Trade Facilitation Provisions in Preferential Trade Agreement

Impact on Peru's Exporters

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Abstract

Trade facilitation measures that simplify, modernize, and harmonize export and import processes are particularly important in a world of global value chains where goods cross borders multiple times. At the firm level, trade facilitation commitments in preferential trade agreements can generate larger gains for firms participating in global value chains, as these firms can benefit both from efficiency enhancement at their own border (when importing inputs) and at the partner countries' borders (when exporting). This paper uses Peruvian customs data to investigate the heterogeneous impact of trade facilitation provisions across firms, depending on their global value chain linkages. The results show that trade facilitation provisions in preferential trade agreements promote the export performance of global value chain firms, especially when they import inputs from the preferential trade agreement partner country. In the case of Peru, the main benefit of trade facilitation provisions results from efficiency enhancements at its own border, allowing global value chain firms to import inputs in a more timely and predictable manner.

Trade Facilitation Provisions in Preferential Trade Agreements: Impact on Peru's Exporters[1]

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1. Introduction

The rapid growth of international trade and global value chains in the past decades has been associated with significant reduction in trade costs. But while some developing countries have been highly successful in integrating into global markets, others have been much less so. Border inefficiency and regulatory uncertainty are often viewed as key barriers for developing countries to boost trade, even when tariff levels are low (WTO 2015). This has motivated renewed energy to improve, simplify, and harmonize the procedures and controls governing the movements of goods across borders –i.e. the trade facilitation agenda.

Modern Preferential Trade Agreements (PTAs) increasingly cover detailed trade facilitation provisions (Kieck 2020). In this paper, we investigate the effect of these provisions on export outcomes using firm level data from Peru. In particular, we focus on the role of trade facilitation measures in simplifying and reducing uncertainty in import processes, as typically import procedures are more cumbersome and administratively heavy. Streamlined import procedures can boost Peruvian exports through two channels. First, enhanced efficiency and clarity in import procedures that results from the PTA in the partner country can reduce export costs and uncertainty for Peruvian exporters. Second, increased import efficiency on Peru's side can allow firms involved in Global Value Chains (referred to as GVC-firms) to access critical inputs more quickly and reliably, and therefore enhance their export competitiveness.

The analysis relies on new data on the content of trade agreements (Mattoo, Rocha, and Ruta 2020) to identify trade facilitation provisions in PTAs and combine this information with firm level data from Peru from the Exporter Dynamic Database (Fernandes, Freund, and Pierola 2016). In particular, we exploit the information on the import side of exporting firms (whether they import and what, from where) to investigate if trade facilitation provisions have a differential impact on GVC-firms through the importing channel. Intuitively, relative to traditional exporters (i.e. those firms that mostly rely on domestic intermediate inputs for their exports), GVC-firms can potentially have larger gains from enhanced trade facilitation as PTA provisions improve border efficiency and transparency both at the Peruvian and partners' borders.

Peru provides an excellent environment for the empirical analysis in this paper for three main reasons. First, the customs data is available for all export and import transactions. The detailed information on firms' imports as well as exports is essential to identify the potentially differential impact of trade facilitation provisions on GVC firms. Second, the data covers an extensive time period (2000–17) in which Peru actively concluded a large number of PTAs with many major trading economies, including China (2010), the European Union (2013), and the United States (2009). Third, GVC integration is one of the potential growth engines that remains significantly under-exploited in Peru. Peru's limited GVC participation has been highly concentrated in forward linkages to its commodity exports, with minimal potential for

productivity spillovers, and its backward linkages—captured by the use of imported inputs in its exports—are among the lowest in the world (Pierola, Fernandes, and Farole 2018). Trade facilitation commitments in PTAs can therefore present significant opportunities for better integration into regional and global value chains by enhancing the competitiveness of GVC firms in Peru.

Our empirical investigation relies on a structural gravity model controlling for a large set of fixed effects. The main findings are threefold. First, the effect of PTAs on export performance varies across different types of firms, both at the extensive and intensive margins. GVC-firms that import intermediate inputs benefit more, especially so when they import inputs from the PTA partner countries. Second, trade facilitation provisions promote export performance of GVC-firms by reducing trade costs and uncertainty associated with import processes, both at the home country and the destination country's border. In the case of Peru, the main benefit of trade facilitation provisions in PTAs results from efficiency enhancements at its own border, allowing GVC-firms to import inputs needed in production in a more timely and predictable manner. Third, the evidence shows that trade facilitation commitments through PTAs also have a non-discriminatory element, as gains are observed for GVC firms that import inputs from PTA partner countries as well as from third countries.

This paper contributes to the literature on the effect of trade facilitation on trade outcomes. Most research to date on trade facilitation has focused on the effect of country-specific customs reforms or WTO's Trade Facilitation Agreement (TFA). At the country level, Fernandes, Hillberry, and Alcántara (2019) study the effect of a customs reform in Albania that reduced physical inspections of import shipments, and find that reduced inspections significantly increase imports. Fernandes, Hillberry, and Berg (2016) find that customs reform in Serbia benefited importing firms by reducing uncertainty about arrival times. Carballo et al. (2014) show that port-of-entry delays due to clearance procedures in Peru raise trade costs significantly for Peruvian importers.[2] At the multilateral level, Moïsé and Sorescu (2013) find that improvements across OECD's 16 Trade Facilitation Indicators (TFI) reduce trade costs in developing countries by 13-15 percent depending on income level. Beverelli, Neumueller, and Teh (2015) find that TFA has significant export diversification effects and that measures

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[2] While most research focuses on TF impact on import procedures, a series of papers study the impact of trade facilitation reforms on exporters. (Volpe Martincus, Carballo, and Graziano 2015) show that time savings in customs due to reduced inspection activity contribute significantly to exports growth in Uruguay, and (Carballo, Schaur, et al. 2016) find that exporters in El Salvador benefited from transit system reforms that streamline administrative processing of trade flows. Carballo, Graziano, et al. (2016) show positive impacts of the electronic trade single window scheme on Costa Rican exporters, and (Carballo, Schaur, and Volpe Martincus 2016a) find that a new postal export regime streamlining export procedures has led to increased and more diversified regional exports for Peruvian firms. (Carballo, Schaur, and Volpe Martincus 2016b) examine the positive impact of Mexico's Authorized Economic Operator program on firms' exports.

aimed at improving information play an important role. Fontagné, Orefice, and Piermartini (2017) study the heterogeneous effect of TFA policies (in the importing country) on exporters of different sizes, using French firm-level data and OECD TFIs. While this study shares the similarity in examining heterogeneous effects across firms, our research is distinctive in the sense that it investigates heterogeneous effects based on firms' GVC linkages and focuses on the role of PTA trade facilitation commitments.

A handful of studies look particularly at trade facilitation provisions included in preferential trade agreements. Duval, Neufeld, and Utoktham (2016) show that PTA provisions related to those featured in the WTO Trade Facilitation Agreement (TFA) contribute to reducing trade costs among PTA members. Importantly, they also find that the preferential effect of these provisions is accompanied by a non-discriminatory reduction in trade costs with all trade partners, and over time the non-discriminatory effect prevails. Hamanaka, Tafgar, and Lazaro (2010) investigate how preferential TF provisions in PTAs are and provide examples where the TF measures can be applied preferentially. Our paper is the first to examine the effect of trade facilitation provisions included in preferential trade agreements on actual trade outcomes at the extensive and intensive margins. It is also novel in exploring heterogeneous effects for GVC firms, which can potentially benefit twice from enhanced border efficiency when they import and export.

Our paper is also related to the growing group of studies that use import and export data at the firm level to investigate the linkages between imports and exports along GVCs, and various policy effects on importing exporters (Bas 2012; Bas and Strauss-Kahn 2014; Aristei, Castellani, and Franco 2013; Vijil, Wagner, and Woldemichael 2019).[3] In the world of GVCs, firms' imports play a key role in their export performance. Also using Peruvian data, Pierola, Fernandes, and Farole (2018) find that the use of imported inputs is associated with better export performance and higher productivity for exporting firms. Interestingly, they also find that importer-exporter firms using the advanced customs clearance procedure (SADA) exhibit higher imports of intermediates which grow faster and are more diverse. In the diagnosis of why Peruvian exporters do not import more intermediates, the authors note that customs and trade-related infrastructure have been a major barrier for exporters seeking to access critical inputs. Logistics costs in Peru, at about 32% of product value, are among the highest in Latin America, and customs and trade-related infrastructure ranks well behind regional peers like Chile and Mexico (Pierola, Fernandes, and Farole 2018).

The rest of the paper is organized as follows. Section 2 describes the effect of trade facilitation provisions on member countries' border efficiency and conceptualizes various channels

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[3] Although not directly looking at export outcomes, Amiti and Konings (2007) look at the role of intermediate inputs on productivity (among many others), and Goldberg et al. (2010) on domestic product scope.

through which these provisions affect GVC-firms. Section 3 describes the data, and Section 4 presents the empirical analysis. Section 5 concludes.

2. Trade facilitation provisions in PTAs and GVCs

Trade facilitation can be defined as the simplification, modernization, and harmonization of export and import processes (Kieck 2020). Implementation of trade facilitation measures allows easier flows of imports as well as exports across borders. This is particularly important in the age of GVCs where goods cross borders multiple times as part of a production chain. At the firm level, firms participating in GVCs not only export, but also import intermediate inputs that are used in their production and exports. In other words, increased efficiency in import procedures has direct implications on firms' export performance and global value chain participation.

Trade facilitation, like tariff liberalization, takes place both at the multilateral and preferential levels. The Trade Facilitation Agreement (TFA) of the World Trade Organization (WTO), which entered into force in 2017, contains measures to facilitate trade and promote compliance and customs cooperation. In addition, countries have also included trade facilitation provisions in their regional and bilateral trade agreements.

The impact of trade facilitation (TF) provisions in PTAs has multiple dimensions that affect trade costs in different ways. First, since PTAs are between two (or more) partner countries, TF provisions can affect import and export procedures in both member countries. Therefore, when Peru signs an agreement with a partner country that includes TF provisions, these provisions could enhance efficiency at the border for Peru and the partner country. While, in principle, trade facilitation measures can facilitate both imports and exports, much of the research and interest focuses on the import channel. This is because import procedures are typically more cumbersome and demanding than export processes, and TF measures tend to have larger impacts on import shipments. Our analysis therefore also focuses on improvements on the importing side of the borders. However, the bilateral nature of PTAs implies that increased efficiency at the destination country's border can promote exports in the home country, even when efficiency gains are solely on import procedures.

Another important element to consider is that some provisions tend to be non-discriminatory (i.e. apply to members and non-members of a PTA), while others grant preferential treatment to PTA partners only. For example, the establishment of a single window which allows firms to submit documentation for importation, exportation or transit of goods through a single entry point can significantly enhance border efficiency and is typically adopted in a non-preferential way. This means that even if the establishment of single window was triggered by a provision in a PTA, the gains are not limited to the PTA partner country as all trade flows

across the border become more efficient. In contrast, other provisions may provide preferential treatment to PTA partners, such as the mutual recognition of authorized operators or preferential exchange of information. To capture these different characteristics, we explore heterogeneous effects for different types of firms, based on whether they import and from where, and use different margins of trade as outcomes.[4]

To illustrate these different aspects, Figure 1 visualizes the effect of trade facilitation provisions using an example PTA between Peru and the United States. TF provisions in this agreement can affect import procedures both at Peru's and the United States' border. On both sides, some provisions will affect imports from all countries in the same way – we refer to these provisions as MFN provisions (Most Favored Nation). Other provisions provide preferential treatment to imports from the partner only. These elements will generate heterogeneous effects of the PTA on Peruvian exports to the United States.
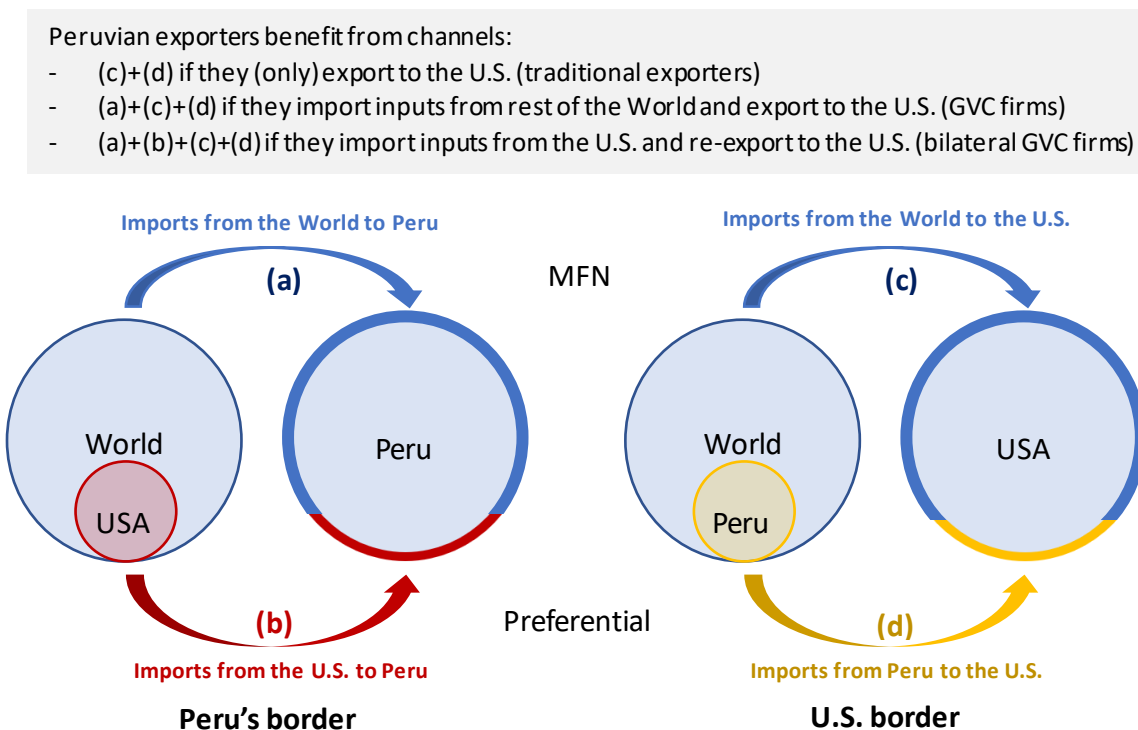
To pin down the various effects of trade facilitation provisions, it is useful to think of how traditional exporters and GVC-firms can be affected. First, consider a traditional exporter that only relies on domestic inputs to export. Trade facilitation provisions in the Peru-U.S. PTA can promote Peruvian exports to the U.S. as import procedures become simpler at the U.S. border. Peruvian exporters will benefit from TF measures at their destination, whether they are applied MFN or preferentially. In Figure 1, this corresponds to channels (c) and (d).

Second, consider a GVC-firm that imports intermediate inputs from a third country and exports to the United States. In addition to any improvements on the U.S. side for processing their shipments, these firms can also benefit from expedited or more predictable import procedures at the Peruvian border. To the extent that the TF measures included in the PTA affect import shipments from all countries (MFN provisions), GVC firms will gain from the enhanced efficiency in their supply chain, regardless of where they import inputs from. Their gains are represented by (a)+(c)+(d) in Figure 1.

Finally, there are firms that both import intermediates from and exports to the U.S. – we will call this set "bilateral GVC firms". These firms can benefit from the most channels as their import shipments from the U.S. gain both from nondiscriminatory and preferential provisions. Their potential gains are characterized by (a)+(b)+(c)+(d).

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[4] In addition, while some provisions mainly address one-time costs (e.g. information on border procedures), others reduce variable costs that occur every time a shipment crosses a border, such as those related to customs requirements and efficiency (Fontagné, Orefice, and Piermartini 2017). This will have differential impacts on the extensive and intensive margins of trade.

Figure 1. Effect of TF provisions in Peru-U.S. FTA

Peruvian exporters benefit from channels:
-   (c)+(d) if they (only) export to the U.S. (traditional exporters)
-   (a)+(c)+(d) if they import inputs from rest of the World and export to the U.S. (GVC firms)
-   (a)+(b)+(c)+(d) if they import inputs from the U.S. and re-export to the U.S. (bilateral GVC firms)

In the econometric exercise, we investigate these different channels by comparing outcomes of these three types of firms.

3. Data

The empirical analysis uses transaction-level customs data for Peru for period 2000–17, from the World Bank Exporter Dynamics Database, described in Fernandes, Freund, and Pierola (2016). The data cover the universe of Peruvian export and import transactions in the agricultural, mining, and manufacturing sectors.[5] Since the focus of the analysis is on export performance of Peruvian firms, and particularly GVC firms, we limit our analysis on exporting firms. We exclude firms with annual export values below USD 10,000 since very small export flows may represent the shipping of samples rather than merchandise sold as a true export venture (Pierola, Fernandes, and Farole 2018). We also exclude firms that export only once in the entire sample period, since economically we are interested in the performance of firms that export with some degree of consistency and econometrically one-time exporters will be

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[5] The data excludes HS Chapter 27 which is hydrocarbons such as oil, petroleum, natural gas, and coal.

omitted in the fixed effects identification. Finally, we exclude partner countries with population less than 1 million as is common in the literature.

The final data set includes 15,484 exporting firms exporting to 147 countries, 7,618 of which also import intermediate goods ("GVC firms"). Of these, 5,654 firms import intermediate goods from a country they also export to ("bilateral GVC firms"), showing the prevalence of tight supply chain linkages even at the bilateral level. At the yearly level, the number of exporting and GVC firms has been on a steady rise, with a small dip towards the end of the sample period (Figure 2). Since the raw data set contains only positive trade flows, we expand the data set to generate zeros for the analysis at the extensive margin. Specifically, we fill in the data so that each exporting firm, destination country, and sample year has an observation. This gives us 15,484 x 147 x 18 = 40,970,664 observations.[6]

Figure 2. Number of exporting firms and GVC firms by year
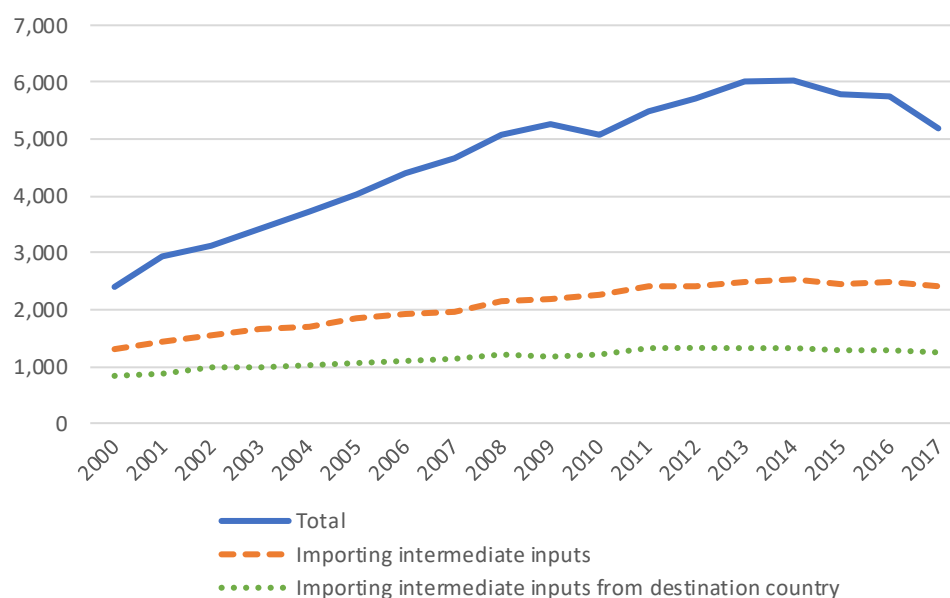
To identify GVC firms among Peruvian exporters, we use the United Nations Broad Economic Classification (BEC) and define those that import intermediate inputs and capital goods as GVC firms. In addition, we further distinguish firms that import intermediate inputs from a country they also export to (bilateral GVC firms). This allows us to investigate the non-discriminatory and preferential aspects of trade facilitation provisions in PTAs. The status of GVC-firms is time invariant, so that firms that import inputs in year *t-1* and export in year *t* will be defined as GVC-firms throughout the sample period. The time-invariant status of GVC

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[6] Some observations are dropped in the regressions when data for the control variables (e.g. GDP) are missing, leading to fewer number of observations.

firms helps with the identification by not restricting to firms that import inputs and export in the same year. In addition, it enables us to capture the effect on those firms that start importing inputs after trade facilitation reforms due to PTAs as the effect on GVC firms.

For the information on the trade facilitation provisions in preferential trade agreements, we use a new database that provides detailed information on the specific provisions included in each chapter of PTAs (Mattoo, Rocha, and Ruta 2020). This database presents detailed data on the content of 18 policy areas that are most frequently covered in PTAs, in force and notified to the WTO by 2017. This entails the coding of 937 provisions by experts in each area, of which 52 provisions are included in the trade facilitation and customs policy area (Appendix Table A1).

While trade facilitation measures are often perceived as mainly non-discriminatory, a close look at the provisions reveals that some provide preferential treatment to member countries. For example, provisions that grant mutual recognition of authorized operators (AOs), cooperation between border agencies, or guarantee specific release times through expedited shipment can be applied in a preferential basis to the PTA member country. In contrast, other provisions such as those requiring internet publication of import/export-related information or the use of international standards are by nature non-discriminatory, hence benefiting all import and export shipments. These different aspects, as described in Section 2, are explored in the empirical analysis.

Peru has entered into 12 PTAs during the sample period with 38 countries in the data set. These agreements vary in terms of overall depth, proxied by the total number of provisions included in the PTA, as well as trade facilitation provisions (Figure 3). While, on average, deeper trade agreements also tend to cover more trade facilitation provisions, this correlation is not perfect. For example, Peru-Korea (2011) and EU-Colombia/Peru (2013) have the highest number of overall provisions among Peru's PTAs, while the highest number of TF provisions are included in Canada-Peru (2009) and Panama-Peru (2012). The imperfect correlation allows us to identify the effect of TF provisions while also controlling for the overall depth of the agreements.

Figure 3. Peru's deep trade agreements (2000-2017)
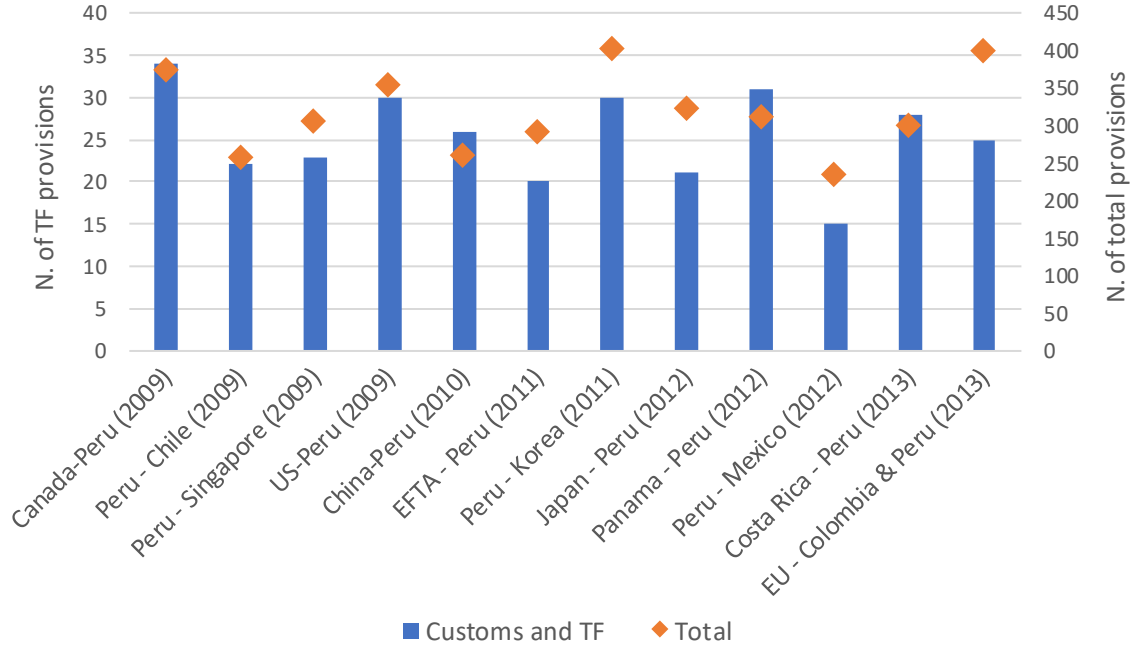
4. Heterogeneous effects of trade facilitation provisions

To examine the different channels through which Peruvian exporters can benefit from TF provisions in PTAs, we define three types of exporters and use interaction terms to capture the differential impacts. As discussed in the conceptual framework, traditional exporters are those that only export and do not import inputs. GVC-firms are defined as exporters that import intermediate inputs, not necessarily in the same year. Bilateral GVC-firms are a subset of GVC-firms that import inputs from their export destination country. Being classified as a bilateral GVC-firm does not preclude the firm from importing inputs from other countries as well.

While our primary interest is in the role of trade facilitation provisions, as a first step we use a structural gravity model to test if PTAs have a differential impact on export performance of GVC firms.

$$ y_{ijt} = \beta_1 PTA_{jt} + \beta_2 \left(PTA_{jt} \times GVCfirm_{i(j)} \right) + \beta_3 \log \left(GDP_{jt} \right) + \alpha_{it} + \alpha_j + \varepsilon_{ijt} \quad (1) $$

In equation (1), the baseline outcome variable y_{ijt} is the export participation (extensive margin) and log export value (intensive margin) of firm i's exports to country j in year t. PTA_{jt} is a dummy variable, equal to 1 if Peru has a PTA in force with country j in time t. This variable is

then interacted with $GVCfirm_{i(j)}$ which is a time-invariant dummy variable, equal to 1 if exporter i imports intermediate inputs (GVC-firm), or if exporter i imports inputs from country j (bilateral GVC-firm). With this specification, coefficient β_1 would capture the average effect of the PTA with country j across all firms and coefficient β_2 would capture the differential impact on GVC firms, if any.

The estimation includes a rich set of fixed effects to control for a wide range of other factors that can affect firms' exports to a particular country. Firm-year fixed effects, α_{it}, control for time-varying firm characteristics, such as productivity shocks, that may affect firms' export performance to all countries. It will also capture Peru's broad opening trend in terms of trade policy that are time varying but not specific to destination countries. Destination fixed effects, α_j, capture destination country characteristics, including standard gravity variables such as distance with Peru, shared language, or cultural/regulatory similarities, that also affect Peru's exports to the country j. In addition, all regressions include the GDP of country j in year t to control for demand shocks.

The estimated impact of PTAs on export outcomes, and its differential effect for GVC firms, is subject to endogeneity concerns that are almost always present in an econometric analysis of trade policy. Trade agreements may arise (and are likely deeper) for countries with which bilateral trade flows are larger and GVC linkages tighter. We use a similar approach as Baier and Bergstrand (2007) to address the endogenous adoption of PTAs. While Baier and Bergstrand (2007) use a panel data gravity model with country-pair fixed effects, we include destination-country fixed effects, which is equivalent to the country-pair fixed effects in our setup with a single country. This means that we are identifying the effect of PTAs, and later trade facilitation provisions, within a bilateral relationship that enters into a PTA during the sample period. This eliminates an important source of endogeneity that is due to time-invariant unobserved heterogeneity between country pairs.

Estimation results of equation (1) confirm that PTAs indeed have a differential effect on GVC firms, both at the extensive and intensive margin (Table 1). The first three columns show the results of a linear probability model, using export participation as the outcome variable. Having a PTA in force increases the likelihood that a firm will export to the partner country by an average of 0.3 percent (column 1). However, the effects are significantly different for GVC firms that import intermediate inputs and export. In column (2), the positive impact of a PTA on exporting is significantly larger for firms that import inputs, in fact showing a small but negative coefficient on firms that only export. For GVC firms, a PTA increases the likelihood of exports by 1.8 percent. Furthermore, for GVC firms that import inputs from the PTA partner country, the effect is even larger at 6.3 percent. Similarly at the intensive margin (columns 4-6), while the average effect of PTA is not statistically significant, GVC firms export larger values to destination countries once the PTA enters into force.

Table 1. Heterogeneous effect of PTAs on GVC firms

Dep var:	(1)	(2)	(3)	(4)	(5)	(6)
	Export participation			log (exp value)		
PTA	0.00332**	-0.0104***	-0.00286*	-0.0701	-0.494***	-0.306***
	(0.00161)	(0.00298)	(0.00153)	(0.0433)	(0.0718)	(0.0574)
PTA x GVC firm		0.0280***			0.510***	
		(0.00610)			(0.0920)	
PTA x Bilateral GVC firm			0.0658***			0.538***
			(0.0133)			(0.0801)
Observations	39,685,492	39,685,492	39,685,492	226,280	226,280	226,280
R-squared	0.093	0.096	0.099	0.496	0.497	0.499

Note: Robust standard errors, clustered at the destination-country level, in parentheses. All regressions control for GDP in destination country and include firm-year and destination fixed effects. *** p<0.01, ** p<0.05, * p<0.1

The differential impact of PTAs on GVC firms is interesting in itself and shows the important role of PTAs in facilitating not only exports but also imports. Since the reduction in importing costs have direct effects on the export competitiveness of GVC firms, it is crucial to understand the mechanisms through which PTAs can facilitate imports. Often for developing countries, the administrative and regulatory procedures at the border and beyond are one of the key barriers to import. We therefore investigate whether the inclusion of trade facilitation provisions increases the export participation and values for GVC firms.

$$y_{ijt} = \beta_1 \, RTA_{jt} + \beta_2 \, TF_{jt} + \beta_3 \left(TF_{jt} \times GVCfirm_{i(j)} \right) + \beta_4 \, Depth_{jt} \\ + \beta_5 \log \left(GDP_{jt} \right) + \alpha_{it} + \alpha_j + \varepsilon_{ijt} \tag{2}$$

Equation (2) now includes our key variable of interest, TF_{jt} which captures the extent of trade facilitation commitments in the PTA by counting the number of provisions included. As shown in Figure 2, the number of TF provisions in Peru's PTAs ranges between 15 and 34. For ease of interpretation, this is normalized between 0 and 1 in the regressions. The interaction terms allow the effect TF provisions to vary by firm type. For export values, we estimate equation (2) using both ordinary least squares (OLS) and Poisson pseudo maximum likelihood (PPML).

A key challenge in identifying the effect of specific provisions in preferential trade agreements is that modern PTAs increasingly cover many policy areas: agreements that are deep overall typically include many commitments across all chapters. This poses econometric challenges to perfectly control for commitments in various chapters due to the very large number of possible

provisions and multicollinearity. In this paper, we take the simplest intuitive approach to control for the overall depth of the agreement, by counting the number of policy areas, similarly to how the TF variable is constructed. Variable $Depth_{jt}$ in equation (2), therefore, captures the depth of PTAs which codes the inclusion of up to 52 policy areas in PTAs (Hofmann, Osnago, and Ruta 2017).[7] The use of this depth measure as control variable precludes "double counting" the detailed TF provisions in the depth variable and alleviates multicollinearity issues.

The results of estimating equation (2), presented in Table 2, show that the average effect of TF provisions on export participation is positive and significant, controlling for the overall depth of the PTA (column 1). When we allow the effects to vary by firm type, results show that the positive impact of TF provisions is driven by GVC firms that import intermediate inputs (column 2). While TF provisions have no significant impact on firms that only export (traditional exporters), the estimated effect for exporters that import intermediates is positive and significant. The interpretation of magnitude is not straightforward given the multiple interaction terms and how the TF and PTA depth variables are constructed from the count of provisions. For GVC firms, a PTA with average overall depth (0.661) that includes TF provisions at the "deepest" level increases the probability of export participation by about 3.4 percent.[8] For bilateral GVC firms that import inputs from the PTA partner country, this effect is larger at 9.9 percent (Table 2, column 3). Qualitatively similar results hold at the intensive margin, where TF provisions in PTAs increases export values to the partner country significantly for GVC firms (columns 4-6). GVC firms exporting to a destination that concludes a PTA with Peru, with average overall depth and the deepest level of TF commitments, increase their export values by 19.8 percent.[9]

The heterogeneous effect of trade facilitation provisions on different types of firms sheds light on the different channels, illustrated in Figure 1, through which Peruvian exporters can benefit. The limited impact for traditional exporters suggests that the main benefits of TF provisions in PTAs, at least in the case of Peru, seem to materialize through the efficiency enhancements at their own border rather than at the partner country's border. This allows GVC firms to get their foreign inputs in a more timely and predictable manner, hence increasing their export competitiveness and leading to more exports to Peru's PTA partners at the extensive and intensive margin.

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[7] Specifically, we construct the depth variable by counting the number of strictly enforceable provisions. See Hofmann, Osnago, and Ruta (2017) for detailed information on the legal enforceability of provisions.

[8] Calculated by $-0.0172 + 0.00334 + 0.0434 + (0.00661*0.661) = 0.0335721$.

[9] Other provisions in deep trade agreements may also have differential impacts on GVC firms. As a sensitivity analysis, we include additional interaction terms allowing the effect of PTAs and overall depth to vary across firm type. The positive and significant effect of TF provisions on GVC firms remains robust.

Table 2. Heterogeneous effect of TF provisions on GVC firms with GDP

Dep var:	(1)	(2)	(3)	(4)	(5)	(6)
	Export participation			ln (exp value)		
PTA	-0.0172**	-0.0172**	-0.0141**	-0.0677	-0.0728	-0.0430
	(0.00709)	(0.00709)	(0.00614)	(0.119)	(0.119)	(0.0878)
… TF provisions	0.0247***	0.00334	0.0149	0.309**	-0.335**	0.0962
	(0.00900)	(0.0101)	(0.00909)	(0.134)	(0.161)	(0.158)
… TF provisions x GVC firm		0.0434***			0.774***	
		(0.00913)			(0.139)	
… TF provisions x Bilateral GVC firm			0.0960***			0.775***
			(0.0194)			(0.111)
… Depth	0.00661	0.00661	0.00284	-0.267	-0.255	-0.421***
	(0.0125)	(0.0125)	(0.0106)	(0.171)	(0.172)	(0.158)
Observations	39,685,492	39,685,492	39,685,492	226,280	226,280	226,280
R-squared	0.094	0.096	0.099	0.496	0.497	0.499

Note: Robust standard errors, clustered at the destination country level, in parentheses. All regressions control for GDP in destination country and include firm-year and destination fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The fact that the positive impact is not limited to GVC firms that import their inputs from PTA partner countries (bilateral GVC firms) suggests that trade facilitation commitments have a public good aspect, facilitating border procedures for shipments from non-member countries as well. This is an intuitive result given that many trade facilitation measures are applied in a non-discriminatory way, as described in Section 2. Trade facilitation commitments in PTAs, such as improvements in transparency at customs or the establishment of a single window to facilitate trade flows, generate positive spillover effects to firms that have GVC relationship with other countries. As expected, the largest gains are observed for bilateral GVC firms, who can benefit from efficiency enhancements at their own border (when importing inputs) and at the partner countries' border (when exporting) whether they are non-discriminatory or preferential.

The positive impact of TF provisions on exports for GVC firms are robust to an alternative estimation using Poisson pseudo maximum likelihood (PPML) model. Taking into account zero trade flows and potential heteroskedasticity, Table 3 further confirms that GVC firms are likely to export more to a partner country when Peru has an active PTA that includes more provisions that cover trade facilitation. The negative coefficients on the depth variable in columns (4)-(6) are unexpected and are likely due to multicollinearity between TF provisions and overall depth. In addition, the chapters that are included in the overall depth variable cover a broad range of policy areas—including environment, labor market regulations, subsidies, and

state-owned enterprises. It is possible that some of these provisions may hurt Peru's export competitiveness in the short term, leading to reduced exports in the short term.[10]

Table 3. PPML estimation results

Dep var:	(1)	(2)	(3)	(4)	(5)	(6)
			Export value			
PTA	-0.0599	-0.0609	-0.0235	0.148	0.145	0.233
	(0.311)	(0.307)	(0.363)	(0.213)	(0.216)	(0.279)
… TF provisions	0.0677	-1.171**	-0.626	1.108***	-0.129	0.518
	(0.632)	(0.519)	(0.816)	(0.401)	(0.538)	(0.535)
… TF provisions x GVC firm		1.345**			1.330**	
		(0.534)			(0.528)	
… TF provisions x Bilateral GVC firm			0.841***			0.893***
			(0.289)			(0.262)
… Depth				-1.211***	-1.196***	-1.407***
				(0.306)	(0.311)	(0.376)
Observations	11,911,728	11,911,728	11,911,728	226,280	226,280	226,280

Note: Robust standard errors, clustered at the destination country level, in parentheses. All regressions control for GDP in destination country and include firm-year and destination fixed effects. *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

This paper examines the heterogeneous impact of trade facilitation provisions in PTAs on different types of exporters, based on their GVC linkages. The econometric evidence shows that the effects of trade agreements are heterogeneous across firm types, depending on their GVC linkages. Trade facilitation provisions, in particular, help export performance of GVC firms by reducing trade costs and uncertainty associated with import processes, both in the home economy and in the destination country. In the case of Peru, the main benefit of trade facilitation provisions in PTAs seems to materialize through the efficiency enhancements at its own border, allowing GVC firms to import inputs in a more timely and predictable manner. As a result, Peruvian GVC firms are more likely to export and tend to export larger values to countries with which Peru has a PTA containing trade facilitation provisions.

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[10] As a sensitivity analysis, we also estimate equation (2) using an alternative measure of depth. Appendix Table A2 provides results when we use the overall depth measure of PTAs from Mattoo, Rocha and Ruta (2020). This measure codes over 900 provisions included in PTAs for the set of policy areas most frequently covered in trade agreements. Specifically, the depth variable is constructed as a count of all provisions across policy areas, excluding trade facilitation provisions. The positive and significant effect of TF provisions, and the stronger effects for GVC-firms remain robust. Due to multicollinearity and the presence of provisions that do not directly promote trade, in this specification we still find a negative coefficient on the depth variable.

In addition, the benefits of trade facilitation provisions in PTAs are observed for GVC firms that import inputs from the PTA partner country as well as those that source their inputs from third countries, indicating that both non-discriminatory and preferential aspects of TF commitments in PTAs contribute to improve Peruvian firms' participation in global value chains. This finding implies that trade facilitation commitments through PTAs have positive spillover effects to shipments from non-member countries, while still providing preferential benefits to the partner country. This is an intuitive result considering that some TF provisions are non-discriminatory in nature (e.g. single window) while others can be implemented preferentially (e.g. expedited shipments).

The overall findings in this paper have relevant implications for the link between trade and development. The results underscore the role that trade facilitation commitments in PTAs can play in reducing trade costs beyond tariff reductions. Specifically, TF reforms contribute to enhance countries' export competitiveness through the importing channel and therefore promote further integration into global and regional value chains.

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Appendix

Appendix Table A1. TF provisions in DTAs

N.	Provision	Section
1	Publication & Availability of Info	Transparency
2	Internet Publication	Transparency
3	Enquiry points	Transparency
4	Publication prior to Implementation	Transparency
5	Obligation to consult traders/business	Transparency
6	Opportunity to comment on the proposed regulations	Transparency
7	Advance Rulings	Transparency
8	Appeals	Transparency
9	Fees & charges connected wt import/export	Fees and Formalities
10	Penalty disciplines	Fees and Formalities
11	Pre-arrival processing	Fees and Formalities
12	Separation of release from clearance	Fees and Formalities
13	Risk management	Fees and Formalities
14	Post Clearance Audits	Fees and Formalities
15	Release times	Fees and Formalities
16	Authorized operators	Fees and Formalities
17	Expedited Shipments	Fees and Formalities
18	Cooperation in Customs and other TF matters	Fees and Formalities
19	Simplification/harmonization of formalities/procedures	Fees and Formalities
20	Use of international standards	Fees and Formalities
21	Single Window	Fees and Formalities
22	PSI / Destination inspection / Post-shipment inspections	Fees and Formalities
23	Customs brokers	Fees and Formalities
24	Temporary admission of goods	Fees and Formalities
25	Freedom of transit for goods	Transit
26	Exchange of customs-related information	Customs & other forms of cooperation
27	Technical assistance and capacity building	Technical assistance/Capacity Building
28	Specific disciplines for Customs processing fees	Fees and Formalities
29	Advance lodging in electronic format	Fees and Formalities
30	Electronic payment of duties	Fees and Formalities
31	Release good within prescribed time limits	Fees and Formalities
32	Mutual recognition of AOs	Fees and Formalities
33	WCO Immediate Release Guidelines	Fees and Formalities
34	Special arrangements for release - perishable goods	Fees and Formalities
35	Cooperation between border agencies	Fees and Formalities
36	Copies of supporting documents	Fees and Formalities
37	Interconnected / compatible Customs/SW systems	Customs & other forms of cooperation
38	Cooperate on law enforcement	Customs & other forms of cooperation
39	Exchange of information on best practices	Customs & other forms of cooperation
40	Cooperation in international for a	Customs & other forms of cooperation
41	Harmonization and common legal framework	Customs Union Specific
42	Customs and other duties collection	Customs Union Specific
43	Sharing of Customs revenue	Customs Union Specific
44	Require proof of origin	FTA Specific
45	Issuance of proof of origin	FTA Specific
46	Proof of Origin: Paper/Electronic format	FTA Specific
47	Submission of proof of origin	FTA Specific
48	Origin verification measures	FTA Specific
49	Support through advisory services etc	Technical assistance/Capacity Building
50	Establishment of structures	Institutional arrangements
51	Establishment of a mechanism	Institutional arrangements
52	Inter-operability of single window	Fees and Formalities

Appendix Table A2. Alternative depth measure

Dep var:	(1)	(2)	(3)	(4)	(5)	(6)
	Export participation			ln (exp value)		
PTA	-0.0132**	-0.0132**	-0.0123**	-0.156**	-0.159**	-0.165**
	(0.00662)	(0.00662)	(0.00554)	(0.0747)	(0.0710)	(0.0787)
… TF provisions	0.0610***	0.0397**	0.0331**	0.602***	-0.0266	0.209
	(0.0158)	(0.0153)	(0.0127)	(0.214)	(0.242)	(0.339)
… TF provisions x GVC firm		0.0434***			0.778***	
		(0.00913)			(0.139)	
… TF provisions x Bilateral GVC firm			0.0956***			0.760***
			(0.0194)			(0.107)
… Depth (all_prov)	-0.0287**	-0.0287**	-0.0146	-0.434**	-0.443**	-0.374
	(0.0143)	(0.0143)	(0.0122)	(0.183)	(0.179)	(0.231)
Observations	39,685,492	39,685,492	39,685,492	226,280	226,280	226,280
R-squared	0.094	0.096	0.099	0.496	0.497	0.499

Note: Robust standard errors, clustered at the destination country level, in parentheses. All regressions control for GDP in destination country and include firm-year and destination fixed effects. *** p<0.01, ** p<0.05, * p<0.1