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Abstract

We estimate the effects of trade facilitation on the extensive margins of trade. Using OECD Trade Facilitation Indicators – which closely reflect the Trade Facilitation Agreement negotiated at the Bali WTO Ministerial Conference of December 2013 – we show that trade facilitation in a given exporting country is positively correlated with the number of products exported by destination and with the number of export destinations served by product. To address the issue of causality, we employ an identification strategy whereby only exports of new products, or exports to new destinations, are taken into account when computing the respective margins of trade. Our findings therefore imply a positive causal impact of trade facilitation on the extensive margins of trade. The results are, to a large extent, robust to alternative definitions of extensive margins, to different sets of controls variables and to various estimation methods. Simulating the effect of an increase to the regional or global median values of trade facilitation, we are able to quantify the potential extensive margin gains of trade facilitation reform in different regions.

Keywords: Trade facilitation, Export diversification, International trade agreements, WTO

JEL Classification: F13, F14, F17

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1 Introduction

Trade economists have for some time now emphasized the need to bring down trade costs, which by many estimates remain quite sizeable. Even for a "representative rich country", Anderson and van Wincoop (2004) have calculated that the ad valorem equivalent of trade costs could be as high as 170%. As persuasively shown by Arvis et al. (2013), customs formalities and trade procedures that result in unnecessary delays or complexities to traders constitute an important component of trade costs. Recognizing this, the WTO's 1996 Ministerial Conference in Singapore agreed "to undertake exploratory and analytical work" on this issue. The simplification of the trade procedures has been part of the WTO's negotiating agenda since August 2004. In December 2013, WTO members concluded negotiations on a Trade Facilitation Agreement at the Bali Ministerial Conference.

An illustrative example of how trade facilitation can simplify trade procedures and make them more transparent can be taken from a country which became a WTO Member in 2013 – the Lao People's Democratic Republic. An online portal for trade has been operative since 2012.[1] On this website, all trade-related laws, regulations, measures, restrictions, licensing requirements and tariffs are indexed, cross-referenced, and made searchable by commodity code. The website also includes detailed process maps of business procedures for importing and exporting; full listings of national standards for products; procedures for clearing goods at the border; downloadable forms; and e-alerts which traders can customize to receive information.

The importance of achieving success in the WTO negotiations on trade facilitation has been underlined by a fair amount of empirical work. Various approaches for measuring the benefit of a multilateral agreement on trade facilitation have been pursued, including how much it will reduce trade costs, how much trade will increase, as well as the positive impact on jobs and on GDP. One effect that seems not to have been explored in sufficient depth is the effect on the extensive margins of trade. To the extent that trade and customs procedures act like fixed costs, they prevent exporters from entering new markets or selling a wider array of products. The benefit of export diversification over selling more of the same product or selling more to the same market is the resulting reduction in risk from shocks to international trade. Exporters with diversified export baskets or destinations are likely to be better insulated from shocks to specific markets or sectors than

[1] See `http://www.laotradeportal.gov.la/index.php?r=site/index`.

those who are not.

There are various approaches taken in the literature to measure, more or less directly, trade facilitation. A large part of the literature uses the World Bank's Logistics Performance Index (LPI) and Doing Business indicators as proxies. The LPI is based on a worldwide survey of operators on the ground, providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. In addition, survey data is supplemented with quantitative data on the performance of key components of the logistics chain in a given country. This includes the quality of trade and transport infrastructure. Doing Business indicators use data on the time and cost (excluding tariffs) associated with exporting and importing a standardized cargo of goods by sea transport. The time and cost necessary to complete every official procedure for exporting and importing the goods are recorded as well.

The most comprehensive approach in measuring trade facilitation is the one developed by the OECD. It has developed indicators on import, export and transit trade that are closely related, and can be readily mapped on, to the families of measures included in the WTO's Trade Facilitation Agreement – Information availability, Involvement of the trade community, Advance Rulings, Appeal Procedures, Fees and charges, Formalities, Cooperation, Consularization, Governance and Impartiality and Transit proceedings – see Table A-1. As explained in Moïsé et al. (2011) and Moïsé and Sorescu (2013), the twelve OECD Trade Facilitation Indicators (TFIs) are composed of some ninety-eight variables, whose values are drawn from questionnaire replies as well as publicly available data.

This paper makes use of the TFIs to estimate the impact of trade facilitation on the extensive margins of trade. In the baseline estimations, we consider two types of extensive margins: the number of products (HS sub-headings) by export destination, and the number of export destinations by product. We also consider theory-based extensive margins: the bilateral extensive margin suggested by Hummels and Klenow (2005), and an exporter-product extensive margin that, to the best of our knowledge, has not previously been explored in the literature.

While we are not the first to study the extensive-margin effects of trade facilitation, we are the first to do so using the OECD TFIs. Moreover, we add to the existing literature by considering an exporter-product, not only a bilateral dimension of trade margins. A third novel contribution of this paper is the quantification of the effect of implementing trade facilitation under two realistic scenarios: (i) trade facilitation reform that moves countries that are below the median of their region to that benchmark; and (ii) reform that moves countries that are below the global median to that level.

The remainder of this paper is organized as follows. The next section provides an overview of the literature on trade facilitation. Section 3 discusses the empirical methodology to estimate the effect of trade facilitation on trade margins. We first define the indicators for the different trade margins used in the empirical analysis. Next, we specify the econometric model. Finally, we discuss data sources and present the descriptive statistics of the variables used in the regression analysis. In Section 4, we present the empirical results. Section 5 presents estimations that use alternative measurements of trade margins and of trade facilitation. It also discusses various methodologies we have employed to test whether the effects are heterogeneous across country pairs and sectors. Section 6 includes the results of simulations under the two scenarios of convergence to the regional median and convergence to the global median. Section 7 concludes.

2 Literature

Trade facilitation has a significant potential to reduce trade costs. This effect has been quantified by a series of empirical studies that infer trade costs from the observed pattern of production and trade across countries (following the methodology of Novy, 2013). Chen and Novy (2009) estimate that technical barriers to trade, taken as a whole, explain 4.5% of the variation in trade costs across 11 European Union member countries between 1999 and 2003.[2] Arvis et al. (2013) estimate trade costs in agriculture and manufactured goods in 178 countries for the 1995-2010 period. They find that a one standard deviation improvement in the World Bank's LPI is associated with a trade cost reduction of 0.2 – 0.5 standard deviations. Moïsé et al. (2011) focus more closely on trade facilitation. Using the OECD TFIs, they estimate a cost reduction potential of around 10% of overall trade costs. In a follow-up study, Moïsé and Sorescu (2013) disaggregate the cost-reduction potential across income groups. They estimate this potential to be 14.5% in low income countries, 15.5% in lower middle income countries and 13.2% in upper middle income countries.

[2]Their preferred specification explains 80.8% of the variation in trade costs. 42.8% is attributable to the 3-digit industry fixed effects. Of the 38% that the remaining regressors explain, geography and transport costs alone are responsible for about 25%; policy variables explain 7.6%, with technical barriers to trade (TBTs) being the most important policy factor (4.5%). TBTs therefore explain 11.8% of the variation in trade costs not accounted for by unobservable industry characteristics.

Trade facilitation is likely to impact both variable and fixed trade costs. The formalities and requirements of a country's customs have to be met each time a shipment crosses a border. There are, however, also one-time costs incurred by a firm to acquire information on border procedures. A reduction in these costs can create new trading opportunities. Firms that did not export before may be able to do so now, since their revenues could now cover the lower fixed costs of exporting (Melitz, 2003). Trade facilitation can, therefore, both expand existing trade flows (intensive margin effect) and create new trade flows (extensive margin effect).

Empirical evidence on the intensive margin effects is provided by several authors. Moïsé and Sorescu (2013) estimate a positive effect on bilateral trade flows of bilateral measures of trade facilitation constructed from the OECD TFIs. A related literature highlights the importance of time for trade. Since trade facilitation is likely to reduce the time it takes for products to cross borders, this literature is also relevant in this context. In a recent contribution, Zaki (2014) shows that the time to import (export) is equivalent to a mean ad valorem tax of 34.2% (17.6%) for developing countries. A study by Hummels and Schaur (2013) shows that each day in transit is worth 0.6%-2% of the value of the good and that time is particularly important for intermediate goods. However, Freund and Rocha (2011) find that when comparing the effects of transit, documentation, and ports and customs delays on trade, the most significant effect comes from inland transit delays. Each additional day that a product is delayed prior to being shipped reduces trade by at least 1 per cent, as found by Djankov et al. (2010). A result which combines the effects of time and costs is obtained by Hausman et al. (2013). In their study, a 1% reduction in processing costs/time leads to 0.49%-0.37% of increased bilateral trade. There is also firm-level evidence showing the adverse effect of customs delays on trade. Using a sample of Uruguayan firms, Volpe Martincus et al. (2013) show that an increase by two days in the duration of export inspections reduces exports by 16.4%. Moreover, exports would be 5.9% larger if all exports could be processed within one day.

Some studies in this literature use econometric results from gravity equations to perform counterfactual analysis. Hoekman and Nicita (2011) simulate the effect of policy convergence by low income countries to the average of middle income countries. The percentage increase in exports (imports) of low income countries that would result from a combined convergence of the Doing Business "cost of trading" indicator and of the

LPI score to the average of middle income countries would be 17% (13.5%)[3]. Hufbauer et al. (2013) perform a thought experiment in which countries lift their trade facilitation halfway to the region's top performer in each category. They estimate an increase in total merchandise exports of developing countries of $569 billion (9.9%) and an increase in total exports of developed countries of $475 billion (4.5%).

The empirical evidence on the extensive margins effects of trade facilitation is more limited than the one on the intensive margins. Nordås et al. (2006) were among the first to show the negative effects of time to export on the probability to export. Dennis and Shepherd (2011) estimate the impact of various Doing Business indicators on the number of products that developing countries export to and import from the European Union. They find that poor trade facilitation has a negative impact on developing country export diversification. Another approach is taken by Feenstra and Ma (2014). They proxy trade facilitation with port efficiency and estimate its impact on export variety, a theory-based measure of the extensive margin. They show a positive and significant effect of port efficiency on export variety. Finally, Persson (2013) distinguishes between the effects of trade facilitation (measured using the number of days needed to export from the World Bank's Doing Business indicators) on homogenous and differentiated products. She finds that trade facilitation has a higher impact on differentiated products. Reducing export transaction costs increases the number of differentiated products by 0.7% and by 0.4% for homogenous products.

3 Empirical methodology

In this section, we provide econometric estimates of the impact of trade facilitation on trade margins. We first define such margins. Next, we specify the various econometric approaches employed. We further discuss data sources and present descriptive statistics of the variables used.

3.1 Definition of trade margins

We consider the relationship between trade facilitation and two indicators of trade margins: the number of exported products by destination and the number of export destinations by product.

The number of exported products by destination, npd_{ij}, counts how many HS sub-headings (6 digit HS codes,

[3]The LPI index alone has a higher effect than the Doing Business "cost of trading" indicator. This is because improvements in the LPI also capture improvements in the quality of a country's infrastructure.

from now on also referred to as "products" or "goods") country i exports to destination j. In the HS 2002 classification that we use, there are 5224 sub-headings. For each ij pair, npd_{ij} can therefore theoretically range between 0 (no trade) and 5224 (country i exports all products to j).

The number of destinations by product, ndp_{ik}, counts how many destinations are served by country i's exports of product k (HS sub-heading). The number of export destinations is bounded by the number of countries included in UN-COMTRADE, which we use for trade data.

In the construction of npd_{ij} and of ndp_{ik}, we rely on mirror trade data to the extent possible because import data tend to be more complete than export data. We therefore measure exports of country i in product k using the reported imports of country j in the same product. For the few country-years for which mirror data is not available, we rely on reported export data.[4]

3.2 Econometric model

The sample used for the regressions includes, as exporters i, the 133 countries for which OECD Trade Facilitation Indicators are available.[5] This data does not vary over time. We therefore estimate cross-sectional regressions for the year 2009. We chose this year for two reasons. First, this is suggested by Moïsé and Sorescu (2013).[6] Second, this will allow us to construct measures for npd_{ij} and ndp_{ik} that are respectively based on new products and new destinations, to address endogeneity concerns (see Section 4).[7]

3.2.1 ij regressions

Consider the ij regressions that use, as dependent variable, the number of exported products, npd_{ij}. This is a bilateral measure of trade outcomes. It is therefore natural to employ a gravity framework. We postulate the following econometric model:

$$log(npd_{ij}) = \beta_0 log(TFI_i) + x_i'\beta_1 + w_{ij}'\beta_2 + r_{ij}'\beta_3 + \gamma_j + \varepsilon_{ij} \tag{3.1}$$

[4]Mirror data is not available for the years 2010, 2011 and 2012 for the following countries with TFI information: Antigua and Barbuda, Brunei Darussalam, Cuba, The Gambia, Indonesia, Iran, Kuwait, Mali, Mongolia, Papua New Guinea, Qatar and Suriname.

[5]The full list of countries by World Bank region group, with information on the date of WTO (GATT, where applicable) membership, is available in Table A-2.

[6]See footnote 11 of Moïsé and Sorescu (2013).

[7]The results with all time-varying variables averaged between 2002 and 2010 are very similar to the ones presented here and are available upon request.

(OLS, importer fixed effects) or, alternatively,

$$log(npd_{ij}) = \beta_0 log(TFI_i) + x_i' \beta_1 + \delta_{ij} + \varepsilon_{ij} \tag{3.2}$$

(OLS, pair fixed effects). In equations (3.1) and (3.2),

$$x_i' = [log(pcGDP_i), log(market\ access_i), number\ of\ PTAs_i, log(area_i), landlocked_i]$$

is a vector of variables that only vary across exporters i's;

$$w_{ij}' = [log(GDP_i \cdot GDP_j), PTA_{ij}, log(distance_{ij}), common\ border_{ij}, common\ language_{ij}, colony_{ij})]$$

is a vector of standard bilateral gravity variables;

$$r_{ij}' = [MR\ PTA_{ij}, MR\ log(distance_{ij}), MR\ common\ border_{ij}, MR\ common\ language_{ij}, MR\ colony_{ij})]$$

is a vector of multilateral resistance terms, constructed using the methodology outlined in Baier and Bergstrand (2009); γ_j are importer-specific effects; δ_{ij} are country-pair-specific effects;[8] β_0 (β_1, β_2 and β_3) is (are) a scalar (vectors of parameters) to be estimated.

The OLS specifications (3.1) and (3.1) are a first, rough step of our econometric analysis. Since the dependent variable is a count variable, a model for count data is theoretically more appropriate. Following Dennis and Shepherd (2011) and Persson (2013), we also adopt a Poisson estimation methodology, with density:

$$f(npd_{ij}|TFI_i, x_i', w_{ij}', r_{ij}', \gamma_j) = \frac{exp(-\lambda_{ij})\lambda_{ij}^{npd_{ij}}}{npd_{ij}!} \tag{3.3}$$

[8] For any pair of countries m and n, we have only one pair identifier, both in the case in which m is the exporter and n the importer and in the case in which m is the importer and n the exporter. In this way, we can include pair fixed effects because the number of pair fixed effects is at most equal to $N/2$.

(Poisson, importer fixed effects), or, alternatively,

$$f(npd_{ij}|TFI_i, x'_i, \delta'_{ij}) = \frac{exp(-\mu_{ij})\mu_{ij}^{npd_{ij}}}{npd_{ij}!} \tag{3.4}$$

(Poisson, pair fixed effects). In equations (3.3) and (3.4), the respective parameters of the Poisson distribution are specified as follows:

$$\lambda_{ij} = exp[\beta_0 log(TFI_i) + x'_i\beta_1 + w'_{ij}\beta_2 + r'_{ij}\beta_3 + \gamma_j]$$

$$\mu_{ij} = [exp\ \beta_0 log(TFI_i) + x'_i\beta_1 + \delta_{ij}]$$

3.2.2 *ik* regressions

Consider now the ik regressions that use, as dependent variable, the number of export destinations, ndp_{ik}. This measure of trade outcomes does not have any bilateral dimension, since it varies by exporting country i and by product k. We postulate the following econometric model:

$$log(ndp_{ik}) = \beta_0 log(TFI_i) + x'_i\beta_1 + \theta_k + \varepsilon_{ik} \tag{3.5}$$

(OLS), where x'_i is as defined above and θ_k are product-specific effects.

For the same reasons as above, we also specify a model for count data and adopt a Poisson estimation methodology with density:

$$f(ndp_{ik}|TFI_i, x'_i, \theta_k) = \frac{exp(-\lambda_{ik})\lambda_{ik}^{ndp_{ik}}}{ndp_{ik}!} \tag{3.6}$$

(Poisson). In equation (3.6), the parameter of the Poisson distribution is specified as follows:

$$\lambda_{ik} = exp[\beta_0 log(TFI_i) + x'_i\beta_1 + \theta_k]$$

3.3 Data and descriptive statistics

The number of exported products npd_{ij} and the number of export destinations ndp_{ik} are constructed from UN-COMTRADE row data that vary by year, HS6 sub-heading, origin and destination country. As mentioned above, we use mirrored trade data. The reason why we have a time dimension in the row data will be made clear in Section 4. Here, we present descriptive statistics using the regression samples for the year 2009.

Table 1 presents summary statistics for npd_{ij}. Overall, the variable varies between 0 and 4831 (the latter being $npd_{USA-CAN}$ – the number of HS6 sub-headings exported by the United States to Canada). Disaggregating over World Bank regions (and excluding "Offshore " and "Industrial" to focus on developing and emerging economies), the mean of npd_{ij} varies between 61 for Sub-Saharan Africa to 612 for East Asia and Pacific. The incidence of zeros is also highest in Sub-Saharan Africa (15% of observations) and lowest in Asia (6% in South Asia, 5% in East Asia and Pacific). There is, however, considerably more variance across Asian countries than across Sub-Saharan African countries and countries from other regions.

< Table 1 about here >

Panel (a) of Table 2 presents summary statistics for ndp_{ik}. Overall, the variable varies between 0 and 169 (the latter being the number of Chinese export destinations of HS sub-heading 392690 – "Other Articles of Plastics"; HS sub-heading 830140 – "Other locks of Base Metal"; and HS sub-heading 940320 – "Other Metal Furniture"). Again, the disaggregation over World Bank regions reveals relatively low scores for Sub-Saharan Africa (with an average of 1 destination served by product), and relatively high scores for Asian countries (with an average of 16 and 9 destinations served by product by East Asia and Pacific and South Asia, respectively). The incidence of zeros is also highest in Sub-Saharan Africa (68% of observations). The same incidence ranges between 36% and 51% for other regions.

< Table 2 about here >

In Table 3, we present summary statistics for the variable $\mathrm{TFI_i}$. This is the simple average of the country-specific OECD Trade Facilitation Indicators TFI_i^A, $TFI_i^B, \dots, TFI_i^L$.[9] The average is unweighted because there is no criterion in the WTO Trade Facilitation Agreement or in the previous drafts to rank different

[9] We only have information on indicators A-L.

indicators in terms of their relevance. Since each sub-indicator ranges between 0 and 2, so does $\mathrm{TFI_i}$. Among developing and emerging economies, the scores are lowest in Sub-Saharan Africa and highest in Europe and Central Asia.[10] There is however substantial variation within these regions, and especially within Sub-Saharan Africa (where the best-performing country, Mauritius, has a score of 1.93). The fact that the best performer in Sub-Saharan Africa (the region with the lowest average of $\mathrm{TFI_i}$) has the highest score in the data suggests that a scenario in which all countries in the region move to the best performer's value is unlikely. We will take this in consideration in the simulations of Section 6.

< Table 3 about here >

Table 4 presents summary statistics for all control variables. GDP and GDP per capita (in current US$) are from IMF World Economic Outlook data. Market $\mathrm{access_i}$ is the Market Access Trade Restrictiveness Index (TRI) estimated by Kee et al. (2009).[11] The number of Preferential Trade Agreements (PTAs) signed by country i and the dummy $\mathrm{PTA_{ij}}$ (equal to 1 in the presence of a PTA between the two countries) are from a comprehensive dataset assembled by the Economic Research and Statistics Division of the WTO using a variety of sources, including the WTO RTA Database and the World Bank Global Preferential Trade Agreement Database. Non time-varying geographical data ($\mathrm{area_i}$, $\mathrm{landlocked_i}$, $\mathrm{distance_{ij}}$, common $\mathrm{border_{ij}}$) are from the CEPII gravity dataset (Head et al., 2010). Finally, following the methodology of Head and Mayer (2013), $\mathrm{remoteness_i}$ is constructed as follows:

$$remoteness_i = \left[\sum_j \frac{GDP_j/GDP_{world}}{distance_{ij}}\right]^{-1}$$

< Table 4 about here >

The sample correlations between all variables used in the regressions are in tables 5 (ij sample) and 6 (ik sample).

< Tables 5 and 6 about here >

[10] It is important to note that the latter region does not include industrialized OECD countries – see Table A-2.

[11] This index captures the trade policy distortions imposed by the trading partners of each country i on its export bundle. It measures the uniform tariff equivalent of the partner country tariff and non-tariff barriers (NTB) that would generate the same level of export value for the country in a given year. The TRI index is constructed using applied tariffs.

4 Results

4.1 ij regressions

The baseline results of the OLS and Poisson estimations of ij regressions are in Table 7. Each column respectively corresponds to equations (3.1)-(3.4) above. In OLS regressions, the dependent variable is in logs, while it is in levels in the Poisson regressions. In both cases, however, coefficients on explanatory variables in logs can be interpreted as elasticities.[12] We always include World Bank region dummies and partner (pair) fixed effects in odd- (even-) numbered columns.[13]

< Table 7 about here >

Both in the OLS and in the Poisson regressions, irrespective of whether partner (i.e. importer) or pair fixed effects are used, the coefficient on the variable of interest, β_0, is positive and statistically significant. In the specification of column (4), the elasticity is 0.303, implying that a 1% increase in the average trade facilitation indicator is roughly associated with a 0.3% increase in the number of HS6 products exported by destination. The coefficients on the control variables are correctly signed and statistically significant. Although the dependent variable is different, it is useful to compare the distance coefficients with the standard results from gravity studies. As reported in Table of 4 Head and Mayer (2013), the mean of the distance coefficient estimated in 159 papers ranges between -0.93 and -1.1, with a standard deviation of 0.40-0.41. The distance elasticity we obtain is in line with Table 4 of Head and Mayer (2013) for the OLS estimation. In the Poisson model it is lower, but it is a well-established fact in the literature that the distance coefficient is lower when using count-data models. Moreover, our result is very similar to the one obtained by Persson (2013), which is the most comparable study to ours.

We see three possible concerns with the estimations of Table 7. First, and foremost, we cannot exclude reverse causation, that is the possibility that trade outcomes affect the incentives to invest in trade facilitation, and

[12]To see this in the Poisson case, note that the conditional mean of npd_{ij} is:

$$E(npd_{ij}|log(TFI_i), x_i', w_{ij}', r_{ij}') = \lambda_{ij} = exp[\beta_0 log(TFI_i) + x_i'\beta_1 + w_{ij}'\beta_2 + r_{ij}'\beta_3 + \gamma_j].$$

This can be rewritten as:

$$E(npd_{ij}|log(TFI_i), x_i', w_{ij}', r_{ij}') = TFI_i^{\beta_0} exp[x_i'\beta_1 + w_{ij}'\beta_2 + r_{ij}'\beta_3 + \gamma_j],$$

which shows that β_0 is the elasticity of npd_{ij} with respect to the TFI variable.

[13]World Bank region dummies are included because in the simulations of Section 5 we average results over such regions. We do not include partner dummies in the regressions with pair fixed effects because of serious multicollinearity issues.

consequently the trade facilitation scores. We propose two ways of addressing this concern. The first one is to lead the dependent variable by few years, based on the intuition that trade outcomes in the future are less likely to affect investments in trade facilitation today. Accordingly, in columns (1) and (2) of Table 8 we show the results of Poisson regressions in which the dependent variable is measured in year 2012, while the explanatory variables are measured in year 2009. The results of the regressions with partner fixed effects are very similar to column (3) of Table 7. In the regression with pair fixed effects the coefficient β_0 is halved, but still statistically significant.

< Table 8 about here >

Our preferred way of addressing possible reverse causality relies, however, in using only "new products" (HS sub-headings) in the construction of the dependent variable, in the spirit of Freund and Rocha (2011). We proceed as follows: when computing how many products country i exported to country j in 2009, we only include the subset of products for which: (i) there were no exports from i to j (zero or missing) recorded in any of the years between 2002 and 2007; and (ii) there were positive exports from i to j recorded in at least one year between 2008 and 2010. Since npd_{ij} is, in this case, the count of new HS6 products that were not traded before 2008, it is less likely to be endogenous to trade facilitation than the indicator calculated using the set of products traded in 2009.

The use of "new products" has an additional advantage. We do not necessarily exclude products that dropped from a country's bilateral export basket during the big trade collapse of 2009. As long as a product that was not exported in any year between 2002 and 2007 started to be exported in any year before 2008 and 2010, it counts for the construction of npd_{ij}.

The results are in columns (3) and (4) of Table 8, respectively for the regressions with importer fixed effects and with country pair fixed effects (our preferred one). While in the regression with importer fixed effects β_0 is lower than the comparable coefficient of column (3) of Table 7, for our preferred specification with pair fixed effects (column (4)) the coefficient is higher than, though quite close to, the one of column (4) of Table 7. This indicates the possibility of a small downward bias induced by reverse causality.

The second possible concern with the estimations of Table 7 relates to the measurement of trade facilitation. So far, we have used $\mathrm{TFI_i}$ – the unweighted average of the country-specific OECD Trade Facilitation

Indicators. As an alternative, we have created a trade facilitation indicator based on Principal Component Analysis (PCA). The results are in columns (5)-(8) of Table 8. They are very similar to the results obtained in columns (3)-(4) of Table 7 (using npd_{ij} based on all products) and in columns (3)-(4) of Table 8 (using npd_{ij} based on new products).

Thirdly, one might worry about the omission of variables that might be correlated with the vector of explanatory variables. The inclusion of partner fixed effects (in odd-numbered columns of tables 7 and 8) and of symmetric pair fixed effects (in even-numbered columns of the same tables) greatly alleviates this concern. Another possible fix is the inclusion of other right-hand side variables that are possibly correlated with the main explanatory ones. Accordingly, we have also estimated regressions that include the bilateral applied (or, alternatively, bound) tariff that country i faces when exporting to country j.

The applied tariff is constructed as the unweighted average between effectively applied tariffs, MFN applied tariffs and preferential tariffs of importer j *vis-à-vis* exporter i on total trade. The bound tariff is simply the bound bilateral tariff on total trade. Summary statistics for bilateral $\text{tariff}_{\text{ij}}$, disaggregated by World Bank region, are available in Table 9. The results of regressions with applied and bound tariffs, using pair fixed effects, are in Table 10. The coefficient of interest β_0 remains positive and, with the exception of column (1), statistically significant. When using applied tariffs, the coefficients are slightly lower than in the comparable regressions of tables 7 and 8. When using bound tariffs, they are very similar, especially in regressions with "new products". It is worth noting that the coefficients on tariffs are consistently and significantly positive. While counter-intuitive, this result is in line with the Poisson-IV specifications of Dennis and Shepherd (2011) and with the results of Persson (2013).[14]

< Tables 9 and 10 about here >

4.2 *ik* regressions

The results of *ik* regressions are in Table 11. In the table, odd-numbered columns are based on OLS estimation, and even-numbered columns are based on Poisson estimation. In OLS regressions, the dependent

[14]We have tried regressions with only tariffs as the explanatory variable, including pair fixed effects and exporting country dummies (we could not include importing country dummies because the likelihood maximization algorithm did not converge). In all specifications, the coefficient on applied and the coefficient on bound tariffs are positive and significant. This is, therefore, a feature of the data rather than the symptom of econometric mis-specification.

variable is in logs, while it is in levels in the Poisson regressions. In both cases, however, coefficients on explanatory variables can be interpreted as elasticities. In all regressions, we include HS sub-heading fixed effects and World Bank region dummies.

< Table 11 about here >

The baseline results are in columns (1) and (2). All explanatory variables are correctly signed and statistically significant. In particular, the coefficient on the variable of interest, β_0, is positive, with an estimated elasticity in column (2) of 0.372. This implies that a 1% increase in the average trade facilitation indicator is roughly associated with a 0.37% increase in the number of destinations to which an HS6 product is exported.

In columns (2)-(6) we address possible endogeneity concerns using the same methods as the one described above in the case of ij regressions. In columns (3) and (4), we measure the dependent variable in year 2012, while the explanatory variables are measured in year 2009. The results are almost identical to columns (1) and (2). In columns (5) and (6) we present results that address possible reverse causality by using only "new destinations" in the computation of the dependent variable. The procedure is very similar in spirit to the one described above in the case of ij regressions. When computing how many destination countries were served by country i in exporting product k in 2009, we only include the subset of destinations for which: (i) there were no exports of product k (zero or missing) recorded in any of the years between 2002 and 2007; (ii) there were positive exports of product k recorded in at least one year between 2008 and 2010. In this case, therefore, ndp_{ik} becomes the count of new destinations that were not served before 2008.

Also in this case, the use of "new destinations" has the additional advantage that we do not necessarily exclude destinations that ceased to be served by country i in sector k during the big trade collapse of 2009. As long as a destination that was not served in any year between 2002 and 2007 started to get served in any year before 2008 and 2010, it counts for the construction of ndp_{ik}.

In the regressions with new destinations, the estimated coefficient β_0 remains positive and significant. In our preferred Poisson specification of column (6), it is slightly larger than the baseline coefficient of column (2).

In columns (7)-(10) we present the results of the regressions that use a measure of TFI based on Principal Component Analysis, rather than the simple mean across indicators. Again, the results do not change significantly. That is, results of columns (7) and (8) are similar to results of columns (1) and (2); results of columns (9) and (10) are similar to results of columns (5) and (6).

Also for ik regressions we have performed estimations adding applied and bound tariff. In this case, the applied tariff is the unweighted average between effectively applied tariffs, MFN applied tariffs and preferential tariffs faced by exporter i on product k (across all importers). The bound tariff is simply the unweighted average of bound tariffs faced by exporter i on product k (across all importers). Summary statistics for bilateral $\text{tariff}_{\text{ik}}$, disaggregated by World Bank region, are available in Table 12. The regression results are in Table 13. The estimated coefficients of interest (on TFI_i) stay positive and significant, but, in the Poisson regressions, they are halved relative to the comparable ones in Table 11. Again, the coefficients on the applied and bound tariffs are positive and significant, which constitutes a counter-intuitive result.[15]

< Tables 12 and 13 about here >

5 Robustness

5.1 Trade margins based on HS4 trade data

The measures of trade margins we have presented so far are based on trade data disaggregated at the HS6 (sub-heading) level. The level of sectoral disaggregation is especially relevant for the ik sample, because it dramatically affects the sample size. Panel (b) of Table 2 presents the summary statistics for ndp_{ik} computed using HS4 trade data. The number of observations and the percentage of zeros are clearly lower than for ndp_{ik} computed from HS6 trade data. Conversely, in the ij sample the sample size is determined by the number of exporting and importing countries, not by the level of sectoral disaggregation.[16]

The results of ij and ik regressions using trade margins based on HS4 trade data are in Table 14. In odd-numbered columns, we present baseline results of Poisson regressions. In columns (2) and (4) we present results of Poisson regressions that respectively use npd_{ij} computed with new HS4 and ndp_{ik} computed with new destinations. Since we also include applied tariffs in the set of regressors, columns (1) and (2) should

[15] In this case, too, we have tried regressions only with tariffs as explanatory variables. We have included product fixed effects and exporting country dummies. The coefficient on applied and the coefficient on bound tariffs are always positive and significant, leading us to conclude that, also in the ik sample, this is a feature of the data rather than the symptom of econometric mis-specification.

[16] We do not present summary statistics for npd_{ij} computed from HS4 trade data because they are very similar to the ones of Table 1. In the ij sample, the correlation between npd_{ij}'s using HS4 and HS6 trade data is 0.98.

be compared with columns (2) and (3) of Table 10, respectively. Columns (3) and (4) should be compared with columns (2) and (3) of Table 13. In the ij regressions, the coefficients on TFI_i are slightly smaller than the one estimated using HS6 trade data, but still correctly signed and statistically significant. In the ik regressions, the estimated TFI_i coefficients are slightly larger, but again correctly signed and statistically significant.

< Table 14 about here >

5.2 Hummel-Klenow trade margins

In this section, we present econometric estimates using theory-based "Hummels-Klenow extensive margins" as dependent variables. In the regressions with country pairs, we use the following variable, directly from Hummels and Klenow (2005):

$$em_{ij} = \frac{\sum_{k \in K_{ij}} X_{wjk}}{\sum_{k \in K} X_{wjk}} \tag{5.1}$$

In equation (5.1), K_{ij} is the set of goods in which country i exports to country j; w is the reference country that has positive exports to j in all products k (in the empirical implementation, it is the rest of the world); K is the set of all products; X_{wjk} are the exports of country w to country j in product k. em_{ij} is therefore the share of exports to j only in goods k that country i exports in total exports to country j.

In the regressions with country-product observations, we construct a similar measure (not previously used in the reviewed literature):

$$em_{ik} = \frac{\sum_{j \in J_{ik}} X_{wjk}}{\sum_{j \in J} X_{wjk}} \tag{5.2}$$

In equation (5.2), J_{ik} is the set of destinations to which country i exports product k; w is the reference country that has positive exports of k to all destinations j (in the empirical implementation, it is the rest of the world); J is the set of all destinations; X_{wjk} are – as in equation (5.1) – the exports of country w to country j in product k. em_{ik} is therefore the share of exports of k only to destinations j that country i exports to in total exports of product k to all destinations.[17]

The summary statistics for the Hummels-Klenow extensive margins em_{ij} and em_{ik} are in Table 15. In the

[17] We use the Stata module developed by Ansari (2013) to compute em_{ij} and em_{ik}.

developing world, Hummels-Klenow extensive margins, and therefore export diversification, are lowest in Sub-Saharan Africa and highest in East Asia and Pacific. From a qualitative standpoint, these descriptive statistics are in line with the ones presented in tables 1 and 2 for npd_{ij} and ndp_{ik}, respectively. In fact, the sample correlation between npd_{ij} and em_{ij} is equal to 0.89, while the sample correlation between ndp_{ik} and em_{ik} is equal to 0.83.[18]

< Table 15 about here >

Table 16 present the results of ij and ik regressions using, as dependent variable, the Hummels-Klenow extensive margins em_{ij} and em_{ik}, respectively. Since the dependent variable is a fraction between zero and one, we use Generalized Estimating Equations (GEE) (see Hardin and Hilbe, 2005) in the ij regressions and Generalized Linear Model (GLM) in the ik regressions.[19] Odd-numbered columns present baseline results, in which the respective trade margin is calculated using trade data from 2009. In even-numbered columns we address concerns related to reverse causality and construct the dependent variable using only the subset of new products (in the case of em_{ij}) or new destinations (in the case of em_{ik}).[20]

< Table 16 about here >

In the ij regressions, controlling for country characteristics, tariffs and pair fixed effects, the coefficient on (the log of) $\mathrm{TFI_i}$ is positive and significant. This confirms the results obtained above with npd_{ij} as dependent variable. In the ik regressions, however, only the coefficient of estimations in columns (5) and (7) is correctly signed and statistically significant. When we use the definition of the Hummels-Klenow extensive margin em_{ik} based on new destinations, the coefficient on $\mathrm{TFI_i}$ turns negative and statistically significant. There is no easy way to explain this counter-intuitive result. It should be mentioned, however, that the coefficient on $\mathrm{TFI_i}$ is correctly signed and statistically significant if we perform the same regressions of columns (5)-(8) of Table 16 using HS4 headings in the construction of the dependent variable.

[18]Sample correlations computed from columns (1) and (5) of Table 16, respectively.

[19]Baum (2008) suggests using a Generalized Linear Model (GLM) with a logit transformation of the response variable and the binomial distribution. In the ij sample, this model did not produce any result due to the excessive number of pair dummies added to the matrix of explanatory variables. This is why we opted for GEE.

[20]See Section 4.1 for details on the procedure.

5.3 World Bank Doing Business indicators

Following, among others, Hoekman and Nicita (2011) and Dennis and Shepherd (2011), we have also performed regressions that use, as proxies of trade facilitation, the "Trading across borders" indicators of the World Bank Doing Business database. In this database, there are three indicators relevant for our purposes: Number of documents to export;[21] number of days required to export;[22] cost to export (US$ per container).[23] To increase comparability with the results that use the OECD TFIs, we have transformed these variables as follows. First, we have computed their inverse. Then, we have rescaled them between 0 (least facilitation) and 2 (most facilitation). Summary statistics for our new variables, respectively called DB $\mathrm{docs_i}$, DB $\mathrm{cost_i}$ and DB $\mathrm{time_i}$, are presented in Table 17. Table 18 presents, in turn, the correlations among these variables, and the correlations between these variables and $\mathrm{TFI_i}$.

< Tables 17 and 18 about here >

The results of ij regressions are in Table 19. The coefficients on DB $\mathrm{docs_i}$ and DB $\mathrm{cost_i}$ are consistently positive across all specifications – including the ones using new products. The coefficient on DB $\mathrm{time_i}$ is, oddly, negative but not statistically different from zero in the Poisson regression of column (6). It becomes, however, positive and statistically significant when new products are used (column (9)). All control variables are correctly signed and significant.

< Table 19 about here >

The results of ik regressions are in Table 20. In this case, all the coefficients on DB $\mathrm{docs_i}$, DB $\mathrm{cost_i}$ and DB $\mathrm{time_i}$ are consistently positive across all specifications – with the exclusion of a statistically non-significant coefficient on DB $\mathrm{time_i}$ in the baseline OLS regression of column (3). Importantly, all coefficients are significant in the regressions using new destinations. Again, all control variables are correctly signed and significant.[24]

< Table 20 about here >

[21] The total number of documents required per shipment to export goods. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks are taken into account.

[22] The time necessary to comply with all procedures required to export goods.

[23] The cost associated with all procedures required to export goods. It includes the costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport.

[24] We have performed the same regressions as the ones in tables 19 and 20 adding tariffs to the set of regressors. The results are in line with the ones presented here and are available upon request.

5.4 The elusive quest for heterogeneous effects

Beyond the central results of Section 4, we also investigated possible heterogeneity in the impact of trade facilitation on the extensive margins of trade. A first source of heterogeneity is between country pairs that have a PTA in place and country pairs that do not have one. There is ample evidence that most PTAs include trade facilitation provisions (see for instance Neufeld, 2014). Maur (2011) argues that in areas such as product standards and technical regulations, trade facilitation through policies such as harmonization between PTA members has the potential to introduce discrimination *vis-à-vis* excluded countries. Conversely, aspects of trade facilitation such as transparency and simplification of rules and procedures (the narrow definition of trade facilitation that we use in this paper and that is reflected in the OECD TFIs), should be non-discriminatory in nature and therefore benefit all trading partners equally. Accordingly, one should not expect any heterogeneous effect of exporter's trade facilitation on the extensive margin of bilateral trade across importers that have a PTA with the exporter and importers that do not have one.

To test this prediction, we have augmented the ij regressions with an interaction term between the PTA dummy and $\mathrm{TFI_i}$. In line with the theoretical prediction, we have not obtained any consistent pattern in the results. In most regressions, the marginal effect when the PTA dummy is equal to one is not statistically different from the marginal effect when the PTA dummy is equal to zero.[25]

Second, we have investigated whether the effect of trade facilitation on the extensive margins differs between final and intermediate products. Yi (2003) developes a model in which trade costs hamper vertically-specialized trade (i.e. trade along supply chains) relatively more than trade in final products.[26] Martinez-Zarzoso and Márquez-Ramos (2008) show that improvements in the Doing Business indicators "Number of days" and "Document required" to export/import have a relatively larger effect on technology-intensive goods and on differentiated products, as opposed to homogeneous ones. Marti et al. (2014) argue that improvements in the LPI have an effect which is larger for goods that are relatively more complex to transport. In a more direct test of Yi's hypothesis, Saslavsky and Shepherd (2012) show that trade in parts and components –

[25] The results are available upon request.

[26] Yi's model shows the magnifying trade effects of tariff reductions when vertically specialized goods cross multiple borders while they are being produced. He argues that reductions in transportation costs and trade reforms more general than tariff liberalization also have a magnifying effect on trade. Ferrantino (2012) makes the link with trade facilitation explicit. He argues that NTMs and trade facilitation can be compared using a common metric. Efforts to reduce NTMs and efforts to increase trade facilitation should both have larger effects on trade in complex supply chains that on trade in simple supply chains. See also U.S. Chamber of Commerce (2014) and UNECA (2013) for less formal expositions, respectively by the business community and by an international organization, of the idea that trade facilitation should matter most for intermediate goods trade.

which they assume takes place largely within network structures – is more sensitive to improvements in logistics performance than trade in final goods. These papers focus on the intensive margin of trade (bilateral trade value in a gravity framework). As discussed in Section 2, Persson (2013) applies similar ideas to the extensive margins of trade. She does not explicitly consider trade in intermediate products as her focus is on product differentiation. She finds that trade facilitation has a higher extensive margin impact on trade in differentiated products than on trade in homogenous products.

In the spirit of this literature, we have tested for heterogeneous effects on the extensive margins of trade between intermediate and non-intermediate and products. We have used two alternative definitions of intermediate products, a narrow one and a broad one. The narrow definition, used in WTO (2011), includes the HS sub-headings corresponding to codes 42 and 53 of the Broad Economic Categories (BEC) classification, supplemented with unfinished textile products in HS chapters 50-63. The broad definition includes the HS sub-headings corresponding to the intermediate goods of the BEC classification.

As a first step, we have estimated ij regressions in two sub-samples: one in which the dependent variable is computed across the subset of intermediate products; one in which the dependent variable is computed across the subset of all other products. We have not been able to find any significant difference between estimated coefficients across these specifications. To test this result further, in the ik sample we have augmented the regressions with an interaction term between a dummy equal to one if the product is intermediate and the $\mathrm{TFI_i}$ variable. We have not found the coefficient of this interaction term to be significant in most specifications.[27] This leads us to conclude that the effect of trade facilitation on the extensive margin does not differ between intermediate and final products.

6 Simulation results

So far, we have had only limited discussion about the economic significance of our results. In this section, we present the result of counterfactual analysis aimed at estimating the percentage increase in the number of export destinations and in the number of exported products under two different scenarios. The first scenario considered is one in which each country with a $\mathrm{TFI_i}$ below the median of the geographical region it belongs

[27] The results are available upon request.

to increases its $\mathrm{TFI_i}$ to the regional median. The second scenario considers an increase to the global median. As shown in the "sd" column of Table 3, there is wide variation in outcomes across countries belonging to the same geographical region. This suggests that a scenario involving convergence to the top regional performer would be very unrealistic. Such a scenario is, therefore, discarded a priori.

It is important to note that results of counterfactual analysis have to be taken cautiously. First, because they are only as good as the underlying econometric model. Although we have taken care in addressing omitted variable and reverse causality biases, we cannot control for every possible country-specific variable correlated with trade facilitation and we cannot completely exclude the endogenous co-determination of trade outcomes and trade facilitation infrastructure. Second, the counter-factual analysis does not take into account that regional (global) median values would be affected by changes in trade facilitation occurring in all countries in the region (world).

With these caveats in mind, the baseline results, grouped by region, are presented in Table 21 for ij regressions and Table 22 for ik regressions. To remain on the conservative side, we have chosen to base the simulations on the results that include applied tariffs, which generally yield smaller estimated coefficients for $\mathrm{TFI_i}$ than the coefficients of regressions without tariffs.[28]

For ease of interpretation, it is useful to keep in mind that the entries in tables 21 and 22 represent the percentage change in the variable of interest (respectively, npd_{ij} and ndp_{ik}) that, based on the estimated regression coefficients, are predicted if country i moves from below the regional (global) median to the relevant median. The results are then averaged across regions. All countries at, or above, the relevant median are dropped from the calculation of the regional average percentage increase in the trade margin. If, say, in a given region there are 16 countries, 8 of which are below the regional median and 15 below the global median, the results under the regional median scenario are averaged over the 8 bottom countries in terms of $\mathrm{TFI_i}$, while the results under the global median scenario are averaged over all countries with the exclusion of the top regional performer.

Tables 21 and 22 have two panels each. In the upper panel, we present results based on regressions using HS6 trade data. In the lower panel, we present results based on regressions using HS4 trade data. We use both the "baseline" Poisson and the Poisson specification with new products and new destinations. Since

[28] The results using the coefficients from regressions without applied tariffs for ij and ik simulations are available upon request.

the estimates obtained in the latter specifications address the issue of reverse causality, we take them as our preferred results. We therefore discuss only the results of even-numbered columns.

< Tables 21 and 22 about here >

The estimated gains in terms of number of products exported by destination (npd_{ij}) are, generally, slightly larger in panel (a) than in panel (b) of Table 21. Under the scenario of convergence to the regional median, the percentage gains range from 3.4% in the case of Middle East and North Africa and South Asia (HS4 data, regional median scenario) to 16.7% in the case of Sub-Saharan Africa (HS6 data, global median scenario). It is apparent from the table that the gains are largest in two regions, namely Sub-Saharan Africa and Latin America and the Caribbean.

In the case of the number of export destinations by HS code (ndp_{ik}), the estimated gains are larger in the HS4 regressions of panel (b) than in the HS6 regressions of panel (a). They range from 3.5% for South Asia (regional median scenario, HS6 regressions) to 14.1% for Sub-Saharan Africa (global median scenario, HS4 regressions). In this case, too, the gains are largest in Sub-Saharan Africa and Latin America and the Caribbean.

7 Conclusions

This is the first paper to focus exclusively on, and to provide detailed estimates of, the prospective effect of the WTO's Trade Facilitation Agreement on the extensive margins of trade. We have done so by using direct measures of trade facilitation that map into the obligations of the Agreement, namely, the OECD Trade Facilitation Indicators. We have explored a variety of measures of the extensive margins of trade – the number of products a country exports to a given destination (npd_{ij}), the number of destinations to which a country exports a given product (ndp_{ik}), the Hummels-Klenow measure of the bilateral extensive margin (em_{ij}) and a similar measure of the country-product extensive margin (em_{ik}) that has not previously been explored in the literature.

The estimation results are convincing, with the coefficient on the trade facilitation variable being positive and statistically significant across almost all specifications. Using these estimates, we have simulated the impact of implementing the Agreement on developing countries' extensive margin of trade. Implementation of the Agreement has been measured using two alternative realistic scenarios – convergence to the regional median and convergence to the global median. Developing countries are likely to experience a substantial increase in the number of destination markets and new export products. For Sub-Saharan African countries, our simulations suggest they could see an increase of up to 16.7% in the number of products exported by destination and an increase of up to 14.1% in the number of export destinations by product. For countries in Latin America and the Caribbean, our simulations suggest they could see an increase of up to 13% in the number of products exported by destination and an increase of up to 9.1% in the number of export destinations by product. For the reasons outlined in Section 6, these numbers have to be treated with caution. Nonetheless, they imply potentially sizeable impacts of the Trade Faciliation Agreement on extensive margins of export.

It is important to emphasize that we make no claim about the welfare effects of implementing the WTO's Trade Facilitation Agreement. This would require us to estimate not only the benefits but also the costs of implementing the Agreement. Notwithstanding this qualification, we know from the available literature that the costs of implementation of trade facilitation initiatives are relatively small (OECD, 2009; UNECA, 2013). At the same time, our estimations do not capture several other potential benefits of the Agreement. A proper welfare analysis would also factor in the value of locking in commitments in a multilateral agreement and other positive spillovers, such as, for instance, the reduction in the extent of rent-seeking behaviour or the environmental benefit of lower fuel consumption from shorter waiting times at the border. These topics need to be investigated further to get a more comprehensive understanding of the effects of the WTO Trade Facilitation Agreement.

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Tables

Table 1: Summary statistics, npd_{ij}, by World Bank region

World Bank region	mean	sd	min	max	N	zeros	% zeros
Sub-Saharan Africa	61	252.76	0	4525	2962	458	15%
East Asia and Pacific	612	855.07	0	4224	1564	86	5%
Europe and Central Asia	257	515.40	0	3788	2813	359	13%
Latin America and the Caribbean	147	363.69	0	3429	2690	249	9%
Middle East and North Africa	92	164.79	0	1534	1152	79	7%
South Asia	407	657.61	0	3740	541	33	6%
Offshore	22	84.03	0	780	93	5	5%
Industrial	1044	1114.53	0	4831	2467	13	1%
Whole sample	361	725.95	0	4831	14282	1282	9%

Descriptive statistics computed from the sample of column (4) of Table 7 and based on HS6 trade data

Table 2: Summary statistics, ndp_{ik}, by World Bank region

Panel (a): ndp_{ik} computed using HS6 trade data

World Bank region	mean	sd	min	max	N	zeros	% zeros
Sub-Saharan Africa	1	4.87	0	128	167008	114129	68%
East Asia and Pacific	16	29.46	0	169	73066	26561	36%
Europe and Central Asia	7	13.49	0	135	125256	49152	39%
Latin America and the Caribbean	4	9.12	0	137	125256	62326	50%
Middle East and North Africa	4	9.28	0	122	57409	28086	49%
South Asia	9	20.40	0	166	31314	16040	51%
Offshore	0	1.42	0	63	5219	3972	76%
Industrial	30	34.41	0	167	104380	12544	12%
Whole sample	9	21.16	0	169	688908	312810	45%

Descriptive statistics computed from the sample of column (3) of Table 11

Panel (b): ndp_{ik} computed using HS4 trade data

World Bank region	mean	sd	min	max	N	zeros	% zeros
Sub-Saharan Africa	3	8.87	0	138	39808	18523	47%
East Asia and Pacific	28	40.43	0	174	17416	4039	23%
Europe and Central Asia	13	20.71	0	146	29856	6567	22%
Latin America and the Caribbean	8	15.22	0	141	29856	8677	29%
Middle East and North Africa	10	16.74	0	137	13684	3598	26%
South Asia	17	31.44	0	169	7464	2519	34%
Offshore	1	3.00	0	67	1244	672	54%
Industrial	50	44.34	0	173	24880	1246	5%
Whole sample	17	30.41	0	174	164208	45841	28%

Descriptive statistics computed from the sample of column (3) of Table 14

Table 3: Summary statistics, TFI_i, by World Bank region

World Bank region	mean	median	sd	min	max	N
Sub-Saharan Africa	1.10	1.07	0.35	0.39	1.93	2962
East Asia and Pacific	1.34	1.35	0.27	0.81	1.81	1564
Europe and Central Asia	1.39	1.37	0.28	0.77	1.91	2813
Latin America and the Caribbean	1.22	1.30	0.31	0.45	1.65	2690
Middle East and North Africa	1.22	1.22	0.28	0.83	1.65	1152
South Asia	1.26	1.36	0.16	1.01	1.38	541
Offshore	1.20	1.20	0.00	1.20	1.20	93
Industrial	1.50	1.53	0.18	1.13	1.86	2467
Whole sample	1.29	1.34	0.31	0.39	1.93	14282

Descriptive statistics computed from the sample of column (4) of Table 7

Table 4: Summary statistics, control variables

Variable	mean	sd	min	max
Log($pcGDP_i$)	8.48	1.47	5.36	11.27
Log(market $access_i$)	-2.43	0.76	-5.37	-1.15
Number of $PTAs_i$	40.53	25.98	0	88
Log($area_i$)	11.90	2.11	5.76	16.65
$Landlocked_i$	0.21	0.41	0	1
Log($remoteness_i$)	8.46	0.51	7.20	9.36
Log(GDP_i*GDP_j)	7.45	3.08	-2.17	18.10
PTA_{ij}	0.22	0.41	0	1
Log($distance_{ij}$)	8.73	0.78	4.74	9.89
Common $border_{ij}$	0.02	0.14	0	1
Common $language_{ij}$	0.14	0.35	0	1
$Colony_{ij}$	0.01	0.09	0	1
MR PTA_{ij}	0.25	0.81	-0.18	7.34
Log(MR $distance_{ij}$)	10.71	47.12	-7.57	485.03
MR Common $border_{ij}$	0.00	0.15	-0.05	1.55
MR Common $language_{ij}$	0.20	1.33	-0.10	13.63
MR $Colony_{ij}$	0.04	0.22	-0.01	2.51

Descriptive statistics computed from the sample of column (3) of Table 7 – except for Log($remoteness_i$)
Descriptive statistics for Log($remoteness_i$) computed from the sample of column (4) of Table 7

Table 5: Correlations (ij sample)

	npd_{ij}	$Log(TFI_i)$	$Log(pcGDP_i)$	$Log(market\ access_i)$	Number of $PTAs_i$	$Log(area_i)$	$Landlocked_i$	$Log(remoteness_i)$	$Log(GDP_i*GDP_j)$	PTA_{ij}	$Log(distance_{ij})$	Common $border_{ij}$	Common $language_{ij}$	$Colony_{ij}$
npd_{ij}	1													
$Log(TFI_i)$	0.22*	1												
$Log(pcGDP_i)$	0.35*	0.38*	1											
$Log(market\ access_i)$	-0.00	0.10*	-0.26*	1										
Number of $PTAs_i$	0.23*	0.26*	0.32*	0.11*	1									
$Log(area_i)$	0.20*	0.03*	-0.17*	-0.10*	-0.03*	1								
$Landlocked_i$	-0.15*	-0.05*	-0.32*	0.04*	-0.21*	0.00	1							
$Log(remoteness_i)$	-0.36*	-0.34*	-0.60*	0.16*	-0.47*	0.22*	0.08*	1						
$Log(GDP_i*GDP_j)$	0.57*	0.29*	0.40*	-0.10*	0.24*	0.32*	-0.21*	-0.31*	1					
PTA_{ij}	0.25*	0.09*	0.09*	0.04*	0.32*	-0.00	-0.08*	-0.14*	0.17*	1				
$Log(distance_{ij})$	-0.29*	-0.02*	-0.05*	0.07*	-0.14*	0.06*	-0.05*	0.25*	-0.07*	-0.40*	1			
Common $border_{ij}$	0.23*	0.01	-0.01	-0.01	0.01	0.05*	0.02*	-0.02*	0.05*	0.21*	-0.37*	1		
Common $language_{ij}$	0.048*	-0.06*	-0.08*	0.10*	-0.04*	-0.04*	-0.01	0.15*	-0.14*	0.11*	-0.11*	0.12*	1	
$Colony_{ij}$	0.12*	0.02*	0.05*	0.00	0.05*	0.02*	-0.02*	-0.07*	0.08*	0.03*	-0.03*	0.05*	0.14*	1

Correlations computed from the sample of column (3) of Table 7, and including $Log(remoteness_i)$

* $p<0.05$

Table 6: Correlations (*ik* sample)

	$\mathrm{ndp_{ik}}$	$\mathrm{Log(TFI_i)}$	$\mathrm{Log(pcGDP_i)}$	$\mathrm{Log(market\ access_i)}$	$\mathrm{Number\ of\ PTAs_i}$	$\mathrm{Log(area_i)}$	$\mathrm{Landlocked_i}$	$\mathrm{Log(remoteness_i)}$
$\mathrm{ndp_{ik}}$	1							
$\mathrm{Log(TFI_i)}$	0.22*	1						
$\mathrm{Log(pcGDP_i)}$	0.35*	0.38*	1					
$\mathrm{Log(market\ access_i)}$	0.19*	0.03*	-0.17*	1				
$\mathrm{Number\ of\ PTAs_i}$	0.00	0.10*	-0.26*	-0.10*	1			
$\mathrm{Log(area_i)}$	0.22*	0.26*	0.32*	-0.03*	0.11*	1		
$\mathrm{Landlocked_i}$	-0.15*	-0.05*	-0.32*	0.00	0.04*	-0.21*	1	
$\mathrm{Log(remoteness_i)}$	-0.35*	-0.34*	-0.60*	0.22*	0.16*	-0.47*	0.08*	1

Correlations computed from the sample of column (2) of Table 11

Table 7: Number of products by destination (npd_{ij}), baseline results

	OLS		Poisson	
	(1)	(2)	(3)	(4)
Log(TFI_i)	0.229***	0.334***	0.511***	0.303***
	[0.037]	[0.061]	[0.054]	[0.058]
Log($pcGDP_i$)	0.138***	0.335***	0.107***	0.408***
	[0.018]	[0.020]	[0.025]	[0.019]
Log(market $access_i$)	0.457***	0.313***	0.417***	0.325***
	[0.013]	[0.028]	[0.018]	[0.029]
Number of $PTAs_i$	-0.001**	0.003***	0.002***	0.005***
	[0.001]	[0.001]	[0.001]	[0.001]
Log($area_i$)	-0.043***	0.206***	-0.052***	0.211***
	[0.007]	[0.007]	[0.009]	[0.006]
$Landlocked_i$	-0.184***	-0.340***	0.023	-0.107***
	[0.024]	[0.041]	[0.028]	[0.038]
Log($remoteness_i$)		-0.628***		-0.613***
		[0.041]		[0.031]
Log(GDP_i*GDP_j)	0.752***		0.738***	
	[0.013]		[0.021]	
PTA_{ij}	0.121***		0.051	
	[0.041]		[0.039]	
Log($distance_{ij}$)	-0.927***		-0.602***	
	[0.035]		[0.040]	
Common $border_{ij}$	0.481***		-0.035	
	[0.115]		[0.085]	
Common $language_{ij}$	0.746***		0.383***	
	[0.052]		[0.055]	
$Colony_{ij}$	0.769***		0.583***	
	[0.129]		[0.106]	
Observations	16,854	17,956	21,125	14,282
R-squared	0.737	0.520		
Log pseudolikelihood			-1.335e+06	-285595
Partner (j) FE	yes	no	yes	no
Pair FE	no	yes	no	yes
Number of id (j countries)	161		161	
Number of id (pairs)		12,097		7,141

Robust (clustered on id variable) standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: $log(npd_{ij})$ (OLS regressions); npd_{ij} (Poisson regressions)

Region dummies always included

Multilateral resistance terms included in regressions (1) and (3)

All regressions based on HS6 trade data

Table 8: Number of products by destination (npd_{ij}), extended results

	Dep. var. in 2012		New HS6		PCA for TFI		PCA for TFI & new HS6	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(TFI_i)	0.477***	0.156***	0.320***	0.383***	0.545***	0.348***	0.285***	0.369***
	[0.045]	[0.055]	[0.075]	[0.055]	[0.061]	[0.058]	[0.078]	[0.052]
Log($pcGDP_i$)	0.060**	0.418***	0.095***	0.431***	0.105***	0.398***	0.097***	0.427***
	[0.023]	[0.019]	[0.030]	[0.018]	[0.026]	[0.020]	[0.030]	[0.018]
Log(market $access_i$)	0.396***	0.356***	0.311***	0.260***	0.411***	0.321***	0.312***	0.260***
	[0.017]	[0.030]	[0.022]	[0.025]	[0.018]	[0.030]	[0.022]	[0.025]
Number of $PTAs_i$	0.003***	0.005***	0.001**	0.006***	0.002***	0.005***	0.001*	0.006***
	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log($area_i$)	-0.060***	0.199***	-0.021**	0.113***	-0.051***	0.211***	-0.021**	0.112***
	[0.008]	[0.006]	[0.009]	[0.005]	[0.009]	[0.006]	[0.009]	[0.005]
$Landlocked_i$	0.019	-0.185***	-0.144***	-0.130***	0.028	-0.105***	-0.143***	-0.134***
	[0.025]	[0.035]	[0.027]	[0.044]	[0.028]	[0.038]	[0.027]	[0.044]
Log($remoteness_i$)		-0.591***		0.044		-0.619***		0.041
		[0.030]		[0.033]		[0.031]		[0.033]
Log(GDP_i*GDP_j)	0.721***		0.474***		0.733***		0.472***	
	[0.020]		[0.026]		[0.021]		[0.026]	
PTA_{ij}	0.045		0.003		0.049		0.003	
	[0.036]		[0.033]		[0.039]		[0.033]	
Log($distance_{ij}$)	-0.555***		-0.432***		-0.605***		-0.432***	
	[0.039]		[0.035]		[0.040]		[0.035]	
Common $border_{ij}$	-0.052		-0.110		-0.033		-0.108	
	[0.082]		[0.103]		[0.085]		[0.103]	
Common $language_{ij}$	0.341***		0.418***		0.376***		0.416***	
	[0.053]		[0.046]		[0.055]		[0.046]	
$Colony_{ij}$	0.566***		0.368***		0.589***		0.370***	
	[0.099]		[0.108]		[0.106]		[0.108]	
Observations	17,835	11,482	21,256	15,164	21,125	14,282	21,256	15,164
Log pseudolikelihood	-1.243e+06	-271332	-777933	-170340	-1.333e+06	-284766	-778456	-170250
Partner (j) FE	yes	no	yes	no	yes	no	yes	no
Pair FE	no	yes	no	yes	no	yes	no	yes
Number of id (j countries)	142		162		161		162	
Number of id (pairs)		5,741		7,582		7,141		7,582

Poisson regressions in all columns

Robust (clustered on id variable) standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: npd_{ij}

Region dummies always included

Multilateral resistance terms included in regressions (1), (3), (5) and (7)

All regressions based on HS6 trade data

Table 9: Summary statistics, tariffs (ij sample)

Panel (a): Applied tariffs

World Bank region	mean	sd	min	max	N
Sub-Saharan Africa	5.77	6.08	0	30.16	1525
East Asia and Pacific	7.78	5.69	0	24.91	786
Europe and Central Asia	7.10	5.69	0	32.7	1486
Latin America and the Caribbean	6.58	5.98	0	41.69	1387
Middle East and North Africa	6.28	5.88	0	26.48	540
South Asia	8.45	6.54	0	28.87	304
Offshore	n.a.	n.a.	n.a.	n.a.	n.a.
Industrial	7.87	4.81	0	25.32	1788
Whole sample	6.99	5.74	0	41.69	7816

Descriptive statistics computed from the sample of column (2) of Table 10

Panel (b): Bound tariffs

World Bank region	mean	sd	min	max	N
Sub-Saharan Africa	23.24	30.25	0	150	1197
East Asia and Pacific	24.27	26.25	0	120	732
Europe and Central Asia	24.73	24.97	0	150	982
Latin America and the Caribbean	22.64	24.64	0	150	1286
Middle East and North Africa	19.00	22.93	0	122	418
South Asia	25.48	27.58	0	125.71	275
Offshore	n.a.	n.a.	n.a.	n.a.	n.a.
Industrial	30.81	28.62	0	140	1634
Whole sample	25.18	27.23	0	150	6524

Descriptive statistics computed from the sample of column (6) of Table 10

Tariff data are from UN-TRAINS

All descriptive statistics based on HS6 trade data

Table 10: Number of products by destination (npd_{ij}), results with tariffs

	Regressions with applied tariff				Regressions with bound tariff			
	OLS	Poisson	New HS6	PCA for TFI & new HS6	OLS	Poisson	New HS6	PCA for TFI & new HS6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(TFI$_i$)	0.116	0.235***	0.245***	0.204***	0.308***	0.239***	0.399***	0.373***
	[0.078]	[0.074]	[0.069]	[0.066]	[0.084]	[0.082]	[0.069]	[0.068]
Log(pcGDP$_i$)	0.332***	0.344***	0.474***	0.473***	0.292***	0.311***	0.464***	0.459***
	[0.025]	[0.022]	[0.023]	[0.022]	[0.026]	[0.024]	[0.023]	[0.022]
Log(market access$_i$)	0.247***	0.307***	0.268***	0.270***	0.151***	0.208***	0.257***	0.261***
	[0.032]	[0.031]	[0.023]	[0.023]	[0.038]	[0.036]	[0.028]	[0.028]
Number of PTAs$_i$	0.006***	0.006***	0.006***	0.006***	0.005***	0.006***	0.008***	0.007***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log(area$_i$)	0.226***	0.253***	0.152***	0.151***	0.208***	0.223***	0.124***	0.123***
	[0.009]	[0.007]	[0.006]	[0.007]	[0.009]	[0.007]	[0.006]	[0.006]
Landlocked$_i$	-0.181***	-0.126***	-0.062	-0.064	-0.285***	-0.260***	-0.125***	-0.127***
	[0.047]	[0.041]	[0.040]	[0.040]	[0.052]	[0.043]	[0.048]	[0.048]
Log(remoteness$_i$)	-0.363***	-0.584***	0.036	0.034	-0.361***	-0.411***	0.168***	0.163***
	[0.047]	[0.034]	[0.034]	[0.034]	[0.053]	[0.041]	[0.039]	[0.039]
Log(applied tariff$_{ij}$)	0.444***	0.345***	0.276***	0.276***				
	[0.034]	[0.029]	[0.025]	[0.025]				
Log(bound tariff$_{ij}$)					0.265***	0.289***	0.240***	0.242***
					[0.032]	[0.027]	[0.023]	[0.023]
Observations	12,107	7,816	8,038	8,038	10,717	6,524	6,730	6,730
R-squared	0.597				0.609			
Log pseudolikelihood		-176187	-90561	-90683		-153210	-77608	-77643
Number of id (pairs)	8,375	3,908	4,019	4,019	7,560	3,262	3,365	3,365

Columns (2)-(4) and (6)-(8): Poisson regressions

Robust (clustered on id variable) standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: $log(npd_{ij})$ (OLS regressions); npd_{ij} (Poisson regressions)

Pair fixed effects and region dummies always included

All regressions based on HS6 trade data

Table 11: Number of destinations by product (ndp_{ik}), regression results

	Baseline		Dep. var. in 2012		New destinations		PCA for TFI		PCA for TFI & new destinations	
	OLS	Poisson	OLS	Poisson	OLS	Poisson	OLS	Poisson	OLS	Poisson
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(TFI$_i$)	0.348*	0.372***	0.352*	0.346***	0.221*	0.442***	0.313*	0.471***	0.197*	0.435***
	[0.197]	[0.007]	[0.196]	[0.007]	[0.118]	[0.005]	[0.179]	[0.007]	[0.107]	[0.005]
Log(pcGDP$_i$)	0.540***	0.683***	0.517***	0.642***	0.342***	0.482***	0.540***	0.667***	0.342***	0.479***
	[0.072]	[0.005]	[0.072]	[0.005]	[0.048]	[0.004]	[0.072]	[0.005]	[0.048]	[0.004]
Log(market access$_i$)	0.382***	0.520***	0.399***	0.513***	0.235***	0.352***	0.384***	0.508***	0.237***	0.351***
	[0.079]	[0.003]	[0.079]	[0.004]	[0.049]	[0.003]	[0.079]	[0.003]	[0.049]	[0.003]
Number of PTAs$_i$	0.001	0.004***	0.002	0.005***	0.001	0.003***	0.001	0.004***	0.001	0.003***
	[0.002]	[0.000]	[0.002]	[0.000]	[0.001]	[0.000]	[0.002]	[0.000]	[0.001]	[0.000]
Log(area$_i$)	0.314***	0.383***	0.313***	0.372***	0.184***	0.234***	0.314***	0.382***	0.183***	0.233***
	[0.025]	[0.002]	[0.025]	[0.002]	[0.015]	[0.002]	[0.025]	[0.002]	[0.015]	[0.002]
Landlocked$_i$	-0.239**	-0.335***	-0.255**	-0.336***	-0.208**	-0.371***	-0.239**	-0.332***	-0.208**	-0.371***
	[0.116]	[0.004]	[0.120]	[0.004]	[0.083]	[0.003]	[0.116]	[0.004]	[0.084]	[0.003]
Log(remoteness$_i$)	-1.198***	-1.263***	-1.205***	-1.211***	-0.579***	-0.605***	-1.199***	-1.270***	-0.579***	-0.608***
	[0.136]	[0.009]	[0.138]	[0.008]	[0.092]	[0.006]	[0.136]	[0.009]	[0.093]	[0.007]
Observations	376,095	688,908	379,492	687,456	418,570	689,172	376,095	688,908	418,570	689,172
R-squared	0.591		0.595		0.491		0.591		0.491	
Log pseudolikelihood		-2.6e+06		-2.7e+06		-1.4e+06		-2.6e+06		-1.4e+06
Number of id (HS6)	5,216	5,219	5,196	5,208	5,221	5,221	5,216	5,219	5,221	5,221

Two-way clustered standard errors (ik) in parentheses (OLS regressions)

Robust (clustered on HS6 products) standard errors in parentheses (Poisson regressions)

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Dependent variable: $\log(ndp_{ik})$ (OLS regressions); ndp_{ik} (Poisson regressions)

Product (HS6) fixed effects and region dummies always included

All regressions based on HS6 trade data

Table 12: Summary statistics, tariffs (*ik* sample)

Panel (a): Applied tariffs

World Bank region	mean	sd	min	max	N
Sub-Saharan Africa	6.81	15.46	0	3000	47595
East Asia and Pacific	5.75	7.43	0	521	44985
Europe and Central Asia	4.13	5.10	0	244	69246
Latin America and the Caribbean	4.98	5.60	0	421	59854
Middle East and North Africa	5.57	10.53	0	1000	29600
South Asia	6.83	7.68	0	429	14863
Offshore	6.22	6.85	0	45	828
Industrial	5.48	6.64	0	1000	89762
Whole sample	5.41	8.53	0	3000	356733

Descriptive statistics computed from the sample of column (2) of Table 13

Panel (b): Bound tariffs

World Bank region	mean	sd	min	max	N
Sub-Saharan Africa	35.14	36.08	0	3000	38796
East Asia and Pacific	18.58	14.08	0	521	43174
Europe and Central Asia	13.29	13.19	0	315	62693
Latin America and the Caribbean	30.97	17.72	0	421	58715
Middle East and North Africa	20.15	33.47	0	3000	26626
South Asia	20.26	21.55	0	429	14114
Offshore	25.63	31.79	0	315	774
Industrial	21.80	15.55	0	1500	87057
Whole sample	22.77	22.18	0	3000	331949

Descriptive statistics computed from the sample of column (6) of Table 13

Tariff data are from UN-TRAINS

All descriptive statistics based on HS6 trade data

Table 13: Number of destinations by product (ndp_{ik}), results with tariffs

	Regressions with applied tariff				Regressions with bound tariff			
	OLS	Poisson	New destinations	PCA for TFI & new HS6	OLS	Poisson	New destinations	PCA for TFI & new destinations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(TFI$_i$)	0.363*	0.129***	0.178***	0.183***	0.356*	0.145***	0.191***	0.200***
	[0.205]	[0.009]	[0.006]	[0.006]	[0.195]	[0.009]	[0.006]	[0.006]
Log(pcGDP$_i$)	0.504***	0.503***	0.297***	0.294***	0.488***	0.461***	0.271***	0.268***
	[0.068]	[0.005]	[0.003]	[0.003]	[0.066]	[0.005]	[0.003]	[0.003]
Log(market access$_i$)	0.353***	0.388***	0.188***	0.187***	0.325***	0.331***	0.166***	0.165***
	[0.085]	[0.003]	[0.002]	[0.002]	[0.081]	[0.004]	[0.002]	[0.002]
Number of PTAs$_i$	0.002	0.003***	0.002***	0.002***	0.002	0.003***	0.002***	0.002***
	[0.002]	[0.000]	[0.000]	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]
Log(area$_i$)	0.300***	0.320***	0.166***	0.166***	0.297***	0.306***	0.159***	0.159***
	[0.025]	[0.002]	[0.001]	[0.001]	[0.025]	[0.002]	[0.001]	[0.001]
Landlocked$_i$	-0.238**	-0.176***	-0.187***	-0.186***	-0.240**	-0.151***	-0.164***	-0.164***
	[0.111]	[0.005]	[0.004]	[0.004]	[0.107]	[0.005]	[0.004]	[0.004]
Log(remoteness$_i$)	-1.136***	-1.123***	-0.442***	-0.444***	-1.091***	-1.058***	-0.404***	-0.406***
	[0.129]	[0.008]	[0.006]	[0.006]	[0.130]	[0.008]	[0.006]	[0.006]
Log(applied tariff$_{ik}$)	0.266***	0.380***	0.203***	0.203***				
	[0.033]	[0.005]	[0.002]	[0.002]				
Log(bound tariff$_{ik}$)					0.275***	0.410***	0.171***	0.171***
					[0.030]	[0.005]	[0.002]	[0.002]
Observations	317,809	356,733	356,784	356,784	301,539	331,949	331,993	331,993
R-squared	0.589				0.596			
Log pseudolikelihood		-1.961e+06	-957035	-956873		-1.833e+06	-901156	-900949
Number of id (HS6)	5,193	5,204	5,212	5,212	5,190	5,203	5,210	5,210

Columns (2)-(4) and (6)-(8): Poisson regressions

Two-way clustered standard errors (ik) in parentheses (OLS regressions)

Robust (clustered on HS6 products) standard errors in parentheses (Poisson regressions)

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: $log(ndp_{ik})$ (OLS regressions); ndp_{ik} (Poisson regressions)

Product (HS6) fixed effects and region dummies always included

All regressions based on HS6 trade data

Table 14: ij and ik regressions with HS4 headings

	ij regressions		ik regressions	
	Baseline	New HS4	Baseline	New destinations
	(1)	(2)	(3)	(4)
Log(TFI_i)	0.185***	0.172***	0.312***	0.206***
	[0.053]	[0.062]	[0.011]	[0.009]
Log($pcGDP_i$)	0.324***	0.352***	0.500***	0.250***
	[0.017]	[0.023]	[0.007]	[0.005]
Log(market $access_i$)	0.215***	0.183***	0.327***	0.147***
	[0.023]	[0.021]	[0.005]	[0.003]
Number of $PTAs_i$	0.005***	0.006***	0.003***	0.002***
	[0.000]	[0.001]	[0.000]	[0.000]
Log($area_i$)	0.205***	0.080***	0.279***	0.122***
	[0.005]	[0.006]	[0.003]	[0.002]
$Landlocked_i$	-0.140***	-0.052	-0.234***	-0.242***
	[0.031]	[0.043]	[0.006]	[0.006]
Log($remoteness_i$)	-0.343***	0.240***	-0.889***	-0.255***
	[0.026]	[0.036]	[0.012]	[0.009]
Log(applied $tariff_{ij}$)	0.306***	0.202***	0.373***	0.180***
	[0.022]	[0.024]	[0.008]	[0.004]
Observations	8,016	8,038	113,342	113,342
Log pseudolikelihood	-76142	-40147	-718865	-323239
Number of id (pairs)	4,008	4,019		
Number of id (HS4)			1,243	1,243

Poisson regressions in all columns

Robust (clustered on country pairs) standard errors in parentheses (ij regressions)

Robust (clustered on HS4 headings) standard errors in parentheses (ik regressions)

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: npd_{ij} (ij regressions); ndp_{ik} (ik regressions)

Pair fixed effects and region dummies always included (ij regressions)

Heading (HS4) fixed effects and region dummies always included (ik regressions)

All regressions based on HS4 trade data

Table 15: Summary statistics, Hummels-Klenow extensive margins

	em_{ij}			em_{ik}		
World Bank region	mean	sd	N	mean	sd	N
Sub-Saharan Africa	0.05	0.12	3681	0.07	0.15	50954
East Asia and Pacific	0.26	0.26	1990	0.37	0.33	46099
Europe and Central Asia	0.16	0.20	3147	0.19	0.24	75335
Latin America and the Caribbean	0.10	0.17	3201	0.13	0.20	62038
Middle East and North Africa	0.12	0.16	1529	0.12	0.18	28156
South Asia	0.14	0.20	862	0.28	0.32	15147
Offshore	0.04	0.07	111	0.05	0.09	1242
Industrial	0.40	0.29	3384	0.47	0.33	91064
Whole sample	0.18	0.24	17905	0.25	0.30	370035

Descriptive statistics for em_{ij} computed from the sample of column (1) of Table 16

Descriptive statistics for em_{ik} computed from the sample of column (5) of Table 16

All descriptive statistics based on HS6 trade data

Table 16: Hummels-Klenow extensive margins: regressions with tariffs

	ij regressions (GEE)				ik regressions (GLM)			
	Baseline	New HS6	Baseline	New HS6	Baseline	New destinations	Baseline	New destinations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{Log(TFI}_\text{i})$	0.417***	0.201**	0.401***	0.204**	0.268***	-0.164***	0.275***	-0.154***
	[0.054]	[0.080]	[0.057]	[0.085]	[0.017]	[0.018]	[0.017]	[0.018]
$\text{Log(pcGDP}_\text{i})$	0.490***	0.394***	0.424***	0.378***	0.532***	0.528***	0.512***	0.506***
	[0.017]	[0.027]	[0.018]	[0.029]	[0.008]	[0.007]	[0.008]	[0.007]
$\text{Log(market access}_\text{i})$	0.282***	0.131***	0.216***	0.108***	0.498***	0.334***	0.471***	0.305***
	[0.022]	[0.035]	[0.024]	[0.037]	[0.007]	[0.007]	[0.007]	[0.007]
$\text{Number of PTAs}_\text{i}$	0.001***	0.002**	0.001***	0.001	0.004***	0.004***	0.004***	0.004***
	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]
$\text{Log(area}_\text{i})$	0.275***	0.200***	0.278***	0.196***	0.401***	0.268***	0.395***	0.260***
	[0.006]	[0.010]	[0.006]	[0.010]	[0.003]	[0.002]	[0.003]	[0.002]
$\text{Landlocked}_\text{i}$	-0.296***	-0.273***	-0.299***	-0.268***	-0.095***	-0.155***	-0.071***	-0.139***
	[0.033]	[0.061]	[0.034]	[0.066]	[0.009]	[0.009]	[0.009]	[0.009]
$\text{Log(remoteness}_\text{i})$	-0.844***	-0.590***	-0.838***	-0.594***	-1.552***	-0.886***	-1.503***	-0.837***
	[0.034]	[0.064]	[0.035]	[0.069]	[0.012]	[0.011]	[0.012]	[0.012]
$\text{Log(applied tariff}_\text{ij})$	-0.208***	0.155***						
	[0.015]	[0.021]						
$\text{Log(bound tariff}_\text{ij})$			-0.084***	0.164***				
			[0.012]	[0.018]				
$\text{Log(applied tariff}_\text{ik})$					0.357***	0.266***		
					[0.007]	[0.007]		
$\text{Log(bound tariff}_\text{ik})$							0.278***	0.249***
							[0.006]	[0.006]
Observations	12,089	12,017	10,701	10,641	315,146	322,211	299,444	304,721
Log pseudolikelihood					-109099	-83634	-106373	-81152
Pearson chi2	8340	1925	7203	1906	86756	67374	81721	63149
Number of id (pairs)	8,366	8,319	7,552	7,515				
Number of id (HS6)					5188	5199	5187	5197

Robust (clustered on id variable) standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: Hummels-Klenow extensive margin em_{ij} (ij regressions); Hummels-Klenow extensive margin em_{ik} (ik regressions)

Pair fixed effects and region dummies always included (ij regressions)

Product (HS6) and region dummies always included (ik regressions)

All regressions based on HS6 trade data

Table 17: Summary statistics, Doing Business variables

Panel (a): DB $\mathrm{docs_i}$

World Bank region	mean	median	sd	min	max	N
Sub-Saharan Africa	0.30	0.32	0.16	0.09	0.80	2894
East Asia and Pacific	0.51	0.43	0.31	0.13	1.18	1518
Europe and Central Asia	0.39	0.32	0.16	0.13	0.80	2631
Latin America and the Caribbean	0.42	0.43	0.21	0.18	1.18	2404
Middle East and North Africa	0.48	0.58	0.17	0.24	0.80	1120
South Asia	0.23	0.18	0.12	0.09	0.43	525
Offshore	0.58	0.58	0.00	0.58	0.58	90
Industrial	0.86	0.80	0.32	0.43	1.93	2274
Whole sample	0.47	0.43	0.29	0.09	1.93	13456

DB $\mathrm{docs_i}$ computed as the inverse of Doing Business indicator "Documents to export (number)" and rescaled between 0 (most burdensome) to 2 (least burdensome)

Descriptive statistics computed from the sample of column (4) of Table 19

Panel (b): DB $\mathrm{cost_i}$

World Bank region	mean	median	sd	min	max	N
Sub-Saharan Africa	0.40	0.32	0.30	0.02	1.13	2853
East Asia and Pacific	1.36	1.34	0.45	0.19	2.00	1491
Europe and Central Asia	0.61	0.51	0.31	0.17	1.43	2375
Latin America and the Caribbean	0.61	0.57	0.31	0.10	1.66	2367
Middle East and North Africa	1.06	1.07	0.29	0.53	1.53	1100
South Asia	0.88	0.80	0.40	0.29	1.40	517
Offshore	0.82	0.82	0.00	0.82	0.82	89
Industrial	0.77	0.75	0.25	0.33	1.21	2236
Whole sample	0.73	0.66	0.43	0.02	2.00	13028

DB $\mathrm{cost_i}$ computed as the inverse of Doing Business indicator "Cost to export (US$ per container)" and rescaled between 0 (most costly) to 2 (least costly)

Descriptive statistics computed from the sample of column (5) of Table 19

Panel (c): DB $\mathrm{time_i}$

World Bank region	mean	median	sd	min	max	N
Sub-Saharan Africa	0.27	0.27	0.15	0.08	0.63	2872
East Asia and Pacific	0.68	0.47	0.51	0.10	1.99	1504
Europe and Central Asia	0.50	0.50	0.20	0.13	0.94	2496
Latin America and the Caribbean	0.53	0.50	0.23	0.10	1.05	2383
Middle East and North Africa	0.52	0.58	0.12	0.29	0.69	1110
South Asia	0.33	0.36	0.14	0.14	0.50	521
Offshore	0.54	0.54	0.00	0.54	0.54	89
Industrial	1.14	1.05	0.40	0.41	1.99	2255
Whole sample	0.58	0.47	0.40	0.08	1.99	13230

DB $\mathrm{time_i}$ computed as the inverse of Doing Business indicator "Time to export (days)" and rescaled between 0 (most days) to 2 (least days)

Descriptive statistics computed from the sample of column (6) of Table 19

Table 18: Correlation between TFI_i and Doing business variables

	TFI_i	DB $docs_i$	DB $cost_i$	DB $time_i$
TFI_i	1			
DB $docs_i$	0.41*	1		
DB $cost_i$	0.28*	0.34*	1	
DB $time_i$	0.52*	0.65*	0.42*	1

Correlations computed from the sample of column (4) of Table 19

* p<0.05

Table 19: Number of products by destination (npd_{ij}), results with Doing Business variables

	OLS			Poisson			New HS6		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(DB docs$_i$)	0.377***			0.146***			0.132***		
	[0.035]			[0.030]			[0.033]		
Log(DB cost$_i$)		0.387***			0.351***			0.254***	
		[0.029]			[0.027]			[0.026]	
Log(DB time$_i$)			0.124***			-0.045			0.154***
			[0.033]			[0.029]			[0.028]
Log(pcGDP$_i$)	0.307***	0.351***	0.372***	0.405***	0.391***	0.466***	0.441***	0.441***	0.429***
	[0.022]	[0.021]	[0.024]	[0.021]	[0.019]	[0.021]	[0.020]	[0.018]	[0.020]
Log(market access$_i$)	0.286***	0.302***	0.341***	0.316***	0.225***	0.358***	0.264***	0.229***	0.254***
	[0.028]	[0.030]	[0.030]	[0.029]	[0.033]	[0.030]	[0.024]	[0.028]	[0.026]
Number of PTAs$_i$	0.002***	0.001**	0.003***	0.005***	0.004***	0.005***	0.006***	0.005***	0.006***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Log(area$_i$)	0.214***	0.234***	0.221***	0.215***	0.221***	0.216***	0.119***	0.130***	0.123***
	[0.008]	[0.008]	[0.008]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Landlocked$_i$	-0.276***	0.001	-0.167***	-0.099***	0.071*	-0.051	-0.113**	0.050	-0.005
	[0.042]	[0.046]	[0.044]	[0.038]	[0.037]	[0.037]	[0.047]	[0.045]	[0.047]
Log(remoteness$_i$)	-0.537***	-0.659***	-0.552***	-0.599***	-0.627***	-0.607***	0.072**	0.029	0.104***
	[0.043]	[0.042]	[0.044]	[0.032]	[0.033]	[0.032]	[0.035]	[0.034]	[0.034]
Observations	17,487	17,471	17,463	13,456	13,428	13,406	14,248	14,226	14,216
R-squared	0.524	0.532	0.525						
Log pseudolikelihood				-277592	-261694	-268648	-164717	-160814	-158643
Number of id (pairs)	11,937	11,929	11,941	6,728	6,714	6,703	7,124	7,113	7,108

Columns (7)-(9): Poisson regressions

Robust (clustered on id variable) standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: $log(ndp_{ij})$ (OLS regressions); npd_{ij} (Poisson regressions)

Pair fixed effects and region dummies always included

All regressions based on HS6 trade data

Table 20: Number of destinations by product (ndp_{ik}), results with Doing Business variables

	OLS			Poisson			New destinations		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(DB $docs_i$)	0.173			0.008*			0.160***		
	[0.106]			[0.004]			[0.003]		
Log(DB $cost_i$)		0.220***			0.335***			0.204***	
		[0.084]			[0.003]			[0.002]	
Log(DB $time_i$)			0.165			0.046***			0.205***
			[0.123]			[0.003]			[0.002]
Log($pcGDP_i$)	0.538***	0.552***	0.520***	0.715***	0.681***	0.697***	0.477***	0.498***	0.446***
	[0.084]	[0.077]	[0.090]	[0.006]	[0.005]	[0.005]	[0.004]	[0.004]	[0.004]
Log(market $access_i$)	0.368***	0.389***	0.359***	0.556***	0.469***	0.539***	0.354***	0.351***	0.332***
	[0.082]	[0.084]	[0.087]	[0.004]	[0.003]	[0.004]	[0.003]	[0.002]	[0.003]
Number of $PTAs_i$)	0.001	0.000	0.001	0.004***	0.003***	0.004***	0.003***	0.002***	0.003***
	[0.002]	[0.002]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Log($area_i$)	0.323***	0.336***	0.324***	0.387***	0.392***	0.388***	0.243***	0.250***	0.241***
	[0.030]	[0.028]	[0.030]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
$Landlocked_i$)	-0.223**	-0.075	-0.127	-0.336***	-0.138***	-0.273***	-0.348***	-0.230***	-0.237***
	[0.114]	[0.114]	[0.115]	[0.004]	[0.004]	[0.005]	[0.003]	[0.003]	[0.003]
Log($remoteness_i$)	-1.167***	-1.236***	-1.144***	-1.281***	-1.282***	-1.262***	-0.595***	-0.635***	-0.567***
	[0.155]	[0.139]	[0.153]	[0.009]	[0.008]	[0.009]	[0.007]	[0.006]	[0.007]
Observations	369,890	369,360	369,084	668,032	668,032	668,032	668,288	668,288	668,288
R-squared	0.588	0.591	0.592						
Log pseudolikelihood				-2.580e+06	-2.529e+06	-2.560e+06	-1.395e+06	-1.391e+06	-1.386e+06
Number of id (HS6)	5,216	5,216	5,216	5,219	5,219	5,219	5,221	5,221	5,221

Columns (7)-(9): Poisson regressions

Two-way clustered standard errors (ik) in parentheses (OLS regressions)

Robust (clustered on HS6 products) standard errors in parentheses (Poisson regressions)

* p<0.10, ** p<0.05, *** p<0.01

Dependent variable: $log(ndp_{ik})$ (OLS regressions); ndp_{ik} (Poisson regressions)

Product (HS6) fixed effects and region dummies always included

All regressions based on HS6 trade data

Table 21: Simulation results, npd_{ij}

Panel (a): Simulations based on npd_{ij} computed from HS6 trade data

	Regional median		Global median	
	Baseline (1)	New HS6 (2)	Baseline (3)	New HS6 (4)
Sub-Saharan Africa	13.1%	13.6%	16.0%	16.7%
East Asia and Pacific	5.8%	6.1%	5.6%	5.8%
Europe and Central Asia	6.3%	6.6%	5.2%	5.4%
Latin America and the Caribbean	12.0%	12.5%	12.5%	13.0%
Middle East and North Africa	4.7%	4.9%	6.7%	7.0%
South Asia	4.6%	4.8%	5.0%	5.2%

Columns (1) and (3) based on column (2) of Table 10

Columns (2) and (4) based on column (3) of Table 10

Panel (b): Simulations based on npd_{ij} computed from HS4 trade data

	Regional median		Global median	
	Baseline (1)	New HS6 (2)	Baseline (3)	New HS6 (4)
Sub-Saharan Africa	10.3%	9.5%	12.6%	11.7%
East Asia and Pacific	4.6%	4.3%	4.4%	4.1%
Europe and Central Asia	5.0%	4.6%	4.1%	3.8%
Latin America and the Caribbean	9.4%	8.8%	9.8%	9.1%
Middle East and North Africa	3.7%	3.4%	5.3%	4.9%
South Asia	3.6%	3.4%	3.9%	3.6%

Columns (1) and (3) based on column (1) of Table 14

Columns (2) and (4) based on column (2) of Table 14

Table 22: Simulation results, ndp_{ik}

Panel (a): Simulations based on ndp_{ik} computed from HS6 trade data

	Regional median		Global median	
	Baseline	New HS6	Baseline	New HS6
	(1)	(2)	(3)	(4)
Sub-Saharan Africa	6.9%	9.6%	8.8%	12.1%
East Asia and Pacific	3.2%	4.4%	3.1%	4.2%
Europe and Central Asia	3.4%	4.8%	2.8%	3.9%
Latin America and the Caribbean	6.5%	9.1%	6.8%	9.4%
Middle East and North Africa	2.6%	3.6%	3.7%	5.1%
South Asia	2.5%	3.5%	2.7%	3.7%

Columns (1) and (3) based on column (2) of Table 13

Columns (2) and (4) based on column (3) of Table 13

Panel (b): Simulations based on ndp_{ik} computed from HS4 trade data

	Regional median		Global median	
	Baseline	New HS6	Baseline	New HS6
	(1)	(2)	(3)	(4)
Sub-Saharan Africa	16.9%	11.2%	21.2%	14.1%
East Asia and Pacific	7.7%	5.1%	7.4%	4.9%
Europe and Central Asia	8.4%	5.5%	6.9%	4.5%
Latin America and the Caribbean	15.9%	10.5%	16.6%	11.0%
Middle East and North Africa	6.2%	4.1%	8.9%	5.9%
South Asia	6.2%	4.1%	6.6%	4.3%

Columns (1) and (3) based on column (3) of Table 14

Columns (2) and (4) based on column (4) of Table 14

Appendix tables

Table A-1: Mapping of OECD TFIs into DCNT and TFA provisions

	Indicator	DCNT Rev. 18	TFA
A.	Information availability	Articles 1 and 2	Articles 1 and 2
B.	Involvement of the trade community	Article 2	Article 2
C.	Advance Rulings	Article 3	Article 3
D.	Appeal Procedures	Article 4	Article 4
E.	Fees and charges	Article 6.1 and 6.2	Article 6.1 and 6.2
F.	Formalities – Documents	Articles 7 and 10	Articles 7 and 10
G.	Formalities – Automation	Articles 7 and 10	Articles 7 and 10
H.	Formalities – Procedures	Articles 5, 7 and 10	Articles 5, 7 and 10
I.	Cooperation – Internal	Articles 9.1 and 12	Articles 8.1 and 12
J.	Cooperation – External	Articles 9.2 and 12	Articles 8.2 and 12
K.	Consularization	Article 8	–
L.	Governance and Impartiality	–	–
M.	Transit fees and charges	Article 11	Article 11
N.	Transit formalities	Article 11	Article 11
O.	Transit guarantees	Article 11	Article 11
P.	Transit agreements and cooperation	Article 11	Article 11

TFI's stand for "Trade Facilitation Indicators"
DCNT stands for (WTO's) "Draft Consolidated Negotiating Text"
TFA stands for (WTO's) "Trade Facilitation Agreement"
Source: Moïsé et al. (2011)

Table A-2: List of countries with OECD TFI data, by World Bank region

Sub-Saharan Africa			
Angola (1994)	Benin (1963)	Botswana (1987)	Burkina Faso (1963)
Burundi (1965)	Cameroon (1963)	Congo (1963)	Côte d'Ivoire (1963)
Ethiopia*	Gabon (1963)	Gambia (1965)	Ghana (1957)
Kenya (1964)	Lesotho (1988)	Liberia*	Madagascar (1963)
Malawi (1964)	Mali (1993)	Mauritius (1970)	Mozambique (1992)
Namibia (1992)	Nigeria (1960)	Rwanda (1966)	Senegal (1963)
Sierra Leone (1961)	South Africa (1948)	Swaziland (1993)	Tanzania (1961)
Togo (1964)	Uganda (1962)	Zambia (1982)	Zimbabwe (1948)
East Asia and Pacific			
Brunei Dar. (1993)	Cambodia (2004)	China (2001)	Chinese Taipei (2002)
Fiji (1993)	Hong Kong, China (1986)	Indonesia (1950)	Korea, Rep. (1967)
Malaysia (1957)	Mongolia (1997)	Papua N. G. (1994)	Philippines (1979)
Singapore (1973)	Thailand (1982)	Viet Nam (2007)	
Europe and Central Asia			
Albania (2000)	Armenia (2003)	Azerbaijan*	Belarus*
Bosnia and Herzegovina*	Bulgaria (1996)	Croatia (2000)	Czech Rep. (1993)
Georgia (2000)	Hungary (1973)	Kazakhstan*	Kyrgyz Rep. (1998)
Latvia (1999)	Lithuania (2001)	Moldova (2001)	Montenegro (2012)
Poland (1967)	Romania (1971)	Russian Fed. (2012)	Serbia*
Slovak Republic (1993)	The FYROM (2003)	Turkey (1951)	Ukraine (2008)
Latin America and the Caribbean			
Antigua and Barb. (1987)	Argentina (1967)	Barbados (1967)	Belize (1983)
Bolivia (1990)	Brazil (1948)	Colombia (1981)	Costa Rica (1990)
Cuba (1948)	Dominican Rep. (1950)	Ecuador (1996)	El Salvador (1991)
Guatemala (1991)	Honduras (1994)	Jamaica (1963)	Mexico (1986)
Nicaragua (1950)	Panama (1997)	Paraguay (1994)	Peru (1951)
Suriname (1978)	Trinidad and Tob. (1962)	Uruguay (1953)	Venezuela (1990)
Middle East and North Africa			
Algeria*	Bahrein (1993)	Jordan (2000)	Kuwait (1963)
Lebanon*	Morocco (1987)	Oman (2000)	Qatar (1994)
Saudi Arabia (2005)	Tunisia (1990)	UAE (1994)	
South Asia			
Bangladesh (1972)	Bhutan*	India (1948)	Nepal (2004)
Pakistan (1948)	Sri Lanka (1948)		
Offshore			
Bahamas*			
Industrial			
Australia (1948)	Belgium (1948)	Canada (1948)	Cyprus (1963)
Denmark (1950)	France (1948)	Germany (1951)	Greece (1950)
Italy (1950)	Japan (1955)	Malta (1964)	Netherlands (1948)
New Zealand (1948)	Norway (1948)	Portugal (1962)	Spain (1963)
Sweden (1950)	Switzerland (1966)	United Kingdom (1948)	United States (1948)

* WTO observer government

Year of WTO (GATT, where applicable) membership in parentheses

For official country names, refer to `http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm`