# What a Difference a Day Makes:

# An Estimate of Potential Gains from Trade Facilitation

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## Abstract

The current paper uses a series of metrics of customs and administrative procedures produced by the World Bank to estimate gravity models. The metrics include estimates of the number of days at the border, the number signatures and the number of documents necessary for a product to cross the border of the importer and the exporter. Simulations using the estimated elasticities show that to improve trade reductions would need to be made in the different metrics. For the greatest benefits all trading partners would have to make the improvements. Additionally, some products are more sensitive to the metrics than others.

**What a Difference a Day Makes:**
**An Estimate of Potential Gains from Trade Facilitation**

Beginning at the Singapore Ministerial Conference in December 1996 the World Trade Organization (WTO) took on trade facilitation as a negotiating topic. A WTO-acceptable definition reflects "a multitude of issues that are relevant to the smooth and efficient flow of trade. The term has been used in the context of a broad range of potential non-tariff barriers such as import licensing, product testing and overly-complex customs clearance procedures." (WTO 2005, p.9) The aim of the WTO negotiations on trade facilitation is to improve cooperation between customs and other related authorities on issues of trade facilitation and customs compliance issues (WTO, 2007).

A body of literature exists to suggest the importance of trade facilitation (or customs and administrative) issues. In terms of trade restrictions affecting developing countries Fliess and Lejarraga (2005) identified customs and administrative procedures as one of the most problematic non-tariff barriers (NTBs) that developing countries contend. The cumbersomeness of customs and administrative procedures has been a challenge for developing countries in exporting to developed countries but also to other developing countries. Developed countries also find customs and administrative producers cumbersome (OECD, 2005) Understanding better the trade effects of customs and administrative procedures is important global trade. The current research provides quantitative evidence that excessive customs and administrative procedures are inhibitors to trade.

One way to consider the effect of customs and administrative procedures is to say that they "thicken" the borders of countries. Customs and administrative procedures are necessary, but requirements beyond what is necessary to move a product through the

border in a manner consistent with local policy objectives may unnecessarily hinder trade by "thickening" the border. The metrics discussed below measure the thickness of borders. If this thickness matters to trade, then reducing this thickness will increase trade flows. Since products traded must cross at least two borders, the thickness of the border is a function of the policies of trading partners. Therefore consideration must be given to the custom and administrative produces of the exporter and the importer.

In the following analysis, we present metrics, produced by the World Bank, of customs and administrative procedures. We compare regions of the world based on these metrics and show that developing countries have relatively thicker borders than developing countries. Then we use these metrics in statistical models. From the results of the models, we run simulations to indicate the extent of reform in customs and administrative procedures to increase trade flows (Wilson (2007) is an earlier version of this paper in working paper form).

**Effects of Customs and Administrative Procedures on Trade**

The current research is based on metrics derived from the World Bank survey called "Doing Business: Benchmarking Business Regulations." In the 2005 survey, a new section was added called "Trading across Borders," which looks at "procedural requirements for exporting and importing a standardized cargo of goods." (World Bank, 2005) The goods considered are coffee, tea, cocoa, spices and manufactures thereof; textile yarn, fabrics, made-up articles; and articles of apparel and clothing accessories The survey contacted local freight forwarders, shipping lines, customs brokers and port officials on the necessary documents, signatures and time to cross the border.

For both exports and imports, three types of metrics are available from the

World Bank survey: The documentation measure (*Number of Documents*) is the number of documents needed to cross the border. The documents considered include port filing documents, customs declaration and clearance documents and official documents exchanged between the concerned parties. The signature metric (*Number of Signatures*) represents the total number of signatures, stamps or other approvals necessary to satisfy one or more formal procedures. The time metric (*Days at the Border*) is the number of calendar days needed for a product to cross the border.

The survey generates a metric for the burdensomeness of customs and administrative procedure for the 156 countries that responded to the survey. Table 1 below provides summary statistics for the regions of the world. The ranking of the metrics for imports and exports is similar across metrics. OECD countries have the least number of restrictions in terms of number of documents, number of signatures and days at the border, while Sub-Saharan Africa has the most. This result indicates that trade with and amongst countries in Sub-Saharan Africa pass through the thickest borders.

The differences between Sub-Saharan Africa and OECD countries are large. Consider the coefficients of variation (CV) for the different metrics. The greatest dispersion is in the number of signatures. The least disperse is the number of documents. An implication of the large CVs for $Number\ of\ Signatures_{Export}$ and $Number\ of\ Signatures_{Import}$ are that there is greater space, relative to that of the other metrics, for improvements.

These metrics are highly correlated with one another. Consider the correlation coefficients for the $Number\ of\ Signatures_{Export}$ and $Number\ of\ Signatures_{Import}$ (0.94) and $Days\ at\ the\ Border_{Export}$ and $Days\ at\ the\ Border_{Import}$ the number of days for the exporter

and importer (0.95). These results suggest that countries tend to treat imports and exports in a similar manner. An interesting result is that the number of signatures and days at border are highly correlated with the lowest coefficient of 0.78 for *Number of Signatures*$_{Import}$ and *Days at the Border*$_{Export}$. The correlation suggests that the days or the signatures tend to be similar. The *Number of Documents*$_{Export}$ and *Number of Documents*$_{Import}$ (0.68) are not as highly correlated with each other and the other metrics as are the other metrics. Overall, the large coefficients of correlation suggest that countries with thick borders typically have large values for all the metrics for both exports and imports.

We now use these metrics in a gravity model to estimate the effect of the corresponding customs and administrative procedures on trade. This method is influenced by the work of Hausman et al. (2005). The gravity model is a common model for trade analysis, and a number of studies show the usefulness of the gravity model (Ferrantino, 2005; Nicoletti, et al., 2003; and Wilson and Cacho, 2007; among others). This analysis is particularly relevant for understanding the effects of NTBs on trade in goods. We use an approach similar to that used for the analysis of logistics services (see Nordås, Pinali and Geloso Grosso (2006)).

**The Preliminary Model**

In the preliminary models, we use the basic gravity model. The gravity model is broadly based on Newton's equation for gravity. The economic analogue is that the economic mass of the two countries, as measured by GDP, is hypothesized to have a positive influence on the bilateral trade between the countries. The distance between the countries, which represents travel costs, is hypothesized to have a negative effect on

trade. From there, economists have added a number of other policy variables to explain further trade flows. In the preliminary model we have included indicator variables: *Common Language*; *Shared Colonial Link*, which indicates a shared colonizer; *Colonial History*, which indicates a colonizer and former colony; *Shared Border*; and regional trade agreement indicator variables. Our concern is the effect of different measures of customs and administrative procedures on trade flows, so we incorporate the variables: $Days\ at\ the\ Border_{Importer}$, $Number\ of\ Signatures_{Importer}$ and $Number\ of\ Documents_{Importer}$. Because of the high correlation amongst these variables, we estimate separate equations for each of these variables. It should be noted that these variables are not bilateral that is we do not have the number of days for an importer to receive products from a particular exporter. The variables representing customs and administrative producers are averages over all exporters and importers. They serve, at best, as estimates of the actual values.

The dependant variable used in these equations and the ones that follow are bilateral trade of coffee, tea, cocoa, spices and manufactures thereof (SITC 07); textile yarn, fabrics, made-up articles (SITC 65); and articles of apparel and clothing accessories (SITC 84). We chose these products because the metrics of customs and administrative procedures were based on these products. The survey was conducted in 2004 so we only use data for that trade year. Even though we only have one year of data, the data are still in panels because of the different exporters, importers and products. Therefore, we use estimation techniques to manage panels. Following Anderson and van Wincoop (2004) Kowalski and Shepard (2006) and Lesher and Mirodot (2006) we use a fixed effects model. In this model we have indicator variables for exporters, importers and products. We suppress the presentation of these variables in the Table 2.

In this preliminary analysis we use only the metrics for imports. That is, we investigate how exports are affected by the customs and administrative procedures of importers. We hypothesize that the metrics should have a negative effect on exports. The gravity model variables are hypothesized to follow the typical pattern: The variables for GDP, language and colonial ties should be positive. Some if not all of the indicator variables for regional (or preferential) trade agreements RTAs (or PTAs) should be positive. The distance variable and the dummy variables for landlocked exporter and importer should be negative.

The results of these preliminary regressions indicate that two of the three variables representing customs and administrative procedures are the right sign and statistically significant (*Days at the Border*$_{Importer}$ and *Number of Signatures*$_{Importer}$). The *Number of Documents*$_{Importer}$ is statistically significant but positive, which is not the correct sign. In a random effects model, *Number of Documents*$_{Importer}$ was the right negative and statistically. We posit that the analysis with only one side of the metric is biasing the result such that it is positive. In subsequent estimates we show that by considering the metrics for both partners and an adjustment to the distance, the upward bias is eliminated.

**Trade Effects of Time-Adjusted Distance**

In the traditional gravity model, the distance between countries, typically measured as the distance between the capitols or major cities, is used as a proxy for travel costs. As the distance between countries increases, one would expect that the travel costs would increase similarly. However, a reasonable assumption would be that the same distance between two developed countries and two developing counties would not have

the same travel costs. Consider the bilateral trade partners presented in Table 5. The distance between Portugal and Finland, which ranks second by shortest distance, is similar to the distance between, Russia and Afghanistan which ranks third by shortest distance. However, the difference between these trading partners in the time necessary for a product to leave the exporting country and enter into the importing country is substantial, a difference of 101 days (over three months). For time-sensitive products like apparel and clothing accessories, long delays at the border may exclude the product from market (Nordås, Pinali and Gelso Grosso, 2006). Also if there is a cost of storage or refrigeration, these extra days could substantially raise the costs. Therefore, we have incorporated the time metric into the distance metric to construct a new metric of distance, *Distance Weighted*, which is described in the following section. With this new metric we see a different ranking of distances. With the new distance, the trading partners Portugal and Finland are now the closest partners of those in Table 3, while Russia and Afghanistan are now the eight most far apart in Table 3.

The metric of time-weighted distance needs to be used with caution. The adjusted distance is limited to the three products categories and the year for which the time metrics are derived. The time at the border may vary even within the products considered and destination. The metrics for time may actually overestimate the time because there could be time savings for trades of larger sizes or frequently traded products. For these reasons, the new, adjusted distance metric does not obviate the use of the simple distance; however, for this application, the adjusted distance may help us develop better estimates of the cost of customs and other administrative procedures.

**Distance Adjusted for Time**

We construct a new variable for the distance because we feel that time at the border may have a substantial affect on the travel cost of products and can substantially affect trade costs. The new distance variable is the following:

$$1) \quad \begin{aligned} &Distance\ Weighted_{Exporter,Importer} = Distance_{Exporter,Importer} \\ &* \ln\left(Days\ at\ Boarder_{Exporter} * Days\ at\ Border_{Importer}\right) \\ &* Remotness_{Exporter,Importer} \end{aligned}$$

The distance is "the geodesic distances following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations, in terms of population" (Gaulier, Mayer and Zignago, 2004, p. 3). Additionally, we adjusted the distance by the remoteness, which Anderson and van Wincoop (2004) argue helps reduce bias in the estimation. The remoteness adjustment is based in part on Head (2003).

$$2) \quad Remotness_{Exporteri,Importer} = \frac{1}{\frac{Distance_{Exporteri,Importer1}}{GDP_{Importer1}} + \frac{Distance_{Exporteri,Importer2}}{GDP_{Importer2}} + \ldots \frac{Distance_{Exporteri,Importern}}{GDP_{Importern}}}$$

In the three estimations in Table 4, we include a different measure of the customs and administrative procedure variables. We use the natural logarithm of product of the variables for the importer and the exporter. For $Number\ of\ Signatures_{Exporter}$* $Number\ of\ Signatures_{Importer}$ and $Number\ of\ Document_{Exporter}$* $Number\ of\ Documentss_{Importer}$, the elasticity is simply the coefficient from the regression. The elasticities are the same for the exporter and the importer. Because of the interaction between the variables for the distance and days at the border, the elasticity $\varepsilon_{Days\ at\ Border,i}$ for $Days\ at\ the\ Border_i$*$Days\ at\ the\ Border_j$ for $i,j$=exporter and importer and $i \neq j$ is the

following:

3) $$\varepsilon_{Days\ at\ Border,i} = \frac{Coefficient\ of\ \ln(Distance\ Weighted)}{\ln(Days\ at\ Border_i * Days\ at\ Border_j)} + Coefficient\ of\ \ln(Days\ at\ Border_i * Days\ at\ Border_j)$$

The metric of time-weighted distance needs to be used with caution. The adjusted distance is limited to the three products categories and the year for which the time metrics were derived. The time at the border may vary even within the products considered and destination.

With this adjusted distance variable, we estimate similar equations as in the preliminary models. The changes are that we include the new time-adjusted distance. For each metric, we use the product of the metric for the importer and exporter, where previously, we only used the metric for the importer. This new version will permit us to see how the changes in the metric will affect exporters and importers separately.

The new regressions give us new elasticities for the metrics. The new estimates of the elasticities for the metrics are presented in Table 4. The new elasticises are smaller than the old elasticities. We assert that the new estimates are not biased as in the preliminary model. The new elasticities are close to the pervious estimates, a result that suggests the robustness of our results. The document variable is now negative and statistically significant which is as we had hypothesized.

***By Bilateral Pairs***

As case studies, let us now consider bilateral, country pairs to understand better the effect of reductions in the days at the border for the exporter and importer on trade between partners we use the results from Table 4. Table 5 presents the number of days at the border, the number of signatures and the number of documents for a product to depart

an exporting country and enter an importing country. Table 6 presents aggregate trade across the three products for a select group of trading partners. We consider a reduction in the number of days to achieve a 10% increase in trade.

From Table 6, we can see the necessary reduction in the number of days to increase trade by 10% between bilateral trade partners. We assume that each partner reduces the number of days by the same percentage (see Appendix 1). The disaggregation, by trade partners, highlights the significant differences amongst the countries in the data. For example if Brazil had reduced the time to export by nearly four days and Bolivia had reduced the export time by nearly five days on average, Brazil could have seen a $2.717 million increase in trade to Bolivia. If, at the same time, Peru had reduced the days to import products by nearly three days on average, Brazil could have earned an extra $4.0528 million in exports to Peru, for a total of $6.760 million. Table 7 considers the necessary reduction in the number of signatures to spur a 10% increase in trade. Considering the same country pairs, had Brazil, Bolivia and Peru reduced the number of signatures or documents by one, Brazil would have exported an additional $6.760 million to its two trade partners. Had both partners reduced the number of signatures by one, the increase in trade would have been the same.

Another pair of countries to consider is Portugal and Finland. Yarn and clothing exports from Portugal and Finland in 2004 totaled over $64.768 million. For Portugal to have exported an extra $6.477 million to Finland, Portugal would have had to cut the number of days to export by nearly 1.5 days and Finland 0.58 days (13.9 hours). In terms of the number of signatures, Portugal and Finland would have had to cut one signature.

These results point to the benefits of all countries improving customs and

administrative procedures. In this experiment had only Brazil decreased it time or signatures, it would have earned only $3.877 million, which is just over half of the increase in trade had all partners reduced the time to trade. Similar results can be found with other country pairs.

These results suggest the potential benefits of reducing the thickness of borders. However, for a true evaluation, we would need an estimate of the costs of implementing policies to reduce the thickness (see OECD (2004b) for a discussion of the costs of reforming customs and administrative procedures). Let us assume diminishing marginal returns to actions to reform customs. We posit that the cost of reducing the number of days at the boarder even one day is more costly for countries with a relatively efficient customs office (Denmark) compared to a country with a relatively inefficient customs office (Uzbekistan) based on Table 5. Because the benefits are differential for trading partners, leaving improvements of customs to trading partners leads strategic games. From these examples, the culmination of the benefits across different trading pairs improves global welfare. Thus, we see the usefulness of the trade facilitation negotiations at the World Trade Organization.

***By Product***

In the third specification, we consider the effect of the different measures on each product. We constructed product specific variables by multiplying the product indicator variables with the different metrics of customs and administrative procedures. These new variables permit us to see how the different metrics affect each product differently. As seen in Table 8, many of the product specific variables are statistically

significant suggesting that the products are affected differentially by the different metrics of customs and administrative procedures.

These results are assumed to hold across all three product groups in the data set. However, some products may be more sensitive to customs and administrative procedures than other products. In the final model specification, we disaggregate the effect of each customs metric for each product in the data set. All three products are sensitive to customs and administrative procedures because of the statistically significant results. However some products are more sensitive than others.

A particular case can be seen by looking at the *Days at the Border* and its effect on the trade of the three product groups between Brazil and Bolivia, Brazil and Peru, Kenya and Nigeria, and Portugal and Finland (see Table 9). Textile yarn, fabrics and made-up products appear to be the least sensitive to time for both partners because of the relatively larger reductions in border time necessary to increase trade by 10% for this product group. For trade between Brazil and Peru, a reduction in the number of days by 2.86 and 2.27 would increase trade of coffee, tea and spices by 10%, but trade in textile yarn, fabrics and made-up articles (which had a larger export value to Brazil), would need a greater reduction in days at border 4.04 and 3.21 in order to achieve a 10% increase in trade. A similar result holds for Kenyan exports to Nigeria. This disaggregation shows that to reap the greatest benefits, reductions should be based on those products which are most sensitive to NTMs.

**Conclusions**

These results generate a series of questions: What does it mean for a country to eliminate one document or one signature? Does removing a signature reduce the amount

of time that a product waits at the border? Does one fewer document hamper the ability customs authorities to process a product? Would one less signature increase the risk of importing dangerous goods? How much control does a government have to lower the days at the border if private firms are involved in some part of customs clearance? These questions prompt us to interpret the results with great caution, and we must consider these results as indicative of the direction and relative importance of different customs and administrative procedures on trade. The results do not provide evidence of the actual amount that will be gained from improved customs.

Nevertheless, we find evidence that improving the efficiency of NTMs such as customs and administrative procedures can facilitate trade. The statistical models, with their attendant simulations, show that all countries can benefit from more efficient customs and administrative procedures, with the greatest benefits accruing to those countries that seem to have less efficient customs and administrative procedures. To gain the greatest benefit from improving customs and administrative procedures, both trade partners need to make efforts, even if these efforts are not equivalent. Greater reductions are needed from those partners with less efficient customs and administrative procedures. The Brazilian examples provide evidence to support these claims. Lower income trading partners require greater reductions in the number of days to attain similar percentage increases in exports. The greatest benefits accrue from improving those procedures relevant for moving products that are most sensitive to cumbersome and long customs and administrative procedures. Additionally, depending on the cost of reduction, it would seem that reducing the number of required documents or signatures generates greater benefits than similar reductions in the numbers of days. The results and questions

presented here suggest the need for further research, especially research that links these benefits to the cost of reducing the different metrics.

Table 1. Regional Averages of Trading Across Borders Metrics

| Region or Economy | *Number of Documents$_{Export}$* | *Number of Signatures$_{Export}$* | *Days at the Border$_{Export}$* | *Number of Documents$_{Import}$* | *Number of Signatures$_{Import}$* | *Days at the Border$_{Import}$* |
|---|---|---|---|---|---|---|
| | *Regional Averages* | | | | | |
| East Asia & Pacific | 7.1 | 7.2 | 25.8 | 10.3 | 9.0 | 28.6 |
| Latin America & Caribbean | 7.5 | 8.0 | 30.3 | 10.6 | 11.0 | 37.0 |
| Middle East & North Africa | 7.3 | 14.5 | 33.6 | 10.6 | 21.3 | 41.9 |
| OECD: High Income | 5.3 | 3.2 | 12.6 | 6.9 | 3.3 | 14.0 |
| South Asia | 8.1 | 12.1 | 33.7 | 12.8 | 24.0 | 46.5 |
| Sub-Saharan Africa | 8.5 | 18.9 | 48.1 | 12.8 | 29.9 | 60.5 |
| | *World Summary Statistics* | | | | | |
| Average | 7.4 | 11.0 | 31.6 | 10.8 | 16.4 | 39.8 |
| Standard Deviation | 2.2 | 10.4 | 19.9 | 3.9 | 16.5 | 26.8 |
| Coefficient of Variation | 0.3 | 1.0 | 0.6 | 0.4 | 1.0 | 0.7 |

Source: World Bank (2005)

Table 2. Preliminary Models of Customs Administration on Trade Flows

| Dependent / Independent | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects |
|---|---|---|---|
| **ln (*Days at the Border*$_{Importer}$)** | **-0.63**** | | |
| | **(0.19)** | | |
| **ln (*Number of Signatures*$_{Importer}$)** | | **-0.99***** | |
| | | **(0.19)** | |
| **ln (*Number of Documents*$_{Importer}$)** | | | **1.11***** |
| | | | **(0.26)** |
| ln (*GDP exporter*) | 0.61** | 0.61*** | 0.61*** |
| | (0.015) | (0.015) | (0.015) |
| ln (*GDP importer*) | 0.77*** | 0.47*** | 0.52*** |
| | (0.064) | (0.078) | (0.10) |
| ln (*Distance*Remoteness*) | -1.35*** | -1.35*** | -1.35*** |
| | (0.075) | (0.075) | (0.075) |
| *Common Language* | 0.29** | 0.29** | 0.29** |
| | (0.11) | (0.11) | (0.11) |
| *Shared Colonial Link* | 0.83*** | 0.83*** | 0.83*** |
| | (0.17) | (0.17) | (0.17) |
| *Colonial History* | 1.00*** | 1.00*** | 1.00*** |
| | (0.14) | (0.14) | (0.14) |
| *Shared Border* | 0.41*** | 0.41*** | 0.41*** |
| | (0.15) | (0.15) | (0.15) |
| *Member of NAFTA* | 1.019** | 1.019** | 1.019** |
| | (0.47) | (0.47) | (0.47) |
| *Member of EBA* | 0.54 | 0.54 | 0.54 |
| | (0.36) | (0.36) | (0.36) |
| *Member of COMESA* | 0.48 | 0.48 | 0.48 |
| | (0.40) | (0.40) | (0.40) |
| *Member of EU* | 0.67*** | 0.67*** | 0.67*** |
| | (0.18) | (0.18) | (0.18) |
| *Member of ASEAN* | -0.53 | -0.53 | -0.53 |
| | (0.40) | (0.40) | (0.40) |
| *Member of CARICOM* | 0.59 | 0.59 | 0.59 |
| | (0.76) | (0.76) | (0.76) |
| *Member of EFTA* | 0.59 | 0.59 | 0.59 |
| | (0.36) | (0.36) | (0.36) |
| *Member of ECOWAS* | 1.076 | 1.076 | 1.076 |
| | (0.89) | (0.89) | (0.89) |
| *Member of CAN* | 1.49*** | 1.49*** | 1.49*** |
| | (0.26) | (0.26) | (0.26) |
| *Member of MERCOSUR* | 0.71 | 0.71 | 0.71 |

| | | | |
|---|---|---|---|
| | (0.51) | (0.51) | (0.51) |
| *Member of CIS* | 1.92*** | 1.92*** | 1.92*** |
| | (0.52) | (0.52) | (0.52) |
| *Member of SADC* | 1.87*** | 1.87*** | 1.87*** |
| | (0.67) | (0.67) | (0.67) |
| *Member of GSP EU* | -0.031 | -0.031 | -0.031 |
| | (0.21) | (0.21) | (0.21) |
| *Member of EURO MED* | -0.13 | -0.13 | -0.13 |
| | (0.26) | (0.26) | (0.26) |
| *Member of AGOA* | -1.18** | -1.18** | -1.18** |
| | (0.54) | (0.54) | (0.54) |
| *Constant* | -8.56 | -1.11 | -2.81 |
| | (2.35) | (2.73) | (2.98) |
| $R^2$ | 0.58 | 0.58 | 0.58 |
| n | 16662 | 16662 | 16662 |

NB: Significance at 1% alpha level=***, at 5% alpha level=*** and at 10% alpha level=*. The standard errors are in parentheses below the estimated coefficient.

Table 3. Distances and Times for Select Bilateral Trade Partners

| Exporter | Importer | Distance[a] (in km) | Ranked by Distance[b] | Rank by Distance Adjusted for Days at the Border and Remoteness[c] | Number of Days at the $Border_{Export}$ | Number of Days at the $Border_{Import}$ |
|---|---|---|---|---|---|---|
| Brazil | Bolivia | 2,381 | 1 | 2 | 39 | 49 |
| Brazil | Peru | 3,455 | 4 | 3 | 39 | 31 |
| Bulgaria | Uzbekistan | 3,756 | 6 | 9 | 26 | 139 |
| Canada | Kyrgyzstan | 10,058 | 9 | 4 | 12 | 127 |
| Greece | Ethiopia | 3,560 | 5 | 7 | 29 | 57 |
| Kenya | Nigeria | 3,806 | 7 | 6 | 45 | 53 |
| Portugal | Finland | 3,363 | 2 | 1 | 18 | 7 |
| Russia | Afghanistan | 3,368 | 3 | 8 | 29 | 97 |
| Singapore | Denmark | 9,978 | 8 | 5 | 6 | 5 |

[a]The distance variable comes from CEPII (see Gaulier, Mayer and S. Zignago, (2004)).
[b]The distances are ranked from the shortest to the longest distance.
[c]The adjusted distance is the distance multiplied by the natural log of the product of the numbers of days to export and import divided by the measure of remoteness. Remoteness is the inverse of the sum of the distance between the exporter and all its importing partners divided by the GDP of the importer.

Source: *Doing Business* (2005)

Table 4. Models of Customs Administration on Trade Flows (with distance adjusted by time at the borders)

| Independent \ Dependent | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects |
|---|---|---|---|
| **ln (*Days at the Border*$_{Exporter}$**Days at the Border*$_{Importer}$**)** | **-0.41**** | | |
| | **(0.19)** | | |
| **ln(*Number of Signatures*$_{Exporter}$* *Number of Signatures*$_{Importer}$*)*** | | **-0.88***** | |
| | | **(0.19)** | |
| **ln (*Number of Document*$_{Exporter}$* *Number of Documentss*$_{Importer}$**)** | | | **-0.96**** |
| | | | **(0.38)** |
| ln(*GDP exporter*) | 0.50** | 0.38*** | 0.54*** |
| | (0.038) | (0.044) | (0.017) |
| ln(*GDP importer*) | 0.77*** | 0.47*** | 0.48*** |
| | (0.063) | (0.078) | (0.12) |
| ln(*Distance Weighted*) | -1.35*** | -1.35*** | -1.35*** |
| | (0.076) | (0.076) | (0.076) |
| *Common Language* | 0.29** | 0.29** | 0.29** |
| | (0.12) | (0.12) | (0.12) |
| *Shared Colonial Link* | 0.84*** | 0.84*** | 0.84*** |
| | (0.18) | (0.18) | (0.18) |
| *Colonial History* | 1.014*** | 1.014*** | 1.014*** |
| | (0.15) | (0.15) | (0.15) |
| *Shared Border* | 0.41*** | 0.41*** | 0.41*** |
| | (0.15) | (0.15) | (0.15) |
| *Constant* | -2.82 | 8.68** | 3.45 |
| | (3.33) | (3.89) | (4.29) |
| $R^2$ | 0.58 | 0.58 | 0.58 |
| n | 16424 | 16424 | 16424 |

NB: Significance at 1% alpha level=***, at 5% alpha level=*** and at 10% alpha level=*. The standard errors are in parentheses below the estimated coefficient.

Table 5. Days at the Border and Number of Signatures for Trade

| Exporter | Importer | *Days at the Border* | *Number of Documents* | *Number of Signatures* | *Days at the Border* | *Number of Documents* | *Number of Signatures* |
|---|---|---|---|---|---|---|---|
| | | *for the exporter*[a] | | | *for the importer*[a] | | |
| Brazil | Bolivia | 39 | 7 | 8 | 49 | 9 | 16 |
| Brazil | Peru | 39 | 7 | 6 | 31 | 13 | 13 |
| Bulgaria | Uzbekistan | 26 | 7 | 5 | 139 | 18 | 32 |
| Canada | Kyrgyzstan | 12 | 6 | 2 | 127 | 18 | 27 |
| Greece | Ethiopia | 29 | 7 | 6 | 57 | 13 | 45 |
| Kenya | Nigeria | 45 | 8 | 14 | 53 | 3 | 71 |
| Portugal | Finland | 18 | 6 | 4 | 7 | 13 | 1 |
| Russia | Afghanistan | 29 | 8 | 8 | 97 | 10 | 57 |
| Singapore | Denmark | 6 | 5 | 2 | 5 | 3 | 1 |

[a]Each represents averages across all countries. These metrics do not represent the bilateral relationships.

Source: *Doing Business* (2005)

Table 6. The Necessary Reduction in the Number of Days at the Border to Increase Trade by 10%

| Exporter | Importer | Total Exports (in 1,000 USD)[a] | Elasticity for Days at the Border | Reduction in Days at the $Border_{Exporter}$ | Reduction in Days at the $Border_{Importer}$ |
|---|---|---|---|---|---|
| Brazil | Bolivia | 27,166.64 | -0.59 | 3.83 | 4.81 |
| Brazil | Peru | 40,527.61 | -0.60 | 3.75 | 2.98 |
| Bulgaria | Uzbekistan | 0.70 | -0.57 | 2.62 | 14.01 |
| Canada | Kyrgyzstan | 4.98 | -0.59 | 1.17 | 12.36 |
| Greece | Ethiopia | 1,044.75 | -0.59 | 2.83 | 5.57 |
| Kenya | Nigeria | 33.68 | -0.59 | 4.46 | 5.26 |
| Portugal | Finland | 64,768.45 | -0.69 | 1.50 | 0.58 |
| Russia | Afghanistan | 1,462.39 | -0.58 | 2.89 | 9.68 |
| Singapore | Denmark | 51,910.47 | -0.81 | 0.42 | 0.35 |

[a]Total exports include trade of coffee, tea, spices, etc.; textile yarn and fabrics, and apparel and accessories for 2004. Some country pairs do not trade all three products.

Source: Author's Calculations

Table 7. The Necessary Reduction in the Number of Signatures to Increase Trade by 10%

| Exporter | Importer | Elasticity for Number of Signatures | Reduction in Signatures for Exporter[a] | Reduction in Signatures for Importer[a] | Elasticity for Number of Documents | Reduction in Documents for Exporter[a] | Reduction in Documents for Importer[a] |
|---|---|---|---|---|---|---|---|
| Brazil | Bolivia | -0.88 | 1 | 1 | -0.96 | 1 | 1 |
| Brazil | Peru | -0.88 | 1 | 1 | -0.96 | 1 | 1 |
| Bulgaria | Uzbekistan | -0.88 | 1 | 2 | -0.96 | 1 | 1 |
| Canada | Kyrgyzstan | -0.88 | 1 | 2 | -0.96 | 1 | 1 |
| Greece | Ethiopia | -0.88 | 1 | 3 | -0.96 | 1 | 1 |
| Kenya | Nigeria | -0.88 | 1 | 5 | -0.96 | 1 | 1 |
| Portugal | Finland | -0.88 | 1 | 1 | -0.96 | 1 | 1 |
| Russia | Afghanistan | -0.88 | 1 | 4 | -0.96 | 1 | 1 |
| Singapore | Denmark | -0.88 | 1 | 1 | -0.96 | 1 | 1 |

[a]The value was rounded up to one if the value was greater than zero.

Source: Author's Calculations

**Table 8. Models of Customs Administration on Trade Flows**

| Dependent / Independent | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects | ln(*Exports*) Fixed Effects |
|---|---|---|---|
| **ln (*Days at the Border for Coffee, Tea and Spices*)** | **-0.52*** ** | | |
| | **(0.19)** | | |
| **ln (*Days at the Border for Yarn and Fabric*)** | **-0.32*** | | |
| | **(0.19)** | | |
| **ln (*Days at the Border for Clothing and Accessories*)** | **-0.44**** | | |
| | **(0.19)** | | |
| **ln (*Number of Signatures for Coffee, Tea and Spices*)** | | **-1.034*** ** | |
| | | **(0.20)** | |
| **ln (*Number of Signatures for Yarn and Fabric*)** | | **-0.74*** ** | |
| | | **(0.19)** | |
| **ln (*Number of Signatures for Clothing and Accessories*)** | | **-0.94*** ** | |
| | | **(0.19)** | |
| **ln (*Number of Documents for Coffee, Tea and Spices*)** | | | **-1.14*** ** |
| | | | **(0.38)** |
| **ln (*Number of Documents for Yarn and Fabric*)** | | | **-0.83**** |
| | | | **(0.38)** |
| **ln (*Number of Documents for Clothing and Accessories*)** | | | **-1.013*** ** |
| | | | **(0.38)** |
| ln (*GDP exporter*) | 0.49*** | 0.38*** | 0.54*** |
| | (0.038) | (0.044) | (0.017) |
| ln (*GDP importer*) | 0.77*** | 0.47*** | 0.47*** |
| | (0.064) | (0.076) | (0.12) |
| ln (*Distance Weighted*) | -1.34*** | -1.34*** | -1.34*** |
| | (0.075) | (0.075) | (0.075) |
| *Common Language* | 0.29** | 0.29** | 0.29** |
| | (0.12) | (0.11) | (0.12) |

| | | | |
|---|---|---|---|
| *Shared Colonial Link* | 0.83*** | 0.82*** | 0.83*** |
| | (0.18) | (0.18) | (0.18) |
| *Colonial History* | 1.0091*** | 1.0074*** | 1.011*** |
| | (0.15) | (0.15) | (0.15) |
| *Shared Border* | 0.42*** | 0.42*** | 0.41*** |
| | (0.15) | (0.15) | (0.15) |
| *Constant* | -2.025 | 9.44** | 4.38 |
| | (3.25) | (3.79) | (4.28) |
| $R^2$ | 0.58 | 0.58 | 0.58 |
| N | 16424 | 16424 | 16424 |

NB: Significance at 1% alpha level=***, at 5% alpha level=*** and at 10% alpha level=*. The standard errors are in parentheses below the estimated coefficient. Distance weighted by time variables and product specific effects

Table 9. The Necessary Reductions in the Days at the Border to Increase Trade by 10%

| Exporter | Importer | Total Exports (1,000 USD) | Elasticity for Days at the Border | Reduction in *Days at the Border*$_{Exporter}$ | Reduction in *Days at the Border*$_{Importer}$ |
|---|---|---|---|---|---|
| | | *Coffee, Tea and Spices* | | | |
| Brazil | Bolivia | 4599.85 | -0.70 | 2.90 | 3.65 |
| Brazil | Peru | 735.28 | -0.71 | 2.86 | 2.27 |
| Kenya | Nigeria | 1901.66 | -0.69 | 3.38 | 3.98 |
| | | *Textile Yarn, Fabrics and Made-up Articles* | | | |
| Brazil | Bolivia | 22675.71 | -0.50 | 4.14 | 5.20 |
| Brazil | Peru | 38956.38 | -0.51 | 4.04 | 3.21 |
| Kenya | Nigeria | 27.99 | -0.49 | 4.83 | 5.69 |
| Portugal | Finland | 30491.19 | -0.60 | 1.58 | 0.61 |
| | | *Clothing and Accessories* | | | |
| Brazil | Bolivia | 4490.93 | -0.62 | 3.30 | 4.14 |
| Brazil | Peru | 835.95 | -0.63 | 3.24 | 2.57 |
| Kenya | Nigeria | 4490.93 | -0.61 | 3.84 | 4.52 |
| Portugal | Finland | 34277.26 | -0.72 | 1.44 | 0.56 |

Source: Author's Calculations

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# Appendix

We use the estimated elasticity to calculate the necessary reduction in the number of days to achieve a 10% increase in trade. The percentage change in the number of days $\left(\hat{T}\right)$ to achieve the 10% increase in trade is $T = \dfrac{-0.1}{\varepsilon_{Days\ at\ Border,\ Exports}}$. The *Days at Border* is the product of *Days at the Border*$_{Exporter}$ and *Days at the Border*$_{Importer}$. To attain the necessary reduction in the product of the days at the border, we assume that both factors are reduced by z, so that $\overline{Days\ at\ Border} = \left(Days\ at\ Border_{Exporter} * z\right) * \left(Days\ at\ Border_{Importer} * z\right)$.

If z equals one, then no reduction occurs. If z is between zero and one, then some or absolute reduction in the number of *Days at the Border* will occur. To obtain the appropriate factor z, we equate the following:

$$\overline{Days\ at\ Border} = \left(Days\ at\ Border_{Exporter} * z\right) * \left(Days\ at\ Border_{Importer} * z\right)$$
$$= \left(1 + \hat{T}\right) * Days\ at\ Border$$
$$= Days\ at\ Border_{Exporter} * Days\ at\ Border_{Exporter} * z^2 = \left(1 - \frac{0.10}{\varepsilon}\right) * Days\ at\ Border$$

$\therefore$

$$z^2 = \left(1 - \frac{0.10}{\varepsilon}\right)$$
$$z = \sqrt{\left(1 - \frac{0.10}{\varepsilon}\right)}$$