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Trading on Time

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Abstract: We determine how time delays affect international trade, using newly-collected World Bank data on the days it takes to move standard cargo from the factory gate to the ship in 126 countries. We estimate a modified gravity equation, controlling for endogeneity and remoteness. On average, each additional day that a product is delayed prior to being shipped reduces trade by at least 1 percent. Put differently, each day is equivalent to a country distancing itself from its trade partners by 70 km on average. Delays have an even greater impact on developing country exports and exports of time-sensitive goods, such as perishable agricultural products. In particular, a day's delay reduces a country's relative exports of time-sensitive to time-insensitive agricultural goods by 6 percent.

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Introduction

It takes 116 days to move an export container from the factory in Bangui (Central African Republic) to the nearest port and fulfill all the customs, administrative, and port requirements to load the cargo onto a ship. It takes 71 days to do so from Ouagadougou (Burkina Faso), 87 days from N'djamena (Chad), 93 from Almaty (Kazakhstan), and 105 from Baghdad. In contrast, it takes only 5 days from Copenhagen, 6 from Berlin, 16 from Port Louis (Mauritius), 20 days from Shanghai, Kuala Lumpur or Santiago de Chile.

We introduce and utilize new data on trade costs from the World Bank's Doing Business report. The data are collected from 345 freight forwarders, port and customs officials operating in 126 countries. We use data on the average time it takes to get a 20-foot container of an identical good from a factory in the largest business city to a ship in the most accessible port.

Our goal is to estimate the effect of time costs on trade volumes. A standard tool is the gravity equation.[1] There are, however, two concerns with the use of a gravity equation that we address. The main concern is that the volume of trade may directly affect trade facilitation. The marginal value of investment in trade facilitation is higher when the trade volume is large since cost savings are passed on to a larger quantity of goods. In addition, many time-saving techniques, such as computerized container scanning, are only available in high-volume ports. Thus, while more efficient trade facilitation stimulates trade, trade also generates improved trade facilitation.[2]

[1] Wilson et. al. (2004) and Nordas and Piermartini (2004) use a standard gravity equation to estimate how trade facilitation costs and infrastructure affect trade flows using a gravity model. They use data on port efficiency from the Global Competitiveness Report. These data are based on perception surveys and may not be comparable across countries.

[2] In a related paper, Hummels and Skiba (2004) provide evidence that trade volumes affect the timing of adopting containerized shipping and reduce shipping costs.

Alternatively, larger trade volumes could increase congestion and lessen the efficiency of trade infrastructure. For example, as trade volumes surged in China, the wait time at Shanghai's port expanded by 2 days on average in 2003. As a result, 12 loading berths were added in 2004. These considerations make it important to distinguish correlation from causation.

The second is that a country's trade with any given partner is dependent on its average remoteness to the rest of the world (Anderson and Van Wincoop 2003). For example, Australia and New Zealand trade more with each other than they would if other large markets were nearby. Studies that do not control for remoteness produce biased estimates of the impact of trade facilitation on trade, as remoteness is correlated with factory-to-port time delays.

We identify the effect of time delays in exporting on trade using a simple gravity equation controlling for remoteness, a "difference" gravity equation, a "difference-in-difference" gravity equation, and by using instrumental variables. The difference gravity equation evaluates the effect of time delays on the relative exports of countries with similar endowments and geography, and that face the same tariffs in importing countries. Comparing exports from similar countries to the same importer allows us to difference out importer effects (such as remoteness and tariffs) that are important to trade. For example, we examine whether Brazilian/Argentine exports to the United States are increasing in Brazilian/Argentine time costs of trade, after controlling for the standard determinants of trade, such as relative size, relative distance, and relative income.[3] In addition to controlling for remoteness, the difference specification reduces the problem of

[3] We also control for adjacency, language, being landlocked, and colonial linkages. We do not need to control for preferential trading area, as our specification only compares relative exports of like countries within a preferential trading agreement.

endogeneity to the extent that major differences in the trade facilitation process, which result from income and trade, come largely from regional variation.

The "difference-in-difference" technique we use compares relative exports of time-sensitive goods to time-insensitive goods of similar trade partners. Thus, for example, we compare relative Ecuadorian/Peruvian exports of beans and other time-sensitive agricultural products to Ecuadorian/Peruvian exports of potatoes and other time-insensitive agricultural products. The advantage of this specification is that we can see whether better trade facilitation encourages more exports in time-sensitive categories on the same trade route.[4] The identification problem may still be present if enhanced trade in time-sensitive industries leads to better trade facilitation, though this is less likely since these products make up a small share of total trade.

Finally, to ensure that we identify only the effect of trade facilitation on trade, we report the results instrumenting for the time of exporting. We use the number of signatures required to export and to import as instruments. The intuition is that administrative costs, such as the extra paperwork required when more signatures are required, are important in extending the number of days for export processing, but are unlikely to be affected by the total volume of trade.

Our estimates imply that each additional day that a product is delayed prior to being shipped reduces trade by more than one percent. Put another way, each additional day is equivalent to a country distancing itself from its trading partners by one percent, or about 70 km. For example, if Uganda reduced its factory-to-ship time from 58 days to 27 (the median for the sample), exports would be expected to increase 31 percent and

[4] This assumes that overall exports, as compared to exports of time-sensitive goods, have a more important effect on trade facilitation.

Uganda would bring itself 2200 km closer to its main trading partners—two-thirds the distance from Kampala to Cairo. If the Central African Republic reduced its factory-to-ship time from 116 days to 27, exports would nearly double. The same effect could be achieved if the Central African Republic cut 6200 km from its distance to the main markets—greater than the distance from Bangui to London.

The paper proceeds as follows. The next section discusses the data. Section III presents the estimation strategy. Section IV presents the results. Section V evaluates time sensitive products, and Section VI concludes.

II. Data

Our data are based on answers to a detailed World Bank questionnaire completed by trade facilitators at freight-forwarding companies in 146 countries in 2005.[5] Freight-forwarders are the most knowledgeable to provide information on the procedural requirements to trade since most businesses use their services to move their products in and out of the country. Globally, 43,000 freight-forwarding companies employ 11 million people and handle approximately 85% of foreign trade. Their services range from arranging the most appropriate route for a shipment, preparing documentation to meet customs and insurance requirements, arranging payments of fees and duties, and advising on legislative changes and political developments that could affect the movement of freight.[6]

[5] The World Bank's Doing Business dataset has 155 economies. However, Afghanistan, Angola, the Kyrgyz Republic, Lesotho, Marshall Islands, Micronesia, Niger, Solomon Islands, and Uzbekistan did not provide data on the time delays in exporting.

[6] This information comes from the International Federation of Freight Forwarders Associations' (FIATA) website.

Four main freight-forwarding companies participated in this survey. Panalpina, a Swiss company, provided their offices in 56 countries. Maersk Sealand, of Denmark, completed 28 surveys in northern Europe and East Asia. SDV International Logistics, of France, completed the questionnaire in 24 countries in west and central Africa. And Manica, of South Africa, covered the 10 southern African countries. Independent freight-forwarders completed the survey in the remaining 18 countries, as well as second set of answers in other countries. Overall, 345 trade facilitators responded, with at least 2 per country. This provided an opportunity to compare the answers and, where differences arose, seek further clarification. After processing all questionnaires, we conducted follow-up conference calls with *all* respondents to confirm the coding of the data.

In addition to surveying freight-forwarders, surveys were completed by port authorities and customs officials in a third of the sample (48 countries). As ports and customs constitute a portion of the exporting procedures, they answered only the relevant sections of the questionnaire and provided information on the existing laws and regulations governing their activities. This allowed a further check on the quality of the information supplied by the main respondents, the freight-forwarders.

The data are collected as part of Doing Business, a World Bank project that investigates the scope and manner of business regulations.[7] Doing Business collects and analyzes data in nine other areas, for example starting a business, hiring and firing workers, enforcing contracts, paying taxes. In addition to exporting procedures, the trade survey covers importing, as well as some specific aspects of trading across borders, for example recent measures to improve security and their impact on the time and cost to ship cargo. The surveys and data are available at www.doingbusiness.org.

[7] The survey was designed by Uma Subramanian and conducted by the Doing Business team.

To document the procedures needed to export cargo, and the associated time, number of documents and signatures, we describe to the survey respondents a stylized transaction. The exporter is a local business (100% owned by nationals), has 201 employees, and is located in the country's most populous city. The exporter does not operate within an export-processing zone or an industrial estate with special export privileges. Each year, more than 10% of its sales go to international markets, i.e., management is familiar with all the trading rules and requirements.

The purpose of defining the exporter is to avoid special cases. In some countries, for example, Syria, foreign companies complete additional procedures or require special permits to export. In other countries, for example the Dominican Republic, much of trade takes place through export-processing zones. In larger and landlocked countries, it is necessary to specify the location of the exporter so as to identify the nearest port.

Assumptions are also made on the cargo, to make it comparable across countries. The traded product travels in a dry-cargo, 20-foot, full container load. It is not hazardous and does not require refrigeration. The product does not require any special phytosanitary or environmental safety standards other than accepted international shipping standards. Finally, every country in the sample exports this product category. These assumptions yield three categories of goods: textile yarn and fabrics (SITC 65), articles of apparel and clothing accessories (SITC 84), and coffee, tea cocoa, spices and manufactures thereof (SITC 07). Two other categories, white goods and basic electronics, were considered at the pilot stage. As the prices of a container load of these goods differed substantially across countries, the two categories were later dropped.

The questionnaire was tested on a pilot sample of 19 countries, on all continents, across all World Bank income groups and all with Panalpina offices.[8] A revised questionnaire was sent to all respondents in February 2005, and they were asked to benchmark their answers to January 2005.[9] An expanded questionnaire was sent to the 42 landlocked countries in the sample. It contained an additional section on transit transport and customs clearance at each border, as well as the associated documents, time and costs.

The questionnaire asks respondents to identify the likely port of export. For many countries, especially in Africa and the Middle East, this may not be the nearest port. Due to high port fees, inadequate inland infrastructure, or problems at border crossings, freight-forwarders avoid some ports. For example, Cotonou, Benin's main port, is seldom used due to perception of corruption and high terminal handling fees. Respondents also identify the likely destination of their cargo. This serves as another quality check of the data, to confirm that this is a viable trade destination compared with the available trade statistics.

The survey then goes through the exporting procedures, dividing them into four stages: pre-shipment activities such as inspections and technical clearance; inland carriage and handling; terminal (port) handling, including storage if a certain storage period is required; and finally customs and technical control. At each stage, the respondents describe what documents are required, where do they submit these

[8] These are Bangladesh, Chile, Dominican Republic, Germany, Honduras, Italy, Japan, Jordan, the Republic of Korea, Latvia, Malaysia, Mexico, Netherlands, Nigeria, Singapore, South Africa, Sri Lanka, Thailand and the United States.

[9] The survey is available at http://rru.worldbank.org/Documents/DoingBusiness/Methodology/TradingAcrossBorders/Logistics-survey.pdf.

documents and whose signature is necessary, what are the related fees,[10] and what is an average and a maximum time for completing each procedure.

Two examples illustrate the data. In Denmark, an exporter needs three documents (exports declaration form, bill of landing and a commercial invoice) and two signatures (one by a customs official and one at the port) to complete all requirements for shipping cargo abroad. It takes on average five days from the time he starts preparing documents to the time the cargo is ready to sail. In contrast, it takes 11 documents, 17 visits to various offices (Figure 1), 29 signatures and 67 days on average for an exporter in Burundi to have his goods moved from the factory to the ship.

Trade facilitation is not only about the physical infrastructure for trade. Indeed, only about a quarter of the delays in the sample is due to poor road or port infrastructure – in part because our exporter is located in the largest business city. Seventy-five percent is due to administrative hurdles - numerous customs procedures, tax procedures, clearances and cargo inspections - often before the containers reach the port. The problems are magnified for landlocked African countries, whose exporters need to comply with different requirements at each border.

Table 1 presents the summary statistics of the necessary time to fulfill all the requirements for export by region and regional arrangement. Several patterns are seen in the data. Getting products from factory to ship is relatively quick in developed countries, taking only 12½ days on average. Countries in East Asia and the Pacific are also relatively efficient taking 24 days on average, with Singapore taking only six days. In

[10] Non-fee payments, such as bribes or other informal payments to ease the process are not considered. This is not because they do not happen – a separate section of the survey asks open-ended questions on the main constraints to exporting, including perceptions of corruption at the ports and customs. However, the methodology for data collection relies on double-checking with existing rules and regulations. Unless a fee can be traced to a specific written rule, it is not recorded.

contrast, export times in Sub-Saharan Africa are especially long, taking 47½ days on average. In addition, the variation across countries in Sub-Saharan Africa is large, ranging from 16 days in Mauritius to 116 days in the Central African Republic.

The time delays reported in the survey are probably at the lower end of the time it takes to move the average product from factory to ship. This is because the products are chosen so that they do not require cooling or any technical inspections based on use of hazardous materials.

Table 2 presents correlations for the full sample of bilateral trade between the time to move goods from factory to ship and other variables included in the regression analysis. Time is positively correlated with remoteness, more remote countries tend to have longer times of getting goods to ship. Time is negatively correlated with per capita income, implying that wealthier countries tend to have better trade facilitation.

The trade data are from the UN Comtrade database. GDP and GDP per capita are from the World Bank's World Development indicators. We use data for 2001-2003, convert to constant values, and average them in order to avoid idiosyncracies in any given year, though results are very similar if we use only data for 2003 (the latest available). Trade data were not available for 20 of the 146 countries for which we have data on the time to move goods from factory to ship, so our final sample is the 126 countries listed in Table A1.[11]

[11] The 20 countries with missing trade data for 2001-2003 are Bhutan, Chad, Congo Republic, Democratic Republic of Congo, Ethiopia, Haiti, Iraq, Laos, Macedonia, Mauritania, Palau, Puerto Rico, Serbia and Montenegro, Sudan, Taiwan (China), Timor-Leste, Tonga, Vanuatu, Vietnam and West Bank and Gaza.

III. Estimation

We study the extent to which the time to move goods from the factory to the ship influences the volume of exports. Longer time delays act as a tax on exports, especially on high-value goods, since they are effectively depreciating during the delay. In addition, the exporter must expend capital on the exporting process and storage/transport of the goods during the delay. Finally, long time delays are likely to be associated with more uncertainty about delivery times, which would further depress exports.[12]

For comparison purposes, we begin by estimating an augmented gravity equation that takes the remoteness of a country into account. The intuition is that more remote countries are likely to trade more with their actual trading partners because they have fewer alternatives. For example, Australia is likely to trade more with New Zealand than Austria is with Portugal—even though their other bilateral characteristics are similar—as the latter have more source countries to choose among.

Since this impact is likely to be correlated with our explanatory variables of interest, there is a potential omitted variable bias. Indeed, Anderson and Wincoop (2003) show that the failure to control for what they call the "multilateral resistance" is a major reason that McCallum (2000) found a large border effect in bilateral trade between Canadian provinces and U.S. states. In our case, countries that have more opportunities for export may have higher returns to enhanced local trade facilitation, and invest more in time efficient means. In addition, countries in market centers are more likely to

[12] The Doing Business data contain information on the maximum time for exporting. To control for uncertainty, we added maximum-time and also maximum-time-less-average-time variables to the regression equation. The coefficients on these variables were not significant when either was included along with the average time variable (which remained robust) and coefficients were very similar to those reported here when they were included without the average time variable. The correlation between maximum time and average time is 0.92. This high correlation means it is difficult to pick up the individual effect of uncertainty.

experience transit trade between other countries, and therefore will handle higher volumes of trade. Since there are increasing returns in many port services, trade facilitation may be more efficient in these areas. Indeed, the correlation between remoteness (as described below) and time delays is 0.40, indicating that more remote countries tend to have longer times of processing exports (Table 2). This is even though our time measure does not include the actual time at sea.

We employ two strategies to deal with this problem. The first is to use importer fixed effects to capture importer remoteness and include an approximate measure of exporter remoteness in the standard gravity regression. We follow Head (2003) and define remoteness as

$$remote_j = \frac{1}{\sum_k^N \frac{GDP_k}{D_{kj}}} = \frac{1}{\frac{GDP_1}{D_{1j}} + \frac{GDP_2}{D_{2j}} + ... + \frac{GDP_j}{D_{jj}} + ... + \frac{GDP_N}{D_{Nj}}},$$

where N is the total number of trading partners; D_{jk} is the distance between country j and country k and GDP_k is country k's GDP.[13] The advantage of this measure, as compared with a GDP weighted distance measure, is that very distant countries do not carry undue weight.

We estimate an augmented gravity regression:

$$Ln(Exp_{jk}) = \alpha_k + \beta_0 Ln(GDP_j) + \beta_1 Ln(GDPC_j) + \beta_2 Ln(Dist_{jk}) + \beta_3 Ln(Exp\_Time_j) + \beta_4 remote_j + \beta_5 landlock_j + (D_{jk}) + \varepsilon_{jk},$$

(1)

[13] $Dist_{jj}$, the *internal distance* of country *j*, is measured as the square root of country *j*'s area multiplied by 0.4.

where j and k denote exporter j and importer k respectively; Exp_{jk} is total exports, α_k are importer fixed effects; GDP is Gross Domestic Product, GDPC is Gross Domestic Product per capita; $Dist_{jk}$ is the distance between country j and country k; Exp_Time_j: the required time for exports to take place in country j; $Remote_j$ is the remoteness of country j; $Landlock_j$ is a dummy variable which is equal to 1 if country j is landlocked and zero otherwise; and D_{jk}: vector of dummy variables associated with the exporter and the importer such as sharing the same official language, borders, etc. We cluster the errors on the exporter, since the explanatory variables are at the exporter level and the dependent variable is at the country-pair level.

The explanatory variable of interest is Exp_Time_j. We expect that the time to move goods from factory to ship is negatively correlated with the volume of exports. Importer fixed effects control for the extent to which the importer is isolated from the rest of the world. Remoteness captures the isolation of the exporter. This reduces but does not eliminate the omitted variable bias.

Our preferred strategy is to estimate a simple difference gravity equation on similar exporters: [14]

$$Ln\left(\frac{Exp_{jk}}{Exp_{hk}}\right) = \alpha + \beta Ln(\frac{GDP_j}{GDP_h}) + \varphi Ln(\frac{GDPC_j}{GDPC_h}) + \delta Ln(\frac{Dist_{jk}}{Dist_{hk}}) + \lambda Ln(\frac{Export\_Time_j}{Export\_Time_h}) + \phi(D_{jk} - D_{hk}) + \varepsilon_{jhk}, \quad (2)$$

where D_{ik} is a vector of control indicator variables, such as colony, language, and landlocked, associated with the exporters.[15] The dependent variable is composed of two

[14] A simple difference gravity regression and a difference-in-difference gravity regression are used by Hanson and Xiang (2004) to study the *home-market* effect. Anderson and Marcouiller (2002) use a simple difference gravity specification to study the role of security in international trade.

export values with Exp_{lk} denoting exports of country *l* to country *k*. If time does matter we expect that the coefficient estimate on $Export\_Time_j / Export\_Time_h$ to be negative, meaning that countries associated with higher relative time delays have lower relative exports. Errors are adjusted for clustering on exporter pairs, since each exporter pair will be associated with a numerous importers.

The estimating strategy depends on choosing exporters that are similar (in location and factor endowments) and face the same trade barriers in foreign markets, for example, comparing exports from Argentina to Brazil with exports from Uruguay to Brazil. Therefore we use 18 regional trade agreements among 98 exporter countries, and consider all cases where two countries in a trade agreement export to the same importer (Table A2). As a further robustness check, we eliminate country pairs that do not fall into the same of four World Bank income classifications.[16] This ensures that we are not comparing countries at different levels of development, such as Mexico and the United States or Singapore and Cambodia, but reduces the sample.

This strategy eliminates the need to control for multilateral resistance on the importer side since we compare only imports to the same country. It also reduces the need to control for exporter remoteness because we are comparing proximate exporters. Endogeneity is reduced because effects of trade volumes on time are likely to be much smaller between similar countries in the same geographical region—for example, we are

[15] Thus, it is one (negative one) if the associated dummy in the numerator country is one (zero) and the associated dummy in the denominator country is zero (one), and zero otherwise. For example, if the dependent variable is Paraguay/Uruguay exports the variable landlocked is one, if it were instead Uruguay/Paraguay exports the variable landlocked would be negative one. Similarly, if it were Argentine/Uruguay exports or the reverse, the variable would be zero. Each country pair enters only once in the regression.

[16] Classification by per capita income are as follows: Low-income, below $825; lower-middle income, $825-$3,255; upper-middle income, $3,255-$10,065; high income, above $10,065.

not comparing countries in East Asia to countries in Africa. Large trade volumes have surely contributed to the development of sophisticated port facilities in Singapore and other East Asian countries. If trade facilitation influences trade in large discrete steps, as investing in ports tends to be lumpy, our estimation is robust.[17]

The cost of this strategy is that it reduces the variation in the time delays in exporting. This is because countries within a preferential trade agreement group are similar in terms of tariff and procedural barriers to trade.

Endogeneity may still be a problem since relatively high export volumes within regions may lead to better or worse trade facilitation. To control for the potential effect of export volumes on export time, we also report the results using instrumental variables. The instruments we use are the required number of signatures for exports the required number of signatures for imports. The intuition is that the number of signatures is a measure of excessive bureaucracy that slows down trade facilitation, but is not a result of shipping volumes, such as congestion or having containerized ports is likely to be.[18] For example with congestion effects, more trade may extend the waiting time for a required signature, but it would not affect the number of signatures required.

IV. Results

We start by estimating a gravity equation with importer fixed effects, Equation (1) above, using aggregate bilateral data. The results are shown in Table 3. Column 1 reports the

[17] There may, however, still be an endogeneity concern if even marginally higher trade volumes encourage relatively better trade facilitation or if higher trade volumes lead to congestion effects, extending the time to process goods.

[18] A potential problem is that political interests may lobby more extensively for more transparent export procedures if exports are large. In addition, the number of signatures may be related to the overall business climate, which may affect exports.

results of a standard gravity equation with importer fixed effects. The gravity model performs well for aggregate data as all coefficient estimates are of expected sign, and the model explains 71 percent of variation in the data. The volume of aggregate bilateral exports is increasing in GDP of the exporter and decreasing in the distance of the destination. Sharing borders, common language and being in a colonial relationship in the past all promote trade; being landlocked reduces it.

Column 2 reports the results including the time delays in exporting. The coefficient on time is negative and statistically significant. The results imply that a 10 percent increase in the time delays in exports reduces their volume by about 8 percent. However, one concern is that the coefficient on per capita GDP switches sign when the time to move goods from factory to ship is included. This is likely the result of multicolinearity, as the correlation between income per capita and Time is -0.61 (Table 2). Including remoteness does not change the results (columns 3 and 4). Column 5 reports the results allowing the coefficient for developing countries to be different. Results imply that the magnitude of the coefficient is significantly higher for developing countries.

Next, we estimate the simple difference gravity regression (2) that addresses more precisely the potential problem of omitted variable bias and endogeneity. The results are reported in Table 4 for the full sample of regional-trade-agreement countries and the restricted sample, which eliminates country pairs if the two are at different stages of development. The first and fourth columns report the results excluding our export time as a benchmark. In column 2 and 5, we include the ratio *time,* which has a statistically significant negative impact on the volume of trade. The coefficient is smaller than in the

standard gravity equation and the coefficients on all of the other variables included in the regression are stable. The result implies that a 10 percent saving of time in exporting increases exports by about 4 percent. Thus, accounting for differences in exporter characteristics cuts the effect in half.

The median number of days to export goods in the sample is 27, thus a one day increase in the median country is equivalent to a about a 1.2 percent increase in trade. Given that the coefficient on time is about one-fourth the coefficient on distance, we can reframe the effect in terms of distance. A one day increase in export time is equivalent to about a 1 percent increase in distance (1/27*1/4). The median distance in the sample is 7000 km, implying that a one day increase in export time is equivalent to extending the median distance by about 70 km.

This result holds when we deal with the potential endogeneity of the variable *ratio_time* by using as instruments the number of required signatures for exports to take place and number of signatures for imports to take place.[19] We find that a 10 percent increase in the ratio of the required time for exports to take place results in about a 4 to 5 percent reduction in the ratio of exports to the same destination country. The coefficient on time increases slightly when we use instrumental variables. One explanation is that the simple difference specification virtually eliminates the positive effect of trade on trade facilitation, as this effect works largely across regions. In addition, using signatures as instruments picks up the administrative costs associated with export times, and the elasticities with respect to these may be greater than with respect to overall time.

Table 5 reports results allowing developing countries to have different coefficients on export time. The coefficient on time delays in developing countries is significantly

[19] Coefficient estimates are very similar when we use each instrument independently.

different from that for developed countries. This remains true even when we instrument. The results imply that a 10 percent increase in export time reduces developing country exports by 8-12 percent.

One drawback using relative bilateral exports is that we eliminate country pairs which export to different locations. In addition, the main variable of interest is the ratio of time which varies only at the country-pair level. As an additional robustness test, we examine relative exports to the world, which allows us to use all country pairs and all exports within the regional groups. The disadvantage is the control group is not as carefully defined since we include exports to different partners. The results, reported in Table 6 are similar, implying that a 10 percent increase in the time to move goods from factory to ship reduces aggregate exports by about 3-4 percent.

V. Time-Sensitive Exports

Time delays should have a greater effect on the export of time-sensitive goods.[20] To examine the extent to which they are hampered, we also estimate "difference-in-difference" gravity regressions using trade data of products for which time matters the most and the least. This specification reduces the endogeneity problem coming from reverse causality because the products account for only a small fraction of trade on average (5-6% and 0.3-0.4% for manufacturing and agricultural trade, respectively) so it is unlikely they have a large effect on establishing trade facilitation processes (Table 7).

We examine a set of time-sensitive manufacturing and agricultural goods. The three time-sensitive manufacturing industries (SITC 2-digit) are office equipment (75),

[20] Evans and Harrigan (2005) show that time-sensitive apparel products are more sensitive to distance than time-insensitive products.

electric power machinery (77), and photographic equipment (88) (Table 8). These are drawn from Hummels (2001), which investigates how ocean shipping times and air freight times influences the probability that air transport is chosen. Those industries are associated with highest positive and statistically significant estimates of the days/rate ratio in Hummels (2001). This ratio measures the combined effect of ocean shipping times and air freights on the probability of choosing air transport. Similarly, three two-digit SITC 2 industries – textile yarns (65), cement (66), plumbing fixtures (82) – are chosen as time-insensitive as they are associated with the lowest negative and statistically significant estimates of the days/rate ratio in Hummels (2001).[21]

We base our selection of time-sensitive agricultural products on the information of their storage life (Gast 1991). We focus on fruits and vegetables (HS 07 and 08). We classify products with a minimum storage life of 3 weeks or less, for example apricots, beans, currants, and mushrooms, as time-sensitive agricultural products. Time-insensitive agricultural goods are those with a minimum storage life of 4 weeks or longer, for example apples, cranberries and potatoes (Table 9). Since the data are at a very disaggregate level, we only use export data of those agricultural products of the most important exporters (Table A3).

The difference-in-difference gravity regression we estimate is

$$Ln\left(\frac{Exp_{mjk}/Exp_{ojk}}{Exp_{mhk}/Exp_{ohk}}\right) = \alpha + \beta Ln(\frac{GDP_j}{GDP_h}) + \varphi Ln(\frac{GDPC_j}{GDPC_h}) + \delta Ln(\frac{Dist_{jk}}{Dist_{hk}}) + \phi(D_{jk} - D_{hk})$$
$$+ \lambda Ln(\frac{Export\_Time_j}{Export\_Time_h}) + \varepsilon_{mojhk}, \qquad (3)$$

[21] Time-sensitive products are more likely to be shipped by air, while our measure of time delays is from factory to ship. Much of the time delay in exporting (about 75 percent on average) is due to administrative costs, which are nearly identical for sea and air.

where *m* and *o* denote time-sensitive and time-insensitive industries respectively. We estimate gravity regression (3) using disaggregate data of products of time-sensitive and time-insensitive industries, and do so separately for manufacturing and agricultural trade. The test is essentially whether Ecuadorian/Peruvian relative exports of time-sensitive goods are different from Ecuadorian/Peruvian relative exports of time-insensitive goods. The advantage of the double relative is that we are capturing both relative exports of time sensitive to time insensitive goods and making sure that the control group is to the same importer. A negative coefficient on relative time implies that an increase in the relative time to move goods from factory to ship reduces exports of time-sensitive goods by more than time-insensitive goods.

Table 10 presents the results for time-sensitive manufacturing and agricultural goods. The first three columns report the results for manufactures. The coefficient on exporter time is always negative and significant. Countries having longer required time for exports to take place are associated with a lower ratio of exports in time-sensitive goods to exports in time-insensitive goods to the same destination. In particular, a 10 percent increase in the ratio of time is associated with a 2.4 percent reduction in country j's ratio of exports of time-sensitive goods to the exports of time-insensitive goods in relation to country *h*'s ratio.

Results for agricultural products in the difference-in-difference gravity specification are reported in columns 4-6. Because agriculture production depends on climate and land area, we also include the ratio of distance from the equator and the ratio of log land area. As expected, the coefficient on time is always negative and exhibit robustness across specifications. In particular, a 10 percent increase in the relative time of moving goods

from factory to ship reduces relative exports of time sensitive goods by 6 percent. The coefficient estimate on distance is not significant—indicating that domestic restrictions are a bigger constraint to trade in time-sensitive agricultural goods than distance.

Poor trade facilitation affects the composition of trade, preventing countries from exporting time-sensitive goods. Time-sensitive goods also tend to have higher value, implying that some of the effect of time delays on *aggregate* exports results from countries with poor trade facilitation concentrating on low-value time-insensitive goods. Taken together, our results suggest that time delays depress exports, at least part of which is due to compositional effects.

VI. Conclusions

We use a new World Bank dataset on the time it takes to move containerized products from the factory gate to the ship in 126 countries. A difference gravity equation is first estimated, by regressing relative exports of similar countries—by location, endowment, and facing the same trade barriers abroad—on relative time delays, remoteness and other standard variables. Our estimates imply that on average each additional day that a product is delayed prior to being shipped reduces trade by at least 1 percent. We find a larger effect on time-sensitive agricultural goods: a day's delay reduces a country's relative exports of such products by 6 percent on average.

The size of the effect suggests that a one-day reduction in delays before a cargo sails to its export destination is equivalent to reducing the distance to trading partners by about 70 km. This may explain why Mauritius has enjoyed success as an exporter. At 16 days to process cargo, the efficiency of its trade infrastructure is identical to that of the United Kingdom and better than France's.

Our results have important implications for developing countries seeking to expand exports. The recent Doha trade negotiations focused on import barriers in the United States and European Union. However, since OECD tariffs are already quite low, estimates of increased exports by developing countries from eliminating them are also relatively small—around 2-10 percent.[22] For the least developed countries, which already have preferential access, the benefits from additional market access are in some cases negative.[23] In contrast, our estimates imply that improving trade facilitation can have relatively large effects on exports. For example, in Sub-Saharan Africa it takes 48 days on average to get a container from the factory gate loaded on to a ship. Reducing export times by 10 days is likely to have a bigger impact on exports (expanding them by about 10 percent) than any feasible liberalization in Europe or North America.

[22] Amiti and Romalis (2005) use detailed data on tariffs and trade volumes, incorporating preference schemes, and show that average tariffs on non-LDC developing country products in the U.S. and the EU are below 3 percent. Tariffs on comparative advantage goods are also below 3 percent. They estimate market access gains of 2.28 percent following a 40 percent reduction in tariffs in the EU and US, with no exclusions. Anderson, Martin and van der Mensbrugghe (2005) estimate that *world* exports would increase by about 10 percent if there was complete global trade liberalization.

[23] Francois, Hoekman, and Manchin (2005) estimate an export expansion of 6 percent on average, ranging from -8 to 20 percent in poor countries, from full elimination of OECD tariffs.

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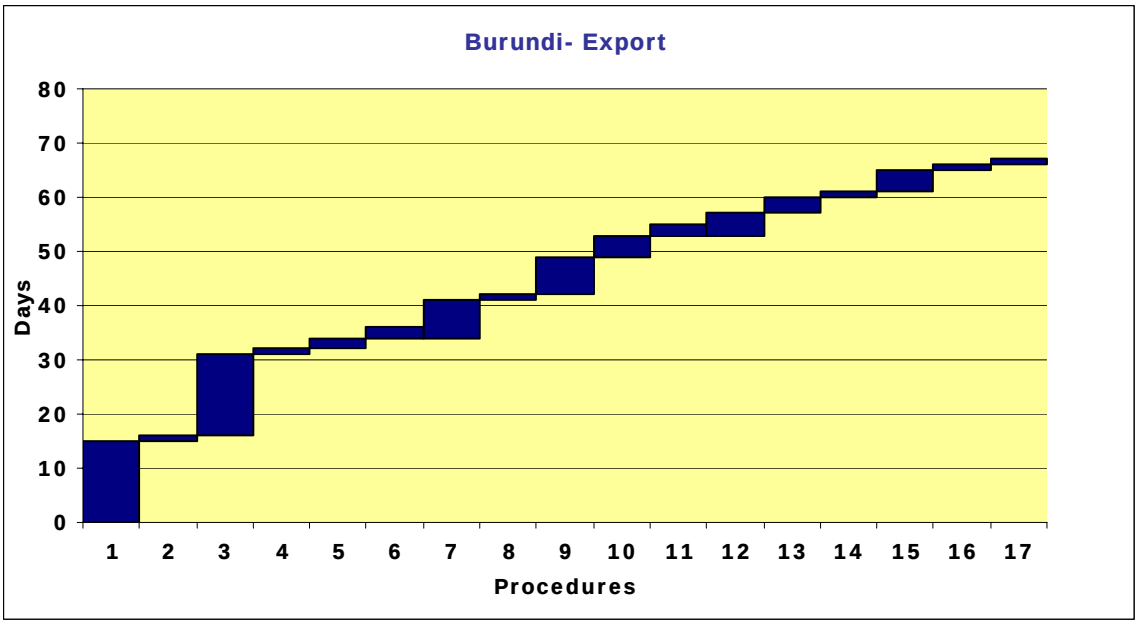
Figure 1: Export Procedures in Burundi



List of Procedures

1 Secure letter of credit
2 Obtain and load containers
3 Assemble and process export documents
4 Pre-shipment inspection and clearance
5 Prepare transit clearance
6 Inland transportation to port of departure
7 Arrange transport; waiting for pickup and loading on local carriage
8 Wait at border crossing
9 Transportation from border to port
10 Terminal handling activities
11 Pay of export duties, taxes or tariffs
12 Waiting for loading container on vessel
13 Customs inspection and clearance
14 Technical control, health, quarantine
15 Pass customs inspection and clearance
16 Pass technical control, health, quarantine
17 Pass terminal clearance

Table 1 Descriptive Statistics by Geographic Region

126-country Sample

Required Time for Exports

	Mean	Standard Deviation	Minimum	Maximum	N. of Obs.
Africa	47.55	21.01	16	116	29
Developed Countries	12.59	7.09	5	29	22
East Asia and the Pacific	23.92	15.70	6	66	13
Europe and Central Asia	32.09	19.08	6	93	22
Latin America and the Caribbean	29.00	8.66	17	43	19
Middle East and North Africa	28.40	9.96	10	49	15
South Asia	32.83	7.47	24	44	6
Total Sample	30.53	18.61	5	116	126

Descriptive Statistics by Regional Trade Agreement

98-country Sample

Required Time for Exports

	Mean	Standard Deviation	Minimum	Maximum	No of Obs.
Andean Community	28.00	7.12	20	34	4
ASEAN 4	22.67	11.98	6	43	6
CACM	33.75	9.88	20	43	4
CEFTA	22.14	3.24	19	27	7
CEMAC	77.5	54.45	39	116	2
CER	10	2.83	8	12	2
CIS	46.43	24.67	29	93	7
COMESA	50.1	16.89	16	69	10
EAC	44.33	14.01	30	58	3
ECOWAS	41.9	16.43	21	71	10*
EFTA	14.33	7.02	7	21	3
ELL FTA	12.00	6.00	6	18	3
Euro-Med	26.78	10.44	10	49	9
European Union	13.00	8.35	5	29	14
MERCOSUR	29.50	8.35	22	39	4
NAFTA	13.00	4.58	9	18	3
SADC	36.00	12.56	16	60	8
SAFTA	32.83	7.47	24	44	6
Total Sample	30.13	19.20	5	116	98

Table 2 Correlation of Explanatory Variables

	Export_Time	GDP	GDPC	Remote	Export_Sign	Import_Sign	Import_Time	Contiguity	Language	Colony
GDP	-0.225	1								
GDPC	-0.611	0.460	1							
Remote	0.404	-0.241	-0.534	1						
Export_Sign	0.796	-0.150	-0.486	0.291	1					
Import_Sign	0.753	-0.160	-0.482	0.283	0.938	1				
Import_Time	0.938	-0.236	-0.630	0.430	0.786	0.778	1			
Contiguity	0.066	-0.012	-0.046	0.013	0.057	0.057	0.063	1		
Language	0.052	0.020	-0.020	0.166	0.049	0.051	0.075	0.120	1	
Colony	-0.038	0.061	0.074	-0.072	-0.032	-0.032	-0.044	0.098	0.171	1
Landlocked	0.393	-0.112	-0.124	-0.014	0.288	0.241	0.327	0.033	-0.032	-0.025

Table 3
Standard Gravity Regressions
Aggregate Bilateral Data - Sample of 126 Exporters

Independent Variables	(1)	(2)	(3)	(4)	(5)
Time		**-0.776 ****		**-0.801****	**-0.708 ****
		(-20.71)		**(-21.26)**	**(-17.27)**
Time_Developing Countries					**-0.097 ****
					(-4.75)
GDP	1.105 **	1.119 **	1.106 **	1.128**	1.122 **
	(108.30)	(110.55)	(105.70)	(108.27)	(105.84)
GDPC	0.081 **	-0.170 **	0.087 **	-0.147**	-0.195 **
	(6.41)	(-9.47)	(5.78)	(-7.74)	(-8.83)
Distance	-1.399 **	-1.411 **	-1.404 **	-1.439**	-1.443 **
	(-64.68)	(65.95)	(-61.11)	(-63.40)	(-63.49)
Contiguity	1.192 **	1.200 **	1.184 **	1.155**	1.163 **
	(11.72)	(11.74)	(11.52)	(11.22)	(11.28)
Language	0.796 **	0.801 **	0.790 **	0.769 **	0.744 **
	(17.67)	(17.95)	(17.16)	(16.92)	(16.19)
Colony	0.768 **	0.817 **	0.777 **	0.862 **	0.844 **
	(8.41)	(8.94)	(8.45)	(9.39)	(9.15)
Landlocked	-0.199 **	0.008	-0.192 **	0.056	0.045
	(-4.56)	(0.19)	(-4.25)	(1.22)	(0.97)
Remoteness			0.026	0.144**	0.162 **
			(0.78)	(4.30)	(4.83)
R^2	0.709	0.719	0.709	0.719	0.717
No of Obs.	17,949	17,949	17,949	17,949	17,949

Notes: (1) T-statistics computed based on the robust standard errors adjusted for clustering on the exporter are in the parentheses. * and ** denote 5 and 1 percent level of significance, respectively.

(2) Importer fixed effects are included in all regressions.

(3) 17,949, the number of observations is equal to the number of *positive* bilateral export flows of 126 exporters to 203 importers.

(4) Developed exporters are those that have annual GDP greater than $10,065 while developing exporters are those that have annual GDP less than $10,065.

Table 4
Simple Difference Gravity Regressions
Aggregate Bilateral Data – Sample 98 Exporters

Independent Variables	*Unrestricted Sample*			*Restricted Sample*		
	(1)	(2)	(3)	(1)	(2)	(3)
Ratio_Time		**-0.380 ****	**-0.468 ****		**-0.321 ****	**-0.331 ****
		(-6.23)	**(-4.98)**		**(-4.76)**	**(-3.39)**
Ratio_GDP	1.115 **	1.142 **	1.149 **	1.071 **	1.099 **	1.100 **
	(38.55)	(39.14)	(38.29)	(30.33)	(31.07)	(30.43)
Ratio_GDPC	0.284 **	0.139 **	0.106	0.699 **	0.460 *	0.452 **
	(5.46)	(2.30)	(1.60)	(5.40)	(3.13)	(2.88)
Ratio_Distance	-1.375 **	-1.376 **	-1.376 **	-1.416 **	-1.423 **	-1.423 **
	(-25.88)	(-25.36)	(-25.19)	(-25.44)	(-25.12)	(-25.23)
Contiguity	-0.003	-0.004 **	-0.004	-0.002	-0.003	-0.003
	(-0.36)	(-0.41)	(-0.42)	(-0.18)	(-0.31)	(-0.32)
Language	0.012 *	0.016 **	0.018**	0.013	0.017 *	0.017 *
	(1.71)	(2.22)	(2.31)	(1.50)	(1.90)	(1.91)
Colony	0.100 **	0.103 **	0.104 **	0.111 **	0.113 **	0.113 **
	(9.40)	(8.85)	(8.68)	(9.90)	(9.46)	(9.43)
Landlocked	-0.499 **	-0.433 **	-0.418 **	-0.437 **	-0.393 **	-0.391 *
	(-5.38)	(-4.82)	(-4.53)	(-3.62)	(-3.32)	(-3.26)
Ratio_Remoteness	-0.425 **	-0.421 **	-0.397 **	-0.507 **	-0.455 **	-0.453 **
	(-5.90)	(-4.98)	(-4.47)	(-5.58)	(-5.35)	(-5.28)
Instruments						
No of Required Signatures for Exports and Imports to Take Place			Yes			Yes
Overidentification Test			*0.201*			*0.719*
P-Value			*0.6540*			*0.39634*
R^2 in the First Stage			0.5067			0.5797
R^2	0.4867	0.4917	0.4972	0.4708	0.4754	0.4847
No of Obs.	44207	44207	44207	29717	29717	29717

Notes: (1) T-statistics computed based on the robust standard errors adjusted for clustering on pairs of exporters are in the parentheses. * and ** denote 5 and 1 percent level of significance respectively.

(2) In the restricted sample, we only keep pairs of countries that belong to the same group of income. The four groups of income are defined as follows: low income group: less than $825; lower middle income group: $825 - $3255; upper middle income group: $3255 - $10065; and high income group: greater than $10065.

(3) 44027 is the number of exporter pair-importer combinations for which trade data are *positive*. It is noteworthy that we pair only exporters that belong to the same regional trade agreement.

Table 5

Simple Difference Gravity Regressions

Aggregate Bilateral Data – Sample 98 Exporters

Independent Variables	(1)	(2)	(3)
Ratio_Time	**-0.321****	**-0.221 ****	**-0.207 ****
	(-4.76)	**(-3.73)**	**(-3.05)**
Ratio_Time_Developing Countries		**-0.555 ****	**-1.004 ****
		(-2.61)	**(-2.70)**
Ratio_GDP	1.099 **	1.082 **	1.074 **
	(31.07)	(30.42)	(29.39)
Ratio_GDPC	0.460 *	0.429 **	0.355 **
	(3.13)	(2.88)	(2.12)
Ratio_Distance	-1.423 **	-1.410 **	-1.401 **
	(-25.12)	(-24.25)	(-22.75)
Contiguity	-0.003	-0.002	-0.001
	(-0.31)	(-0.30)	(-0.13)
Language	0.017 *	0.016 *	0.016 *
	(1.90)	(1.84)	(1.84)
Colony	0.113 **	0.112 **	0.111 **
	(9.46)	(9.61)	(9.59)
Landlocked	-0.393 **	-0.311 **	-0.236 *
	(-3.32)	(-2.59)	(-1.79)
Ratio_Remoteness	-0.455 **	-0.497 **	-0.521 **
	(-5.35)	(-5.87)	(-5.94)
Instruments			
No of Required Signatures for Exports and Imports to Take Place and the Interactions of those two Variables With Dummy Variables for Developed and Developing Countries			Yes
Overidentification Test			*3.176*
P-Value			*0.20434*
R^2 in the First Stage: Ratio_Time			*0.7420*
R^2 in the First Stage: Ratio_Time_ Developing Countries			*0.3657*
R^2	0.4754	0.4778	0.4853
No of Obs.	29717	29717	29717

Notes: (1) T-statistics computed based on the robust standard errors adjusted for clustering on pairs of exporters are in the parentheses. * and ** denote 5 and 1 percent level of significance respectively.

(2) Developed exporters are those that have annual GDP greater than $10065 while developing exporters are those that have annual GDP less than $10065.

Table 6
Simple Difference Gravity Regression

Aggregate Trade Data to the World				
Independent Variables	(1)	(2)	(3)	(4)
Ratio_Time		**-0.326 ****	**-0.347 ****	**-0.437 ****
		(-4.15)	**(-3.82)**	**(-2.96)**
Ratio_GDP	0.976 **	0.994 **	1.004 **	0.999 **
	(30.79)	(30.27)	(20.65)	(29.99)
Ratio_GDPC	0.381 **	0.274 **	0.572 **	0.238 **
	(7.67)	(5.51)	(3.78)	(3.73)
Ratio_Remoteness	0.100	-0.132	-0.259	-0.099
	(0.95)	(-0.94)	(-1.67)	(-0.68)
Landlocked	-0.229	0.177	0.261 *	0.085 *
	(-1.65)	(1.62)	(1.90)	(1.77)
Instruments				
Signatures for Exports and Signatures for Imports to Take Place				Yes
Overidentification Test				*5.122*
P-Value				*0.02362*
R^2 in the First Stage				0.4242
R^2	0.81	0.82	0.79	0.82
No of Obs	342	342	229	342

Notes: (1) T-statistics computed based on the robust standard errors are in the parentheses. * and ** denote 5 and 1 percent level of significance respectively.

(2) Column (3) reports the regression result when we apply the following restriction: we only keep pairs of countries that belong to the same group of income. The four groups of income are defined as follows: low income group: less than $825; lower middle income group: $825 - $3255; upper middle income group: $3255 - $10065; and high income group: greater than $10065.

(3) 342, the number of observations is also the number of pairs of exporters that belong to the same regional trade agreement. Specifically, they are: EU: 91; EFTA: 3; NAFTA: 3; ASEAN: 15; CEFTA: 21; ELL FTA: 3; Andian Community: 6; CIS: 21; MERCOSUR: 6; CACM: 6; COMESA: 45; SADC: 22 (there are only 22 pairs – not 28 pairs – because Malawi, Mauritius, Namibia, and Zambia belong to both COMESA and SADC); EAC: 2 (there are only 2 pairs of exporters for this three-country trade agreement because Kenya and Uganda are members of both COMESA and EAC); ECOWAS: 45; CEMAC: 1; Euro-Med: 36; Australia and New Zealand: 1; and SAFTA: 15.

Table 7
Summary Statistics
Shares of Manufacturing and Agricultural Products in Total Exports

	Manufacturing		**Agriculture**	
	Treatment	Control	Treatment	Control
Mean	0.0664	0.0519	0.0038	0.0026
Standard Deviation	0.107	0.066	0.007	0.005
Minimum	0.00023	0.00058	4.96e-06	2.75e-06
Maximum	0.6293	0.4812	0.0436	0.0332

Table 8

Time sensitivity of products

List of *Time-Insensitive* and *Time-Sensitive* Industries

SITC	*Time-Insensitive* Industries	SITC	*Time-Sensitive* Industries
651	Textile yarn	751	Office machines
652	Cotton fabrics, woven (not including narrow or special fabrics)	752	Automatic data processing machines and units thereof
653	Fabrics, woven, of man-made fiber (not narrow or special fabrics)	759	Parts, nes of and accessories for machines of headings 751 or 752
654	Textile fabrics, woven, other than cotton or man-made fibers	771	Electric power machinery, and parts thereof, nes
655	Knitted or crocheted fabrics	772	Electrical apparatus for making and and breaking electrical circuits
656	Tulle, lace, embroidery, ribbons, trimmings and other small wares	773	Equipment for distribution of electricity
657	Special textile fabrics and related Products	774	Electro-medical and radiological equipment
658	Made-up articles, wholly or chiefly of textile materials, nes	775	Household type equipment, nes
659	Floor covering, etc	776	Thermionic, microcircuits, transistors, valves, etc
661	Lime, cement, and fabricated construction materials	778	Electrical machinery and apparatus, nes
662	Clay and refractory construction materials	881	Photographic apparatus and equipment, nes
663	Mineral manufactures, nes	882	Photographic and cinematographic supplies
664	Glass	883	Cinematograph film, exposed and developed
665	Glassware	884	Optical goods, nes
666	Pottery	885	Watches and clocks
821	Sanitary, plumbing, heating, lighting fixtures and fitting, nes		

Source: Hummels (2001).

Table 9: Time Sensitivity of Agricultural Products

Time-Sensitive Agricultural Products

Code	Description	Storage Life
070200	Tomatoes, fresh or chilled	4-21 days
070410	Cauliflowers & headed broccoli, fresh or chilled	21-28 days
070420	Brussels sprouts, fresh or chilled	21-35 days
070511	Cabbage lettuce (head lettuce), fresh or chilled	14-21 days
070519	Lettuce, except cabbage lettuce, fresh or chilled	14-21 days
070521	Witloof chicory, fresh or chilled	14-28 days
070700	Cucumbers & gherkins, fresh or chilled	10-14 days
070810	Peas (pisum sativum), shelled or unshelled, fresh or chilled	6-14 days
070820	Beans (vigna spp., Phaseolus spp.) fresh or chilled	5-10 days
070920	Asparagus, fresh or chilled	14-21 days
070930	Aubergines (egg-plants) fresh or chilled	7 days
070951	Mushrooms of the genus Agaricus, fresh or chilled	3-4 days
070970	Spinach, New Zealand spinach & orache spinach (garden spinach) fresh or chilled	10-14 days
080610	Grapes, fresh	14-56 days
080711	Watermelons, fresh	14-21 days
080719	Melons (excluding watermelons), fresh	14-21 days
080910	Apricots, fresh	7-21 days
080920	Cherries, fresh	2-21 days
080930	Peaches, including nectarines, fresh	14-28 days
080940	Plums & sloes, fresh	14-35 days
081010	Strawberries, fresh	3-7 days
081020	Raspberries, blackberries, mulberries, loganberries, Fresh	2-3 days
081030	Black, white, red currants & gooseberries, fresh	2-28 days
081050	Kiwifruit, fresh	14-21 days

Note: We classify those agricultural products as time-sensitive ones based on their minimum storage life.

Time-Insensitive Agricultural Products

Code	Description	Storage Life
070110	Seed potatoes, fresh or chilled	120-300 days
070190	Potatoes other than seed potatoes, fresh or chilled	120-300 days
070310	Onions, Shallots, fresh or chilled	28-180 days
070320	Garlic, fresh or chilled	180-210 days
070910	Globe artichokes, fresh or chilled	120-150 days
070490	Cabbages, kohlrabi	60-90 days
071010	Potatoes, uncooked/cooked by steaming/boiling in water, frozen *	120-300 days
071220	Onions, dried (powder etc), not further prepared	Dried
071310	Peas, dried shelled, including seed	Dried
071320	Chickpeas (garbanzos), dried shelled, include seed	Dried
071331	Beans (Vigna mungo or Hepper…etc), dried shelled	Dried
071332	Small red (Adzuki) beans, dried shelled, including seeds	Dried
071333	Kidney beans, including white pea beans, dried shelled including seeds	Dried
071340	Lentils, dried shelled, including seeds	Dried
071350	Broad beans & horse beans, dried shelled including seeds	Dried
071420	Sweet potatoes, fresh or dried	
080111	Coconuts, desiccated	
080119	Coconuts, other than desiccated	
080121	Brazil nuts, fresh or dried, in shell	Dried
080131	Cashew nuts, fresh or dried, in shell	Dried
080211	Almonds, fresh or dried, in shell	Nuts
080221	Hazelnuts or filberts, fresh or dried, in shell	Nuts
080231	Walnuts, fresh or dried, in shell	Nuts
080240	Chestnuts, fresh or dried	Nuts
080250	Pistachios, shelled or not, fresh or dried	Nuts
080620	Grapes, dried	Dried
080810	Apples, fresh	28-336 days
080820	Pears & quinces, fresh	60-210 days
081310	Apricots, dried	Dried
081320	Prunes, dried	Dried
081330	Apples, dried	Dried

Note: The list of time-sensitive and time-insensitive agricultural products is chosen based on Gast (1991) and the availability of trade data from UN Comtrade Database. Specifically, we eliminate classifications to which we can not attribute a precise storage life based on Gast (1991). Examples are HS 070610 – Carrots and turnips, fresh or chilled and HS 080420 – Figs, fresh or dried.

Table 10
Difference-in-Difference Gravity Regressions

Independent Variables	*Manufacturing Products*		*Agricultural Products*	
	(1)	(2)	(1)	(2)
Ratio_Time		**-0.242 ***		**-0.605 ****
		(-2.39)		**(-3.63)**
Ratio_GDP	-0.037	0.008	-0.669 **	-0.681 **
	(-0.64)	(0.13)	(-3.14)	(-3.00)
Ratio_GDPC	1.323 **	1.198 **	1.267 **	1.353 **
	(9.46)	(7.86)	(-4.93)	(5.22)
Ratio_Distance	-0.113 *	-0.111 *	0.144	0.121
	(-2.07)	(-2.08)	(1.14)	(0.98)
Ratio_Distance from the Equator			-7.786 **	-9.615 **
			(-6.40)	(-5.85)
Ratio_Land			0.277	0.410 *
			(1.52)	(2.25)
Contiguity	-0.519 **	-0.537 **	0.604 **	0.518 **
	(-8.13)	(-8.70)	(4.28)	(4.16)
Language	0.158	0.187 *	-0.267	-0.289
	(1.76)	(2.11)	(-1.86)	(-1.97)
Colony	0.093	0.115	-0.450 *	-0.213
	(1.03)	(1.33)	(-2.33)	(-1.22)
Landlocked	0.034	0.049	-0.795 **	-0.891 **
	(0.22)	(0.32)	(-3.12)	(-3.75)
Ratio_Remoteness	-0.345 *	-0.285	-1.410 **	-1.571 **
	(-2.05)	(-1.79)	(-2.74)	(-2.81)
R^2	0.0890	0.0916	0.0582	0.0675
Number of Obs.	1731930	1731930	138565	138565

Notes: (1) T-statistic computed based on the robust standard errors adjusted for clustering on exporter pairs are in the parentheses. * and ** denote 5 and 1 percent level of significance respectively.

Table A1: List of 126 Countries by Region

Africa
Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Côte d'Ivoire, Eritrea, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe

Developed Countries
Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United States, United Kingdom

East Asia and the Pacific
Cambodia, China, Hong Kong (China), Fiji, Indonesia, Malaysia, Mongolia, Papua New Guinea, Philippines, Republic of Korea, Samoa, Singapore, Thailand

Europe and Central Asia
Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia, Slovenia, Macedonia, Ukraine

Latin America and the Caribbean
Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela

Middle East and North Africa
Algeria, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Saudi Arabia, Syria, Tunisia, Turkey, United Arab Emirates, Yemen

South Asia
Bangladesh, India, Maldives, Nepal, Pakistan, Sri Lanka

Table A2: List of 98 Members of Regional Trade Agreements[24]

Andean Community Colombia, Ecuador, Peru and Venezuela

ASEAN Cambodia, Indonesia, Malaysia, Philippines, Thailand and Singapore

CACM El Salvador, Guatemala, Honduras and Nicaragua

CEFTA Bulgaria, Czech Republic, Poland, Romania, Hungary, Slovakia and Slovenia

CEMAC Cameroon and Central African Republic

CER Australia and New Zealand

COMESA Burundi, Eritrea, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Uganda and Zambia

Commonwealth of Independent States (CIS) Armenia, Azerbaijan, Belarus, Kazakhstan, Moldova, Russia and Ukraine

EAC Kenya, Tanzania and Uganda

ECOWAS Benin, Burkina Faso, Ghana, Côte d'Ivoire, Guinea, Mali, Nigeria, Senegal, Sierra Leone and Togo

EFTA Iceland, Norway, Switzerland

ELL FTA Estonia, Latvia, and Lithuania

Euro-Med Algeria, Egypt, Jordan, Israel, Lebanon, Morocco, Syria, Tunisia, and Turkey

European Union Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom

MERCOSUR Argentina, Brazil, Paraguay and Uruguay

NAFTA Canada, Mexico, and the United States

SADC Botswana, Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania and Zambia

SAFTA Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka

[24] There are 7 countries that belong to more than one regional trade agreement: Kenya, Malawi, Mauritius, Namibia, Uganda, Tanzania and Zambia.

Table A3: List of Members of Regional Trade Agreements for Time-Sensitive Trade

Manufacturing Trade Data

Andean Community Colombia, Ecuador, Peru, and Venezuela
ASEAN Cambodia, Indonesia, Malaysia, Philippines, Singapore and Thailand
CACM El Salvador, Guatemala, Honduras and Nicaragua
CEAMAC Cameroon and Central African Republic
CEFTA Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia
CER Australia and New Zealand
COMESA Burundi, Eritrea, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Uganda, and Zambia
Commonwealth of Independent States (CIS) Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova and Russian Federation
ECOWAS Burkina Faso, Ghana, Nigeria, Senegal and Togo
EFTA Iceland, Norway, and Switzerland
ELL FTA Estonia, Latvia and Lithuania
European Union Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and the United Kingdom
MERCOSUR Argentina, Brazil, Paraguay and Uruguay
NAFTA Canada, Mexico and the United States
SADC Malawi, Mauritius, Namibia and South Africa
SAFTA Bangladesh, India, Nepal, Pakistan and Sri Lanka

Agricultural Trade Data

Andean Community Colombia, Ecuador, and Peru
ASEAN Malaysia and Thailand
CACM El Salvador, Guatemala, Honduras and Nicaragua
CEFTA Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia
CER Australia and New Zealand
COMESA Kenya, Madagascar, Malawi, Mauritius, Namibia, Uganda, and Zambia
Commonwealth of Independent States (CIS) Belarus, Kazakhstan, Kyrgyzstan and Russian Federation
EFTA Iceland, Norway, and Switzerland
ELL FTA Estonia, Latvia and Lithuania
European Union Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Turkey and the United Kingdom
MERCOSUR Argentina, Brazil and Uruguay
NAFTA Canada, Mexico and the United States
SAFTA Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka