0.213)	(0.039)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,277	2,909	4,277	4,277	4,277	2,909	4,277	4,277	4,277	2,909	4,277	4,277
R-squared	0.839	0.420	0.812	0.785	0.839	0.420	0.813	0.785	0.839	0.420	0.807	0.781
						Apparel						
Log Nb. Imported Products	0.454***	0.147***	1.010***	0.324***								
	(0.036)	(0.038)	(0.127)	(0.047)								
Log Nb. Imported Varieties (Product-Country)					0.442***	0.148***	1.037***	0.336***				
					(0.034)	(0.035)	(0.121)	(0.046)				
Dummy for Share of Imports from High-Income>50%									0.289***	0.077	0.324*	0.185***
									(0.056)	(0.055)	(0.185)	(0.070)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,818	6,717	10,818	10,818	10,818	6,717	10,818	10,818	10,818	6,717	10,818	10,818
R-squared	0.861	0.421	0.834	0.935	0.861	0.421	0.836	0.935	0.855	0.418	0.826	0.933

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporter-importers are included in all the regressions.

5. General Performance Premia for Importers in Peru

The results so far show very clear evidence of premia in the export performance of exporter-importers in Peru. As discussed in Section 1, imported intermediate inputs are important because they embody variety and higher quality and thus increase productivity for users, as micro-evidence has shown for several countries. In this section, we discuss some complementary evidence obtained for Peru on the importance of imported inputs for productivity based on firm-level data from the Encuesta Economica Annual (EEA).[8] The EEA data is a useful complement to our main analysis using the panel exporter-level/importer-level customs data because it allows us to calculate more general measures of firm performance than those focusing just on the export market, for example firm productivity. But in addition to not providing nearly as much detail as our customs data does on exports and imports by Peruvian firms, the EEA data has other caveats which explain why we do not use it as our main data source. In particular, the EEA is not a panel data set covering all manufacturing firms in Peru, rather it has a census component for the largest firms and a sample component for the smaller firms which implies that firms are sampled randomly as discussed in Iacovone et al. (2015). As a result, it is not possible to trace firm performance over time, which is fundamental to answering the questions raised in this paper, for any but the largest manufacturing firms.

First, we estimate a variant of Eq. (1) for the cross-sections of manufacturing firms in Peru covered by the EEA over the 2008-2012 period where the dependent variable is a firm outcome measure, either employment, real output (domestic output plus exports), real capital, real capital-labor ratio, or labor productivity (all in logarithms).[9] In the case of labor productivity, the regression also controls for the real capital-labor ratio hence the results are proximate to those that would be obtained for a total factor productivity measure.[10] The corresponding regression results are shown in Table 4, focusing on all manufacturing firms and separately on firms in the agribusiness and apparel sectors.

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[8] Details on the cleaning and preparation of the EEA are provided in Iacovone et al. (2015).

[9] Real output is measured as total output sold by the firm deflated by a 4-digit industry price deflator, real capital is constructed according to the perpetual inventory method and labor productivity is measured as value added reported in the EEA (total production minus costs of intermediate inputs (goods + services)) per employee, all defined as in Iacovone et al. (2015). Appendix Tables 3 and 4 show summary statistics for all the dependent and independent variables from the EEA data used in the analysis.

[10] Given that the EEA data that we use consists of cross-sections of firms it is not possible to obtain firm-level total factor productivity measures based on production function estimation techniques such as those by Olley and Pakes (1996) or Levinsohn and Petrin (2003). Thus, the use of a labor productivity measure while controlling for the capital-labor ratio is the best possible alternative.

Importing firms are significantly larger in terms of their employment and output, significantly more capital intensive and more productive than firms that do not import in the agribusiness sector as well as in the manufacturing sector overall. In the apparel sector importing firms are significantly larger in terms of their employment and output but they are neither more capital-intensive nor more productive than firms that do not import.[11]

Table 4. Performance Premia for Importers based on EEA Data

	Log (Employment)	Log (Real Output)	Log (Capital/ Employment)	Log (Labor Productivity)
	(1)	(2)	(3)	(4)
	All Manufacturing Firms			
Dummy for Importers	0.829***	1.074***	0.422***	0.164***
	(0.037)	(0.039)	(0.039)	(0.018)
Log (Capital/Employment)				0.243***
				(0.004)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry (ISIC 3-digit) Fixed Effects	Yes	Yes	Yes	Yes
Observations	12,076	12,533	12,018	11,645
R-squared	0.122	0.196	0.194	0.452
	Agribusiness			
Dummy for Importers	0.983***	1.280***	0.612***	0.221***
	(0.159)	(0.145)	(0.136)	(0.074)
Log (Capital/Employment)				0.308***
				(0.018)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry (ISIC 3-digit) Fixed Effects	Yes	Yes	Yes	Yes
Observations	897	933	891	864
R-squared	0.065	0.102	0.029	0.27
	Apparel			
Dummy for Importers	1.357***	1.267***	-0.05	-0.027
	(0.159)	(0.126)	(0.135)	(0.061)
Log (Capital/Employment)				0.162***
				(0.015)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,028	1,071	1,015	990
R-squared	0.129	0.131	0.022	0.114

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively.

Next, we focus on the subset of firms in the EEA that are exporters so as to characterize the differences between those that are exporter-importers and those that are exporters-only, particularly in terms of productivity. The top part of Table 5 shows very clear evidence that exporter-importers overall are significantly larger in terms of employment and output, they are older and more likely to be foreign-owned, and they are also more capital-intensive and

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[11] We also considered the subset of the EEA data that is a panel covering only the largest Peruvian firms, as described in Iacovone et al. (2015). That sample is limited but allows us to estimate the same regressions but controlling for firm fixed effects. Unreported results show that even after controlling for firm fixed effects, firms that import exhibit significantly higher capital-labor ratios and labor productivity (controlling for the capital-labor ratio).

significantly more productive than exporters-only. These findings are all verified for exporter-importers in the agribusiness sector whereas for exporter-importers in the apparel sector the findings on the likelihood of foreign ownership, on the higher capital intensity and the higher productivity are not verified.

Table 5. Performance Premia for Exporter-Importers based on EEA Data

	Log (Employment)	Log (Age)	Foreign owned dummy	Log (Real Output)	Log (Capital/ Employment)	Log (Labor Productivity)
	(1)	(2)	(3)	(4)	(5)	(6)
			All Manufacturing Firms			
Dummy for Exporter-Importers	0.776***	0.232***	0.058***	0.837***	0.362***	0.086***
	(0.049)	(0.023)	(0.008)	(0.050)	(0.045)	(0.024)
log (Capital/ Employment)						0.308***
						(0.007)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry (ISIC 3-digit) Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5884	6071	6071	6045	5869	5667
R-squared	0.133	0.174	0.132	0.206	0.243	0.482
			Agribusiness			
Dummy for Exporter-Importers	0.731***	0.241***	0.104***	0.873***	0.584***	0.259***
	(0.183)	(0.074)	(0.024)	(0.150)	(0.147)	(0.088)
log (Capital/ Employment)						0.361***
						(0.024)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	631	647	647	644	629	606
R-squared	0.037	0.02	0.035	0.079	0.03	0.299
			Apparel			
Dummy for Exporter-Importers	1.157***	0.372***	0.011	1.019***	0.169	-0.087
	(0.175)	(0.071)	(0.014)	(0.135)	(0.141)	(0.067)
log (Capital/ Employment)						0.151***
						(0.021)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	622	642	642	641	616	600
R-squared	0.114	0.078	0.006	0.125	0.02	0.087

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporting firms are included in all the regressions in Panels A and B.

6. Why Don't Peruvian Exporters Import More? The Role of Policies

In this section we conduct an exploratory analysis of some of the policies that may be preventing Peruvian exporting firms from importing more and thus from benefiting from those imported intermediate inputs, given the evidence provided in Sections 3, 4 and 5. The policies that we consider are nominal applied tariff rates, non-tariff measures (NTMs) on imports and the use of a special regime to clear import customs in advance ("despacho anticipado"). Our focus is on analyzing the correlations between these three types of policies and Peruvian firms' import outcomes. The results presented in the analysis below indicate correlations between all the policies and the import performance of exporters. For a more sophisticated analysis of how these policies

deter imports of intermediate inputs, we would need to follow more closely the changes observed in the implementation of these policies - which we are able to do only on the implementation of the advance clearance system - or to have further information, for example on domestic intermediate inputs used so as to also exploit the choice to start importing intermediate inputs that were previously bought domestically.

First, we focus on the correlations between tariffs and Peruvian firms' import choices. The data on nominal applied tariff rates at the transaction level was provided by SUNAT, and it is calculated for each firm as the ratio of total ad-valorem tariff duty paid over the total value imported across all of the firm's transactions at the product-country of origin level in a given year.[12] We consider the effects of changes in the applied tariff rate on contemporaneous changes in firm total imports using the following specification in growth rates:

$$\Delta M_{it} = \beta \Delta tariff_{it} + I_t + I_i + I_{hs2} + \varepsilon_{it} \tag{2}$$

where i stands for an exporter-importer firm, t stands for a year, M_{it} are total imports of intermediate inputs, I_t are year fixed effects, I_{hs2} are fixed effects indicating the main HS 2-digit product imported by the firm, other variables are defined as above and ε_{it} is an i.i.d. error. The firm fixed effects I_i included allow for heterogeneity across firms in their rates of import growth. We consider also the specification in levels below:

$$M_{it} = \beta tariff_{it} + I_t + I_i + I_{hs2} + \varepsilon_{it} \tag{3}$$

where all variables are defined as above. The results from estimating these specifications are shown in Table 6.[13] Appendix Table 5 shows yearly averages of applied tariffs on intermediate inputs for all sectors and for agribusiness and apparel separately.

The key pattern that emerges from Table 6 is a significant negative short-term effect of higher growth in tariffs and higher tariffs on imports of intermediate inputs by Peruvian exporter-importers when considering exporter-importers across all sectors. While the magnitude of the effects of changes in tariffs on import growth is stronger in the agribusiness sector than for all sectors combined, the negative effects in the apparel sector are not significant.

While the reduced-form specifications whose estimates are shown in Table 6 are simple, it is interesting to note that the magnitude of the responses of import flows to tariffs for Peruvian

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[12] Though tariffs are applied to imports of products at the HS 10-digit level, for these calculations products are aggregated up to the HS 6-digit level.

[13] The main HS 2-digit fixed effects are not collinear with the firm fixed effects because firms may switch over time the main HS 2-digit sector that accounts for the largest share of their exports.

firms overall are not too different from those obtained from the estimation of sophisticated structural trade models by Bernard et al. (2003) or Spearot (2013).

Table 6. Tariffs and Imported Intermediates

	Import Growth (1)	Log (Import Value) (2)	Import Growth (3)	Log (Import Value) (4)	Import Growth (5)	Log (Import Value) (6)
	All		**Agribusiness**		**Apparel**	
Change in Applied Tariff Rate	-4.072***		-6.789***		-1.974	
	(0.690)		(2.302)		(1.509)	
Log (Applied Tariff Rate)		-3.286***		-1.777		-1.956
		(0.637)		(1.998)		(1.260)
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Main HS 2-digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,062	22,522	792	1,278	1,485	2,345
R-squared	0.303	0.912	0.409	0.790	0.346	0.880

Notes: Robust standard errors in parentheses. *** indicates significance at the 1% confidence level. Only exporter-importers are included in all the regressions.

Second, we consider the correlations between NTMs and Peruvian firms' import choices. The data on NTMs is taken from the Trade Analysis and Information System (TRAINS) developed by the United Nations Conference on Trade and Development (UNCTAD). For Peru, the data on NTMs is available for year 2012 only, which precludes the analysis from having a time-series dimension. NTMs are available by HS tariff line and are categorized according to the 2009 classification whose categories are; A - Sanitary and phytosanitary measures; B - Technical barriers to trade; C - Pre-shipment inspection and other formalities; D - Price control measures; E - Licenses, quotas, prohibitions and other quantity control measures.[14] For the purpose of this analysis, given the exposure of the particular sectors we are looking at, we only consider the first three categories in our definition of NTMs. We make the simplifying assumption that if at least 1 HS tariff line within an HS 6-digit product is subject to an NTM as of 2012 (in one of the first three categories mentioned above), the entire HS 6-digit product is categorized as being subject to an NTM. For each firm in 2012, we calculate the share of its intermediate imports that is accounted for by HS 6-digit products subject to an NTM and we define a dummy variable equal to 1 if more than 40% of the firm's imports are subject to an NTM. We estimate a cross-sectional variant of Eq. (3) where the tariff measure is replaced by one of the firm-level NTM measures just described, year and firm fixed effects are dropped, and the dependent variable is either import value, the

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[14] See Cadot and Malouche (2012) for more details on the classification and for a thorough review of the role of NTMs for trade.

number of imported products (in logarithms), or the number of imported varieties (in logarithms). It is important to note that in this case, the regressions will only account for differences across firms in the extent to which their imports of intermediates are subject to NTMs. In that sense, only firms that import intermediates subject to NTMs are included in the sample whereas firms whose imports of intermediates are not subject to any NTM are excluded. Appendix Table 5 shows averages of NTMs for all sectors and for agribusiness and apparel separately.

The results shown in Table 7 indicate a clear negative correlation between the presence of NTMs on firms' imported intermediates and total imports as well as numbers of imported products and varieties in all sectors, though the differences in the extent to which imported intermediates are subject to NTMs are less pronounced for agribusiness, hence, the correlations are less significant. The estimates also show that the larger is the actual share of imported intermediates subject to NTMs, the lower are total imports, and numbers of imported products and varieties.

Table 7. Non-Tariff Measures and Imported Intermediates

	Log (Import Value)	Log (Nb. Imported Products)	Log (Nb. Imported Varieties)	Log (Import Value)	Log (Nb. Imported Products)	Log (Nb. Imported Varieties)
	All					
Dummy for Share of Imports under NTMs >40%	-1.091***	-0.983***	-1.033***			
	(0.157)	(0.080)	(0.092)			
Share of Imports under NTMs				-1.966***	-1.822***	-1.878***
				(0.224)	(0.110)	(0.128)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,799	1,799	1,799	1,799	1,799	1,799
R-squared	0.184	0.220	0.206	0.201	0.273	0.248
	Agribusiness					
Dummy for Share of Imports under NTMs >40%	-0.277	-0.159	-0.169			
	(0.555)	(0.286)	(0.312)			
Share of Imports under NTMs				-1.401*	-0.863*	-0.891*
				(0.824)	(0.445)	(0.480)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	95	95	95	95	95	95
R-squared	0.365	0.309	0.303	0.387	0.333	0.325
	Apparel					
Dummy for Share of Imports under NTMs >40%	-2.364***	-1.758***	-1.935***			
	(0.736)	(0.315)	(0.354)			
Share of Imports under NTMs				-3.389***	-2.822***	-3.099***
				(0.925)	(0.400)	(0.445)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	131	131	131	131	131	131
R-squared	0.457	0.344	0.343	0.476	0.435	0.433

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporter-importers are included in all the regressions.

If we restrict the attention to the specific categories of NTMs A and B above, Sanitary and phytosanitary measures (SPS) and Technical barriers to trade (TBT), respectively, Table 8 provides similar type of evidence of negative correlations between the share of imported intermediate inputs under either of those categories of measures and the import outcomes of Peruvian firms in all sectors. Consistent with the results above, the evidence for agribusiness is weaker relative to the overall sector and the apparel sector. Across categories of NTMs, the relationship is stronger in both agribusiness and the apparel sectors for TBTs, which is not surprising given the type of intermediates that firms in those sectors are likely to import, such as tools and machinery as well as fertilizers (for agribusiness) and cloth (for apparel).[15]

Table 8. SPS and TBT Measures and Imported Intermediates

	Log (Import Value)	Log (Nb. Imported Products)	Log (Nb. Imported Varieties)	Log (Import Value)	Log (Nb. Imported Products)	Log (Nb. Imported Varieties)
All						
Share of Imports under TBT	-2.021***	-1.811***	-1.860***			
	(0.229)	(0.112)	(0.131)			
Share of Imports under SPS				-2.261***	-2.257***	-2.321***
				(0.262)	(0.126)	(0.152)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,729	1,729	1,729	1,508	1,508	1,508
R-squared	0.206	0.266	0.237	0.214	0.346	0.310
Agribusiness						
Share of Imports under TBT	-2.170***	-1.058***	-1.123***			
	(0.745)	(0.392)	(0.422)			
Share of Imports under SPS				-1.291	-1.151**	-1.070*
				(0.922)	(0.519)	(0.551)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	88	88	88	75	75	75
R-squared	0.436	0.316	0.306	0.474	0.536	0.538
Apparel						
Share of Imports under TBT	-5.911***	-3.204***	-3.600***			
	(1.216)	(0.444)	(0.496)			
Share of Imports under SPS				-2.773***	-3.121***	-3.369***
				(0.975)	(0.574)	(0.619)
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	110	110	110	81	81	81
R-squared	0.600	0.519	0.523	0.380	0.447	0.443

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporter-importers are included in all the regressions.

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[15] For the agribusiness sector the important distinction to make is across the SPS that we do not consider, those on imports of agribusiness sector products themselves, and the SPS that we consider, those on imports of intermediates by firms in the agribusiness sector where intermediates are fertilizers, tools and machines for which TBT measures rather than SPS measures are likely to play a role.

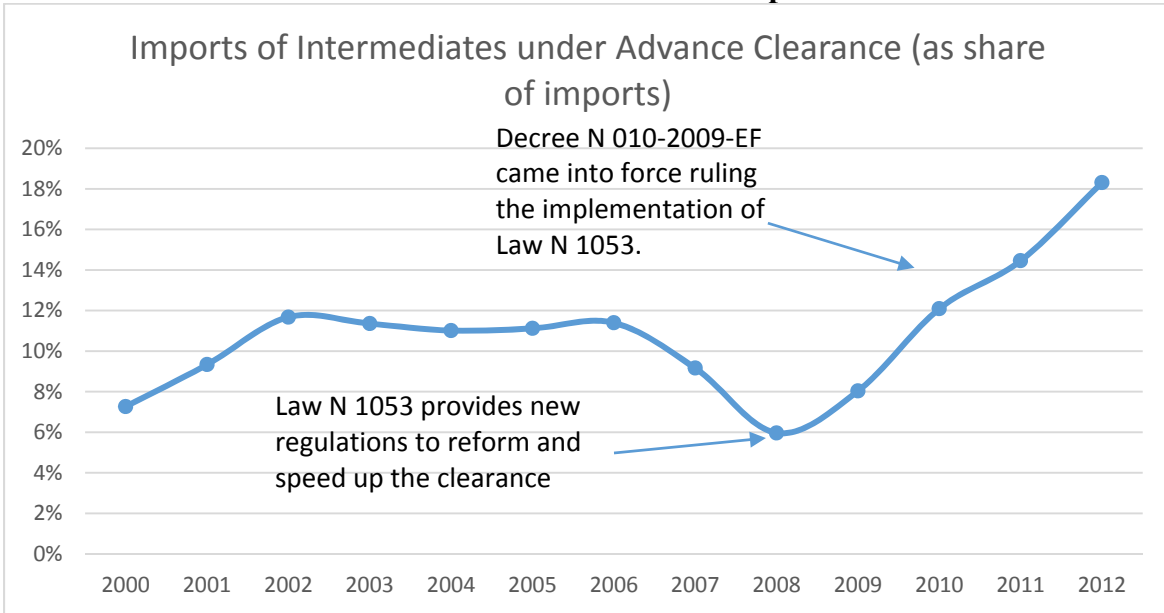Finally we consider the role of the advanced customs clearance system (SADA) ("despacho anticipado") that is available as a modality to clear customs for imports in Peru since the late 1990s but was streamlined and expanded in the late 2000s. The procedure consists in pre-arrival clearance of imported goods as described in Box 1 where the reform to the procedure in the late 2000s is also discussed. Total imports of intermediate inputs entering Peru under the advance clearance procedure increased considerably after this procedure's reform established by Law in 2008 but implemented only in 2010 (Ausa Soluciones Logisticas, 2012), as seen in Figure 5.

Interestingly, note that the increase in imports of intermediates under the advance clearance procedure shown in Figure 5 is particularly pronounced for the set of exporter-importers when compared to importers-only in Peru, as seen in Appendix Figure B.1.

Figure 5. Imports of Intermediates under Advance Clearance Procedure in Peru
Panel A. In Value

Imports of Intermediates under Advance Clearance (as share of imports)

Decree N 010-2009-EF came into force ruling the implementation of Law N 1053.

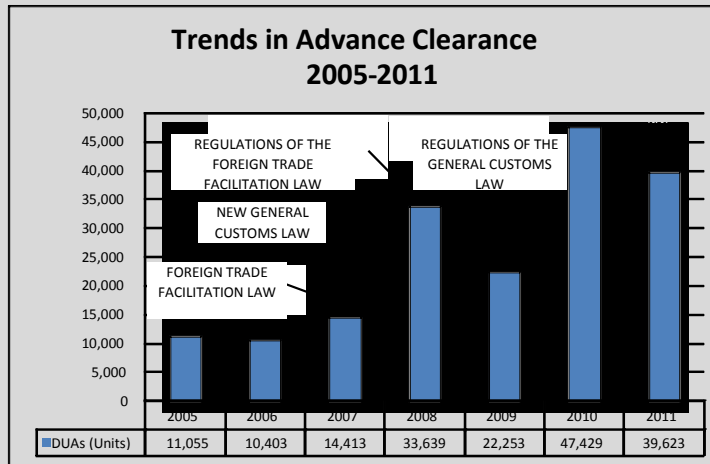Law N 1053 provides new regulations to reform and speed up the clearance
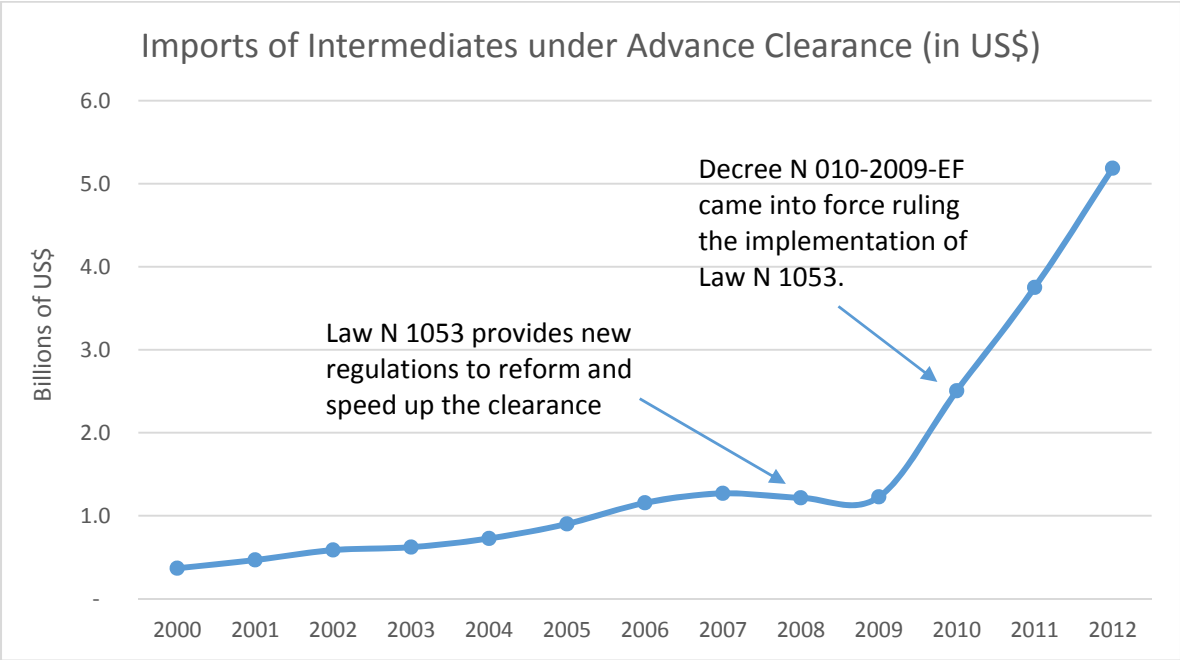
Box 1. Brief Overview on Advance Clearance Procedure and its Reform

The advance customs clearance procedure (SADA) for imports was introduced in Peru at the end of the 1990s. Under the procedure, the import declaration is registered and the cargo manifest is electronically transmitted before the means of transport arrives. Once the corresponding formalities are completed, release for the cargo may be granted at the point of arrival within 48 hours of unloading.

During the 2000s it became necessary to adapt the existing customs procedures to the substantial expansion of trade, the negotiation of several preferential trade agreements and the requirements of foreign trade operators. Following the enactment of the New General Customs Law and its Regulations in 2008-2009, which govern the legal relationship between Peru's Customs Administration (SUNAT) and natural and legal persons involved in the entry and exit of goods into and from the customs territory and their stay and movement within that territory, substantial changes were made to the process and customs clearance procedures in Peru. SUNAT adapted the regulations relating to customs clearance, in coordination with units especially set up for the purpose, including the New Customs Clearance Procedure (NPDA) team responsible for the regulatory and procedural aspects and the New Integrated Customs Management System (NSIGAD) team responsible for the implementation and redesign of information technology (IT) processes and systems in customs. The objective was gradually to expand the use of Advance Clearance for imports by seeking to make Normal Clearance the exception. This adaptation of regulations, which had the backing of the customs services, foreign trade operators, and the user community in general, was supplemented by the training of customs officers and outside users, which turned it into an effective means of facilitating customs clearance procedures. Box 1 Figure 1 shows trends in the use of advance clearance. After this reform, imports may depending on their status, needs and resources, opt for either (i) advance clearance with unloading and transfer of the goods for release in the port terminal; (ii) advance clearance with unloading and transfer of the goods for release in temporary storage; or advance clearance with unloading and transfer to the importer's premises.

Box 1 Figure 1. Trends in the Use of Advance Clearance

Trends in Advance Clearance 2005-2011

	2005	2006	2007	2008	2009	2010	2011
DUAs (Units)	11,055	10,403	14,413	33,639	22,253	47,429	39,623

Source: SIGAD - Prepared by the National Customs Technique Intendency.
Note: DUA = Single Customs Declaration

SUNAT reformed the advance clearance procedure as part of a general program of trade facilitation reforms with the objective of reducing customs release times and the costs of trading in Peru. The effects of the program were captured by the World Bank's Doing Business in the 27-place improvement in Peru's Trading Across Borders indicator rank.
*Source: Espinoza (2011).*

To characterize further the advance clearance procedure, we show in Table 9 the set of imported intermediate products (at the HS 2-Digit level) that most often enter Peru under that customs clearance regime from 2000 to 2012.

Table 9. Products Imported under Advance Clearance Procedure

Products	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
EXPLOSIVES	5%	5%	12%	5%	42%	35%	47%	39%	29%	49%	47%	56%	59%
IRON & STEEL	22%	27%	27%	36%	25%	25%	35%	32%	23%	23%	31%	29%	46%
VEHICLES NON RAILWAYS	11%	11%	17%	17%	17%	15%	14%	18%	21%	24%	33%	39%	43%
WADDING, SPECIAL YARNS, ETC	11%	14%	15%	13%	4%	4%	5%	4%	1%	1%	5%	53%	38%
PHOTOGRAPHIC/CINEMATOGRAPHIC GOODS	15%	29%	30%	27%	33%	14%	6%	8%	2%	6%	15%	26%	38%
STONE, CEMENT, ASBESTOS	14%	10%	14%	23%	25%	18%	9%	6%	2%	7%	14%	25%	37%
WOOD	1%	4%	2%	1%	2%	0%	1%	1%	1%	9%	5%	21%	35%
SOAPS, WAXES, SCOURING	2%	7%	18%	14%	8%	3%	4%	4%	4%	17%	22%	32%	35%
ZINC	0%	44%	54%	55%	42%	35%	18%	4%	19%	9%	9%	27%	33%
ARTICLES OF IRON & STEEL	6%	17%	5%	17%	18%	20%	16%	14%	7%	9%	12%	16%	29%

Among exporter-importers in Peru, the main users of the advance clearance procedure are the large firms, classified as such based on their total sales (domestic and foreign) as provided by SUNAT.[16] Also, large firms seem to be the only group of firms which has consistently increased their use of the advance clearance procedure for their imports of intermediates from 2006 to 2012.

**Figure 6. Imports of Intermediates under Advance Clearance Procedure by Firm Size**
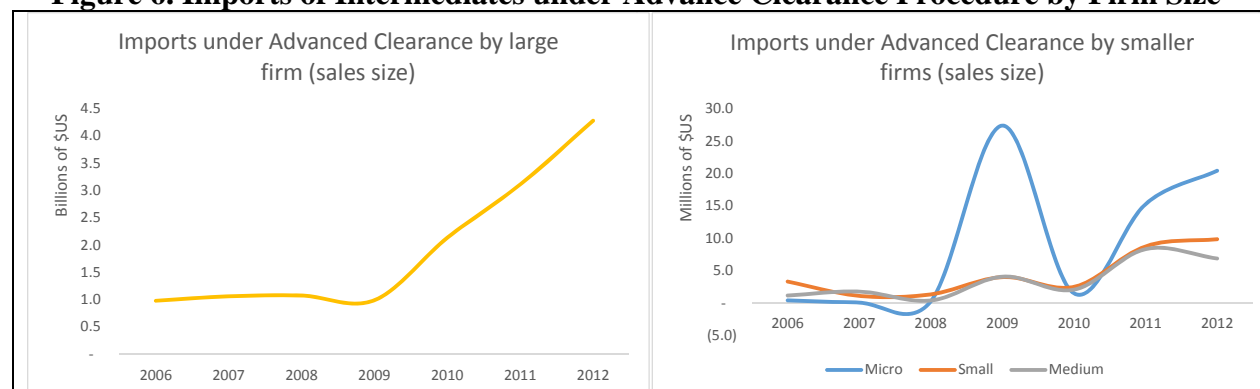
Focusing on the two sectors that we analyze separately, agribusiness and apparel, note that their exporter-importers do not appear to be particularly intensive users of the advance clearance procedure when taken as a whole. Figure 7 shows for exporter-importers in each HS 2-digit sector

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[16] For the purposes of this analysis SUNAT provided us with a variable which indicates for each exporting firm its size category based on total sales in the currency "nuevos soles". The categories are defined based on a unit of measurement for sales called Unidades Impositivas Tributarias (UIT) which is defined in each year by SUNAT and is available at http://www.sunat.gob.pe/indicestasas/uit.html. Firms are defined as micro if their annual sales are smaller than 150 UIT, small if their sales are larger than 150 UIT but smaller than 1700 UIT, medium if their sales are larger than 1700 UIT but smaller than 2300 UIT, and large if their sales are larger than 2300 UIT.

the total share of their intermediates' imports that entered under the advance clearance procedure in 2012.[17] The total share is low for exporter-importers in the apparel sector (4%) and is close to zero for exporter-importers in the agribusiness sector. Unreported graphs for other years show a similar pattern.

Figure 7. Share of Imports of Intermediates under Advance Clearance Procedure by HS 2-digit Sector of Exporter-Importer
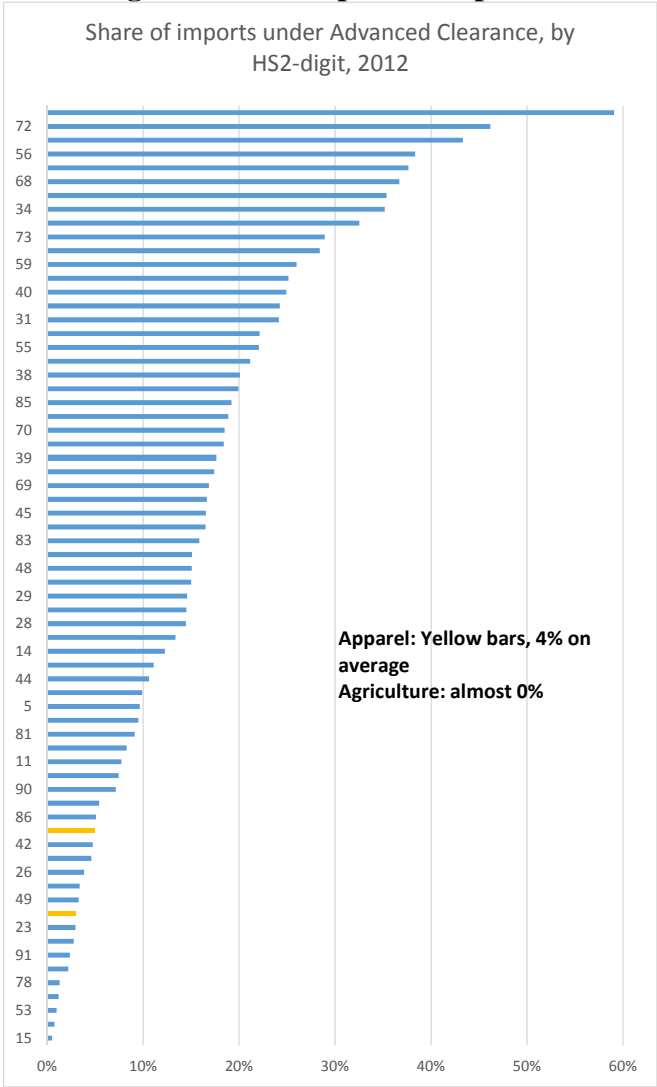
Considering the evolution of imported intermediate inputs entering under the advance clearance procedure in the two sectors, note that there is an increase in the use of the procedure

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[17] An exporter-importer is classified as belonging to a particular HS 2-digit sector if more than 50% of its total exports is of products belonging to that HS 2-digit sector.

after 2009 in the apparel sector while in agribusiness the use of the procedure follows cycles increasing after 2009 but declining in 2012.

Figure 8. Imports of Intermediates under Advance Clearance Procedure by Sector

To gauge the importance of the advance clearance procedure for Peruvian exporter-importers import outcomes we estimate a simple premium regression defined as:

$$Y_{it} = \beta Advance_{it} + I_t + I_i + I_{hs2} + \varepsilon_{it} \tag{4}$$

where i stands for an exporter-importer firm, $Advance_{it}$ indicates that the firm is an advance clearance user, that is, the firm uses the advance clearance procedure for a positive share of its imports of intermediate inputs, other variables are defined as above and Y is either import value, import growth, the number of imported products (in logarithms), or the number of imported varieties (in logarithms).

The estimates presented in Table 10 show that exporter-importers that use the advance clearance procedure exhibit significant premia in their import outcomes: they import more intermediates in total as well as more products and more varieties than those that do not use the procedure. This finding is verified for all exporter-importers in Peru as well as for those in the agribusiness and apparel sectors (in the case of the agribusiness with slightly weaker results for the number of products). Regarding import growth, a significant premium for firms that use the advance clearance procedure relative to those that do not is found when considering all exporter-importers in Peru and those in the apparel sector. In agribusiness import growth does not differ significantly across firms depending on their use of the customs procedure. All in all, the evidence suggests that the use of this faster modality of customs clearance benefits imports and variety of imports of intermediate inputs for exporter-importers in Peru.

Table 10. Advance Clearance Procedure and Imported Intermediates

	Log (Import Value)	Import Growth	Log (Nb. Imported Products)	Log (Nb. Imported Varieties)
	All			
Dummy for Advance Clearance				
Procedure User	0.428***	0.132***	0.207***	0.226***
	(0.026)	(0.033)	(0.016)	(0.016)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes
Observations	22,522	14,062	22,522	22,522
R-squared	0.913	0.278	0.896	0.908
	Agribusiness			
Dummy for Advance Clearance				
Procedure User	0.593***	0.241	0.177*	0.223**
	(0.174)	(0.224)	(0.095)	(0.098)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,278	792	1,278	1,278
R-squared	0.793	0.377	0.803	0.809
	Apparel			
Dummy for Advance Clearance				
Procedure User	0.584***	0.254**	0.310***	0.321***
	(0.097)	(0.125)	(0.059)	(0.062)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Main HS 2-Digit Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,345	1,485	2,345	2,345
R-squared	0.882	0.326	0.861	0.87

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporter-importers are included in all the regressions.

Finally, we examine a relevant policy question that arises which is whether the reform to the advance clearance procedure that took place in Peru after 2009 helped to increase the imports of intermediate inputs. For this purpose we estimate a variant of Eq. (4) where $Advance_{it}$ enters by itself and interacted with a dummy variable identifying the years after the reform to the advanced clearance procedure (that is from 2010 onwards), and where this dummy variable also enters by itself (instead of year fixed effects). The corresponding results for import value (in logarithms) are shown in Table 11. The estimates suggest that imports of intermediates by exporter-importers that use the advance clearance procedure increased significantly after the reforms. This result is strongly significant when all exporter-importers are considered but also for those in the agribusiness and in apparel sectors (though in the latter case significance is lower).

Thus, the reform to the customs procedure did generate a significant boost to the value of imported intermediates for user firms, relative to non-user firms.

Table 11. Reform in Advance Clearance Procedure and Imported Intermediates

	Log (Import Value) (1)	Log (Import Value) (2)	Log (Import Value) (3)
	All	Agribusiness	Apparel
Dummy for Advance Clearance Procedure User	0.177***	0.323*	0.438***
	(0.030)	(0.191)	(0.104)
Dummy for Post-Reform Period (2010-2012)	0.496***	0.391***	0.354***
	(0.023)	(0.110)	(0.073)
Dummy for Advance Clearance Procedure User * Dummy for Post-Reform Period (2010-2012)	0.395***	1.000***	0.349*
	(0.043)	(0.337)	(0.208)
Observations	22,865	1,326	2,393
R-squared	0.906	0.776	0.881

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% confidence levels, respectively. Only exporter-importers are included in all the regressions.

7. Conclusion

Using highly disaggregated firm-level customs transaction data for imports and exports in Peru over more than a decade, this paper explored the relationship between imports of intermediate inputs and firm export performance. In line with a growing body of recent literature (Bas, 2012; Bas and Strauss-Kahn, 2014, 2015; Chevassus-Lozza et al., 2013; Feng et al., 2012; Fernandes and Lopez, 2015) we find that a greater use, variety, and quality of imported intermediate inputs is significantly correlated with higher exports, faster export growth, greater diversification of export markets, and higher quality exports (as measured by relative unit prices). This relationship is robust and persistent to controls for unobserved firm heterogeneity and year fixed effects. A complementary analysis using data from a manufacturing census supports these findings, showing that the use of imported inputs is associated with higher productivity at the firm level.

If imported inputs have such a positive impact on firm performance, why do Peruvian firms, on average, import so little? To understand this we the examined the relationship between specific trade policy measures and the import performance of those exporters that are direct importers. We found that firms exposed to higher tariffs and non-tariff measures import less and (in the case of NTMs) restrict the variety of their imports. We also found that the use of the advanced clearance

procedure as the modality to clear customs for imports is favorable to the import performance of exporter-importers. Even after controlling for the fact that some firms are larger, exporters who import intermediate inputs using this modality import more and import a more diversified bundle of inputs than those that do not use it.

These findings lend support to the policy of extensive trade liberalization pursued by Peru over the past decade. Firms that take advantage of the favorable policy environment for importing see substantial gains to their productivity and export performance. The findings of significant variation in imports across products with different tariff and NTM levels show, however, that even with low average levels, firms remain sensitive to higher levels of those trade policy barriers. Finally, the findings underscore the importance of effective de facto implementation of trade policy measures and efficient trade facilitation procedures, and to ensuring that this is available to firms of all sizes across all sectors. Indeed, the high sensitivity of firms to the policy regimes assessed in this paper, perhaps most importantly to the expedited customs clearance modality, may reflect wider barriers that exist in the trade facilitation environment, suggesting that the battleground for improving trade performance may need to shift increasingly from trade policy to trade facilitation.

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Appendix

A. Export and Import Customs Data Details

The raw exporter-level and importer-level customs data for Peru was subjected to uniform reformatting and to a series of cleaning procedures detailed in Cebeci et al. (2012).The starting point is Peru's raw export and import daily transactions data that are aggregated to the annual level so as to measure total exports or total imports of a given product-country for a given firm over an entire year. Exporting and importing firms are identified by their actual names (and their tax identification numbers in some years) which allows us to create a panel of exporting and importing firms and to actually identify the exporting firms that are also importing firms.

Regarding product nomenclatures, we use a time-consistent 'consolidated' Harmonized System (HS) classification at the 6-digit level that concords and harmonizes product codes across the HS 1996, 2002, 2007, and 2012 versions that are used in the different years of the 2000-2012 sample period for Peru.[18]

Export values are Freight on Board (FOB) figures measured in US dollars (USD) converted from local currency using the corresponding official exchange rates from the IMF's *International Financial Statistics*. Import values are XXX measured in US dollars (USD) converted from local currency using the corresponding official exchange rates from the IMF's *International Financial Statistics*.

Cebeci et al. (2012) show the quality of the data by comparing the total exports obtained from aggregating the transaction-level customs data at the country level with the total exports obtained at the country level from WITS. Specifically for the case of Peru for exports and imports over the 2000-2012 period the comparisons to WITS values for total non-oil exports and for total non-oil imports are provided in Appendix Table 1.

Appendix Table 1. Comparison to WITS total exports and total imports

	Import Value Ratio of Customs Value to COMTRADE Value (Net of Oil)	Export Value Ratio of Customs Value to COMTRADE Value (Net of Oil)
2000	100.32%	100.58%
2001	100.05%	101.11%
2002	100.29%	99.93%
2003	100.35%	100.44%
2004	100.40%	100.88%
2005	100.35%	100.71%
2006	100.23%	100.23%
2007	100.71%	100.39%
2008	100.00%	98.10%
2009	100.28%	99.45%
2010	99.93%	101.19%
2011	100.57%	101.53%
2012	99.99%	100.30%

As mentioned in Section 2, in order to focus on true entrepreneurial ventures in export markets we drop from the sample firms whose total annual export values are lower than 10,000 USD.

The summary statistics for the variables used for the premia regressions in Tables 2 and 3 are shown below.

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[18] See Cebeci (2012) for the details on this consolidation.

Appendix Table 2. Summary Statistics on Key Dependent and Independent Variables from Customs Data for All Firms

Variable	Obs	Mean	Std. Dev.	Min	Max
Dummy for Exporter-Importers	53,881	0.42	0.49	0.00	1.00
Log (Import Value +1)	53,881	5.14	6.34	0.00	20.41
Log (Export Value)	53,881	12.08	2.06	9.21	22.06
Export Growth	33,663	0.10	0.98	-6.53	9.59
Nb. Of Destinat.	53,881	3.33	4.76	1.00	77.00
Avg. Rel. Unit Values of Exports	53,881	1.15	2.78	0.00	213.57
Log Nb. Imported Products	53,881	0.96	1.52	0.00	6.60
Log Nb. Imported Varieties (Product-Country)	53,881	1.07	1.69	0.00	7.93
Dummy for Share of Imports from High-Income>50%	53,881	0.27	0.45	0.00	1.00

B. EEA Data Details

Appendix Table 3. Summary Statistics on Key Dependent and Independent Variables from EEA Data for All Manufacturing Firms

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dummy for Importers	12,626	0.20	0.40	0	1
Log (Employment)	12,076	3.78	1.54	0	18.33
Log (Real Output)	12,533	8.87	1.68	-1.06	16.04
Log(Capital/ Employment)	12,018	3.50	1.68	-14.68	14.79
Log(Labor Productivity)	11,976	3.83	0.94	0.49	12.67

Appendix Table 4. Summary Statistics on Key Dependent and Independent Variables from EEA Data for All Manufacturing Exporting Firms

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dummy for Exporter-Importers	6,071	0.30	0.46	0	1
Log (Employment)	5,884	4.36	1.56	0	14.91
Log (Age)	6,071	2.85	0.76	0	4.74
Foreign owned dummy	6,071	0.07	0.26	0	1
Log (Real Output)	6,045	9.62	1.65	1.60	16.04
Log(Capital/ Employment)	5,869	3.82	1.52	-9.64	13.48
Log(Labor Productivity)	5,837	3.94	0.96	0.68	12.58

C. Additional Summary Statistics and Results

Appendix Table 5. Summary Statistics on Applied Tariffs and NTMs on Imported Intermediates

Panel A. Applied Tariffs on Imported Intermediates

	All		Agribusiness		Apparel	
	Avg. across Firms of Applied Tariff Rate on Imports	Avg. across Firms of Change in Applied Tariff Rate on Imports	Avg. across Firms of Applied Tariff Rate on Imports	Avg. across Firms of Change in Applied Tariff Rate on Imports	Avg. across Firms of Applied Tariff Rate on Imports	Avg. across Firms of Change in Applied Tariff Rate on Imports
2000	12%		12%		14%	
2001	11%	-1%	12%	0%	13%	-1%
2002	9%	-2%	10%	-2%	11%	-1%
2003	9%	0%	10%	0%	11%	-1%
2004	8%	-1%	8%	-2%	11%	0%
2005	8%	0%	8%	1%	12%	0%
2006	8%	0%	7%	0%	11%	0%
2007	5%	-3%	5%	-2%	9%	-2%
2008	3%	-2%	3%	-1%	7%	-2%
2009	3%	0%	4%	0%	7%	0%
2010	3%	0%	4%	0%	7%	-1%
2011	2%	-1%	3%	-1%	4%	-2%
2012	2%	0%	2%	0%	4%	0%

Panel B. NTMs on Imported Intermediate Inputs

	All	Agribusiness	Apparel
Proportion of Firms with Dummy for Share of Imports under NTMs >40% = 1	45.4%	63.2%	43.5%
Average Share of Imports under NTMs	43.4%	60.2%	41.2%
Proportion of Firms with Dummy for Share of Imports under TBT >40% = 1	40.3%	51.1%	23.6%
Average Share of Imports under TBT	39.1%	49.9%	24.2%
Proportion of Firms with Dummy for Share of Imports under SPS >40% = 1	33.4%	54.7%	44.4%
Average Share of Imports under SPS	32.2%	51.0%	39.0%

Note: in Panel B the average share of imports under under NTMs, SPS or TBT are calculated based on the sample of firms whose imports of intermediates do face at least one type of NTMs.

Appendix Figure B.1. Imports of Intermediates under Advanced Clearance Regime for Exporter-Importers and Importers-Only