Calculating Tariff Equivalents for Time in Trade

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Executive Summary

How does time affect trade, what costs does it impose, and how can we measure those costs in dollars? This study addresses each of these questions.

For goods subject to rapid depreciation and uncertain demand, rapid delivery is especially important; for bulk commodities and simple manufactures it is less so. Yet overall, the rising share of air cargo in world trade over less expensive ocean shipping shows that timely delivery is increasingly important. Trade is shifting toward highly time-sensitive, complex manufactures, and production is increasingly segmented across countries and continents.

Data on time in trade is abundant. The World Bank's *Doing Business* reports measure the time required to import and export in 175 countries. Trading across borders, for example, takes longer in developing countries than in developed ones for a number of reasons, including the quality of infrastructure, procedural coordination, and corruption. But what precisely are the costs for importers and exporters? When time costs are expressed in days rather than dollars, this question is hard to answer. To answer it, we present a method for expressing time costs in ad-valorem, or "tariff equivalent," terms. To calculate the tariff equivalents we

1. Estimate the value of one day saved in transit for each *product* ("the per-day value of time savings" by product), drawing on trade and shipping data that reveal how much consumers value timely delivery of each good;
2. Calculate the per-day value of time savings for each *country*, based on the goods it trades or might one day trade; and
3. Calculate *tariff equivalents for import and export waiting times* by combining each country's per-day value of time savings with the *Doing Business* data.

As expected, we find that bulk products are less time sensitive than complex manufactures and goods subject to rapid depreciation, such as fresh fruit and vegetables. For example, crude oil exhibits no time sensitivity, while each day in transit for vegetables and fruit is equivalent to lowering their prices by 0.9 percent.

At the country level, OECD countries' exports are the most time sensitive, while Middle East and North African countries' are the least so. This reflects the importance of sophisticated manufactures in OECD exports compared to bulks such as crude oil in the exports of Middle Eastern and North African countries. When we combine the per-day values with the *Doing Business* data, we find that the tariff equivalents for import delays exceed tariffs in every region;

and the tariff equivalents for export delays exceed tariffs faced by exporters in all regions except the OECD and East Asia and the Pacific. In the Middle East and North Africa, the tariff equivalents for export delays are more than twice the average applied tariff faced by exporters; in Europe and Central Asia and sub-Saharan Africa, the tariff equivalents are three and four times the tariffs faced by exporters, respectively.

Our findings suggest that improved facilitation of trade should be a priority for importers and exporters alike. In the current round of global trade negotiations at the World Trade Organization, substantial benefits from trade facilitation improvements will be lost if the negotiations collapse.

For donors, tariff equivalents for time in trade serve a number of practical purposes: as donors seek to allocate scarce funds for trade facilitation assistance, they may use tariff equivalents to identify countries where trade delays are most costly. In addition, tariff equivalents allow donors to integrate time costs directly into value chain analyses, which they may use for planning competitiveness assistance programs. Finally, they may use tariff equivalents for prospective or retrospective analysis of returns on their trade facilitation investments.

1. Time as a Trade Barrier

World trade has grown rapidly in recent decades, but goods do not yet flow freely from place to place. The large majority of firms serve only domestic markets, and among firms that do export only a small portion of sales are to foreign customers. Bernard *et al*. (2003) show that only one-fifth of U.S. manufacturing firms export, and two-thirds of these export less than 10 percent of output. The pattern is similar in other countries (e.g., Canada, France, Taiwan, South Korea, Colombia, Mexico, and Morocco). Roughly a quarter of world trade takes place between countries sharing a border, and half occurs between partners less than 3,000 km apart (Berthelon and Freund 2004). National borders themselves appear “thick.” For example, McCallum (1995) showed that the quantity of trade between Canadian provinces was about 22 times greater than trade between Canadian provinces and U.S. states of similar size and distance.

Why don’t countries trade more? Discussions of trade barriers usually focus on tariffs, but average import tariffs worldwide dropped from 8.6 to 3.2 percent between 1960 and 1995 (Clemens and Williamson 2002). Perhaps nontariff barriers are the primary obstacles to trade. This report examines a particular type of nontariff barrier: time delays.

WHY TIME MATTERS IN TRADE

Speedy delivery doesn’t matter so much for bulk commodities and simple manufactures, but it is critical in two circumstances: when goods are subject to rapid depreciation and when demand for them is uncertain. Some goods’ value depreciates on a daily or weekly basis. For example, lengthy transit times for fresh produce and cut flowers result in spoilage. Goods subject to rapid technological obsolescence, such as advanced electronics, can also lose significant value while on long ocean voyages.

When demand is certain, firms can place orders well in advance of final sales and be unconcerned by long waits. Consumers, however, often prefer one variety of a good over another, and their preferences may shift quickly. Firms do not know about these preferences well in advance of final sales. The longer firms are able to delay production decisions, the more information they can obtain about preferences and adjust accordingly. Exporters subject to long delays for goods in transit between markets, however, must produce further in advance of final sales, and with significantly less information about market conditions. For example, during holiday gift-giving seasons, toy manufactures rarely know in advance which toys will emerge as children’s favorites. As the holidays approach, manufacturers receive market signals about preferences in the form of product reviews and early sales. If they can defer production and shipping they can adjust inventories accordingly. The ability to respond quickly to new market information is also an important advantage among apparel firms, which are unable to predict which fashions will be especially popular. Evans and Harrigan (2003) show that clothing lines with high re-stocking rates are more likely to come from exporters closest to the U.S. market.

Aizenman (2004) and Schaur (2006) show that fast air shipping may be an effective way to handle volatile international demand. Firms can serve a foreign market with a mix of inexpensive but slow ocean shipping and fast but expensive air shipping. An exporter using slow ocean transport must ship goods before it has full information about the demand that will materialize. Using only ocean shipping minimizes the total shipping bill, but at some risk: if demand is low, the exporter incurs losses from placing too many goods on the market. Alternatively, the exporter can wait until close to the sale date to obtain better information about foreign demand and then meet that demand using air shipping. Schaur (2006) shows that firms rely more on air shipment when shipping goods with historically volatile demand. Furthermore, unusually high demand leads exporters to air ship additional quantities. In short, any good subject to volatile demand can benefit from rapid delivery times.

THE GROWING DEMAND FOR TIMELY DELIVERY

The rising share of air cargo in world trade demonstrates the increasing importance of timely delivery. Since 1951, ton-miles of air cargo shipped worldwide have grown at a rate of 11.7 percent per annum, much faster than the growth of trade or the growth in ocean cargo. For the United States in 2004, air shipments comprised more than a third of imports and more than half of exports with non-adjacent neighbors. The pattern is similar in Latin America. For Argentina, Brazil, Colombia, Mexico, Paraguay, and Uruguay air cargo represents at least 30 percent of trade with non-adjacent neighbors (Hummels 2007a).

This growing demand for timely delivery is rooted in (1) the shift in world trade from bulk commodities to inherently time-sensitive complex manufactures,[1] (2) wealthy consumers' preference for precise product characteristics and ability and willingness to pay for fast delivery, and (3) increasingly segmented production chains. Consumers' increasing willingness to pay for precise product characteristics pressures manufacturers to produce to specifications and to adapt rapidly. Consumers also see rapid delivery as a measure not only of service quality but of product quality—waiting renders a good inferior. In addition, consumers are using their higher incomes to pay directly for timely delivery (e.g., many pay Internet retailers extra for rush delivery).

Timeliness is crucial to the smooth functioning of highly segmented production chains that locate production tasks—research and development, component manufacture, final assembly, marketing, distribution—where the best, most efficient resources are available.[2] As a result,

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[1] Demand for speedy delivery has also risen for less time-sensitive goods. One example is white cotton underwear: firms cannot raise prices above the market price, as consumers will simply buy these standard garments from producers who have not raised prices. Instead, the producer must streamline production, which includes reducing production, storage, and transit times.

[2] For example, research and development requires a ready supply of talented scientists and engineers, component manufacture requires inexpensive supplies of capital and capital machinery, and assembly requires low cost labor. Few countries have all three.

countries increasingly specialize in stages of production rather than entire products, as documented by Hummels, Ishii and Yi (2001). This type of trade promises large gains, but only if the stages of production can be linked in a timely way. For example, multi-stage production networks often rely on “just-in-time” inventory techniques to minimize inventory on-hand and in the pipeline. But the ability to use just-in-time techniques is limited when parts suppliers must endure port delays, lengthy inland transport, and prolonged customs clearance.

REPORT STRUCTURE

In the remainder of this report, we present a method for expressing the cost of trade delays in ad-valorem, or “tariff equivalent” terms. Chapter 2 summarizes the methodology, and Chapter 3 discusses findings arising from applying the methodology in the context of trade facilitation and the implications of those findings for donors. The appendix provides a detailed technical explanation of the methodology for calculating tariff equivalents. In addition, a compact disc that accompanies this report contains data on the time sensitivity of more than 1,000 products (see Chapter 2).

2. Calculating Tariff Equivalents in Three Steps

Published annually since 2004, the World Bank's *Doing Business* report presents comparable, quantitative measures of business regulation in 175 countries.[3] One category of indicators—Trading Across Borders—measures the time, cost, and number of procedures required to import and export in different countries.[4] Table 2-1 presents data from this category for inland transportation and handling, customs clearance and technical control, and ports and terminal handling for each of the World Bank's regional groupings. [5]

Table 2-1

Time to Import and Export in Days, by Region

Region	Import				Export			
	Total	Customs	Ports	Inland	Total	Customs	Ports	Inland
High income: OECD	5.5	1.4	2.5	1.6	4.7	1.9	1.1	2.1
East Asia and Pacific	8.7	4.2	2.7	1.9	5.3	2.4	1.4	1.5
Europe and Central Asia	14.6	4.6	3	7.2	11.7	5.4	2.8	3.7
Latin America and Caribbean	10.5	3.7	4.3	2.5	8.6	3.4	2.7	2.7
Middle East and North Africa	15.6	5.4	5.9	4.4	14.9	8.6	3.3	3.2
South Asia	19	4.4	6.1	8.5	15.8	6.7	3.7	5.4
Sub-Saharan Africa	28.5	9.3	10	9.2	18.9	8.6	4.5	5.9

SOURCE: Doing Business 2007*; aggregation by the author.*

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[3] *Doing Business* data are available online at www.doingbusiness.org.

[4] Indicator definitions and details on methodology for collection of the data can be found at http://www.doingbusiness.org/MethodologySurveys/TradingAcrossBorders.aspx.

[5] Regional classifications correspond to those used on the *Doing Business* website, which differ somewhat from those used in other World Bank publications. We calculate total time in trade without accounting for time to complete documentation, as importers and exporters may begin work on documentation while production is underway.

Import delays in OECD countries are 5.5 days, including about a 1.5 days each for customs and inland transport, and 2.5 days for goods waiting in ports. Outside the OECD, import delays range from 8.7 days in East Asia and the Pacific to more than 4 weeks in sub-Saharan Africa. In each region, export delays are typically 1-3 days less than import delays.

Most of the difference between OECD and other countries comes from longer delays for customs clearance and inland transport. In addition, port waiting times are substantial in Africa and South Asia. Inland transport is slower outside the OECD for several reasons. Countries are physically larger, with trade activity occurring away from coasts (e.g. India). Inland infrastructure is of poor quality, with inferior road and rail lines and multimodal linkages. Customs delays may be longer in developing countries for a number of reasons, including excessive inspection of cargoes, redundant and poorly coordinated procedures, poor communication and information management, low-skill levels among staff, and corruption. Port delays may partially reflect a port's efficiency, but are often caused by infrequent service: smaller, poorer nations distant from major trade lanes receive fewer, less frequent calls from ocean liners (Hummels *et al* 2007).

Presumably, long wait times are more costly than short ones, but by how much? One may attempt to answer this question by estimating determinants of import demand using a "gravity equation." The equation relates the volume of trade between two countries to two types of variables: those meant to capture "trade potential" (the amount of trade that would exist in the absence of trade costs) and variables that capture or act as proxies for trade costs.

Suppose, for example, that improved infrastructure lowers transportation costs and that lower transportation costs increase trade, but we do not directly observe the effect of improved infrastructure on transportation costs. The gravity equation approach thus looks for direct correlations between infrastructure and trade.[6] Or, in the case of time costs, one can see how time lags measured in days lower trade volumes, as in Djankov and Freund (2006). Gravity equation studies are widely employed because they are not data-intensive, requiring only trade data and some trade costs proxies, and because they turn up many interesting correlations. But they suffer from two weaknesses. First, the equations require the strong assumption that one knows the causal relationship between time-cost variables and trade.[7] Second, and most relevant to this study, gravity equations link infrastructure and waiting times to trade *volumes*, but do not reveal the *costs* of those wait times in monetary terms.

In the following subsections, we present a three-step method for quantifying these costs in ad-valorem or tariff equivalent terms. To calculate tariff equivalents for time in trade, we

1. Estimate the value of one day saved in transit for each *product* ("the per-day value of time savings" by product);

[6] See Wilson *et al* (2004) for an example.

[7] Hillberry and Hummels (2004, 2005) provide evidence for alternative models of trade that suggest how standard gravity equation approaches miss entirely the channels through which trade costs affect trade.

2. Calculate the per-day value of time savings for each *country*, based on the goods it trades or might one day trade; and

3. Calculate *tariff equivalents for import and export waiting times* by combining each country's per-day value of time savings with its Trading Across Borders data from *Doing Business*.

These steps are summarized below and presented in detail in the appendix.

ESTIMATE PER-DAY VALUE OF TIME SAVINGS FOR EACH PRODUCT

Hummels (2001) estimates the value of time savings by calculating the premium for air shipping that firms are willing to pay to avoid an additional day of ocean transport. The choice of air versus ocean shipping depends on benefits and costs of rapid delivery. The *benefit* is the value the firm or its consumer attaches to saving a day in transit, while the *costs* are the higher freight prices for air shipping. Note that the units of these two cost components are different: the relative freight price is measured in terms of the delivered price of the traded goods, while time is measured in days. Our objective is to convert the time measured in days into tariff equivalents.

In making this conversion, we note that consumers demand less when prices are higher. The decrease in demand when prices increase by one percent is called the *price elasticity of demand.* Balanced against this is the value that consumers attach to getting goods in a more timely fashion ("the benefit of time saving"). The tariff equivalent for time saving comes from combining the estimated price elasticity of demand with the benefit measured in days. (This procedure is explained in detail in the appendix.)

The data for this exercise come from two sources. The first is a database on U.S. merchandise imports from 1991–2005. The database reports the monthly values, quantities, and transportation modes of imports, disaggregated by product, by entry point into the United States and by exporter. The second is a table of shipping times between ports around the world.[8] From these data we are able to calculate average shipping times between ports in various countries and those in the United States.[9]

Table 2-2 lists per-day values of time savings for selected products, as well as those products' shares in world trade.[10] Which goods are especially time sensitive? We see in Table 2-2 that bulk products such as crude oil, coal, and fertilizers exhibit no time sensitivity. Vegetables and fruit have a time sensitivity of 0.9 percent ad-valorem. That is, from a consumer's perspective, each day that a firm saves by air shipping rather than ocean shipping the good is equivalent to lowering the good's price by 0.9 percent. Conversely, a firm would pay the equivalent of a 16.2 percent

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[8] "Port2Port Evaluation tool," Fourth Quarter 2006, *CompPair Data, Inc.* www.ComPairdata.com.

[9] There are significant differences in shipping times depending on U.S. entry points. For example, Rotterdam to New York is much shorter than Rotterdam to Long Beach.

[10] A compact disc accompanying this report lists per-day values of time savings for over 1,000 products. The products are classified at the four-digit level of the Harmonized Commodity Description and Coding (HS) System.

tariff to avoid putting fruits and vegetables on a boat for the (U.S. import average) ocean voyage of 18 days.[11]

Table 2-2

Value of Time Saving and Share in World Trade for Selected Products

Description	Share in World Trade (%)	Tariff Equivalent for Value of Time Saving Per Day (%)
Road vehicles (including air-cushion vehicles)	7	2
Coffee, tea, cocoa, spices, and manufactures thereof	0.5	1.1
Telecom, sound recording and reproduction app and equip.	4.4	0.9
Vegetables and fruit	1.3	0.9
Motor vehicle parts	2.4	0.8
Cereals and cereal preparations	0.9	0.8
Articles of apparel and clothing accessories	3.7	0.7
Power generating machinery and equipment	2.6	0.6
Textile yarn, fabrics, made-up articles, n.e.s.	2.3	0.6
Office machines and automatic data processing machines	5.4	0.5
Medicinal and pharmaceutical products	2.9	0.3
Footwear	0.8	0.2
Crude oil	5.9	--
Coal, coke and briquettes	0.5	--
Fertilizers (except crude of Group 272)	0.1	--

Note: Categories correspond to Standard Industrial Trade Classification System (SITC) two-digit categories. Selected categories have been further disaggregated for purposes of illustration.

CALCULATE PER-DAY VALUE OF TIME SAVINGS FOR EACH COUNTRY

We next calculate values of time savings for each country by averaging the values of time for the products in each country’s trade basket. We provide estimates for imports and exports using two alternative weighting schemes: (1) the current imports and exports of the country, and (2) the imports and exports of the region to which the country belongs.

Why provide these different weights? Consider a country whose exports have a per-day time value of 0.4 percent ad-valorem using its current export basket. Were the country to reduce trade delays by 2 days, holding fixed the goods that it imports, it would have achieved the equivalent of a 0.8 percentage point decrease in tariffs facing its exporters.

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[11] Our estimates of the value of time savings for each product do not vary from country-to-country; for example, the ad-valorem value of time saving for “Coffee, tea, cocoa” is 1.1 percent for all exporters of this good.

But a reduction in trade delays could also change *what* the country trades. Suppose the country has the right climate to produce fruit and is in fact producing it for domestic consumption, but does not export fruit precisely because lengthy delays price it out of export markets. Here, time costs act like a prohibitive tariff. But, because fresh fruit is weighted by its zero share in the country's current export basket, it is missing entirely from the country's calculated time cost. Weighting by the export basket of the wider region allows one to capture such "missed" or ("potential") opportunities, but the time sensitivity of the country's *current* trade basket is portrayed less precisely. In light of the respective advantages of each approach, we present per-day time values for each country under both weighting schemes.

In Table 2-3, we report our calculations of per-day tariff equivalents for the time costs in seven regions. Tables A-1 and A-2 list per-day tariff equivalents by country. On the export side, OECD countries[12] have the highest per-day tariff equivalents (1.0 percent), while Middle East and North African countries have the lowest (0.4 percent ad-valorem). This reflects the relative importance of sophisticated manufactures in OECD exports compared to bulks such as crude oil in the exports of Middle Eastern and North African countries. On the import side, East Asia and the Pacific and the OECD show the least time sensitivity (0.8 percent), while South Asia shows the most (1.5 percent).

Table 2-3
Per-day Tariff Equivalents, by Region

Region	Imports	Exports
High income: OECD	0.8	1.0
East Asia and Pacific	0.8	0.7
Europe and Central Asia	0.9	0.7
Latin America and Caribbean	0.9	0.8
Middle East & North Africa	1.0	0.4
Sub-Saharan Africa	0.9	0.9
South Asia	1.5	0.6

CALCULATE TARIFF EQUIVALENTS OF IMPORT AND EXPORT WAITING TIMES

Finally, we combine our values for time savings with the *Doing Business* "Trading Across Borders" data. This provides us with our principal output: tariff equivalents of the total import and export time delays for each country.

To see how this works, review the example of China in Table 2-4. The tariff equivalent of the time cost of one day in trade for China's imports is 0.835 percent (weighting by its current import basket). China's importers face 4 days of waiting in customs, 2 days in ports, and 2 days in inland transit, for a total of 8 days. Multiplying the per-day tariff equivalent by the total number of days,

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[12] OECD is treated as a region for the purpose of this analysis.

we arrive at a total tariff equivalent of 0.835 percent * 8 days = 6.7 percent. Of this 6.7 percent, half comes from customs, one-fourth from port delays, and one-fourth from inland transportation.

Table 2-4
Tariff Equivalents for Import Delays in China

Tariff Equivalent of One Day of Waiting for Imports		0.835%
Trading Across Borders Topic	Days	Tariff Equivalent (%)
Inland transport	2	1.7
Ports	2	1.7
Customs	4	3.3
TOTAL	8	6.7

Notes: In this example, China's current basket of imports is used to calculate the per-day tariff equivalent. The total does not include time to complete documentation.

SOURCE: David Hummels and World Bank, Doing Business 2007.

Table 2-5 presents tariff equivalents by region, compared to average tariffs applied to imports and the average applied tariffs *faced by* exporters. Appendix Tables A-1 and A-2 present tariff equivalents for each country's import and export delays.

Table 2-5
Tariff Equivalents vs. Applied Tariffs, by Region (all values are percent ad-valorem)

Region	Per-Day	Inland Transport	Customs	Port	Total	Applied Tariff
IMPORTS						
High income: OECD	0.8	1.3	1.2	2.1	4.6	2.7
East Asia and Pacific	0.8	1.5	3.3	2.1	6.9	5.6
Europe and Central Asia	0.9	6.3	4.0	2.6	12.8	4.7
Latin America and Caribbean	0.9	2.1	3.1	3.7	8.9	7.0
Middle East and North Africa	1.0	4.4	5.4	5.9	15.6	10.0
Sub-Saharan Africa	0.9	8.3	8.4	9.0	25.6	11.2
South Asia	1.5	13.0	6.7	9.4	29.1	25.5
EXPORTS						
High income: OECD	1.0	2.0	1.8	1.1	4.5	4.5
East Asia and Pacific	0.7	1.1	1.7	1.0	3.8	5.2
Europe and Central Asia	0.7	2.7	3.9	2.0	8.4	2.8
Latin America and Caribbean	0.8	2.2	2.8	2.2	7.1	3.9
Middle East and North Africa	0.4	1.2	3.2	1.2	5.5	2.7
Sub-Saharan Africa	0.9	5.3	7.7	4.0	16.8	4.1
South Asia	0.6	3.2	4.0	2.2	9.5	6.5

SOURCE: David Hummels; MacMap HS6; World Bank, Doing Business 2007, *"Trading Across Borders" data. Totals do not include time to complete documentation.*

3. Findings and Implications

What do we find when we compare tariff equivalents for time in trade to tariffs, and what are the implications of these findings for donors' program planning and evaluation?

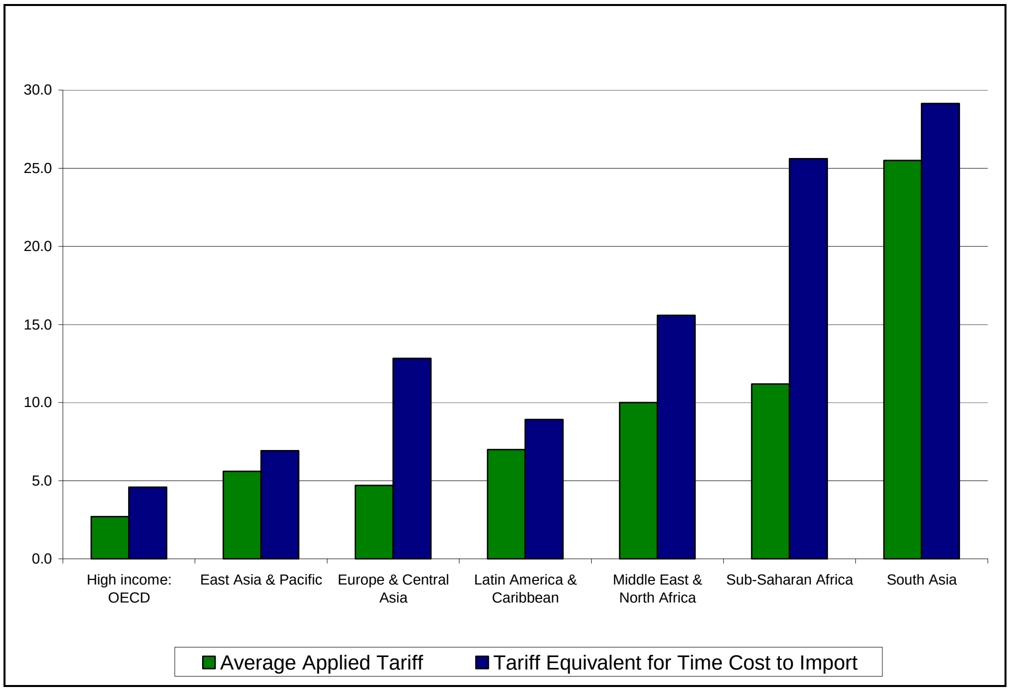
TIME DELAYS VERSUS TARIFFS

Figure 3-1 compares the tariff equivalents for import delays to applied import tariffs; Figure 3-2 compares the tariff equivalents for time to export to the applied tariffs *faced by* exporters. For imports, the tariff equivalents for time delays exceed tariffs in every region. In two regions, sub-Saharan Africa and Europe and Central Asia, the tariff equivalents are more than twice the average applied tariff. For exports, the tariff equivalents exceed tariffs faced by exporters significantly in all regions except the OECD and East Asia and the Pacific. In the Middle East and North Africa, the tariff equivalents for export delays are more than twice the average applied tariff faced by exporters; in Europe and Central Asia and sub-Saharan Africa, the tariff equivalents are three and four times the tariffs faced by exporters, respectively.

These findings suggest the following:

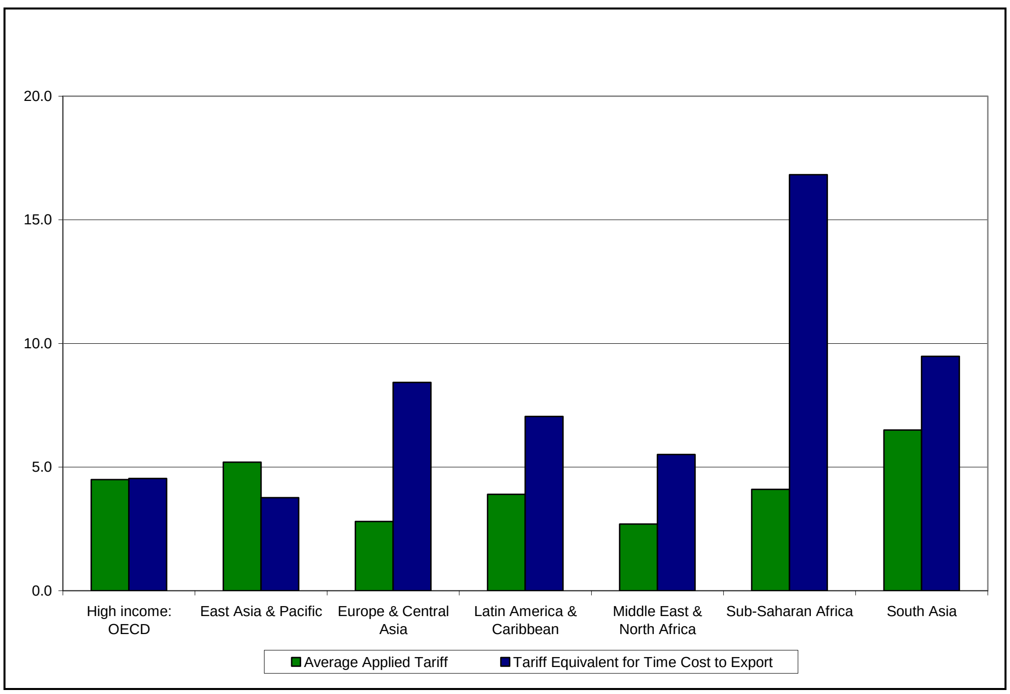
- ***Reducing delays may give exporters from developing country better access to markets than reducing trade partners' tariffs.*** In most regions, developing countries' own export bottlenecks are more costly than the tariffs faced by their exporters. Reducing export time delays offers countries a means to improve their competitiveness vis-à-vis other exporters, even when all competitors face the same tariffs in markets of interest.
- ***Reducing time barriers is also important for importers.*** Consumers of imported goods stand to gain when import times are reduced, as do manufacturers that use imported, intermediate goods. Time delays imposed on intermediate goods are particularly costly because they multiply through the value chain. For example, if an apparel factory uses imported fabric in the manufacture of garments, the production and export of its time-sensitive final products—garments—is also delayed.
- ***Improving trade facilitation should be a priority for all parties in trade negotiations.*** The Doha Round of World Trade Organization negotiations has foundered in part because of sharp disagreement over the scope and scale of multilateral tariff reductions. Yet the parties have made progress toward agreement on trade facilitation issues. As proposed so far, the agreement calls on developing countries to identify their needs in

Figure 3-1
Tariff Equivalents for Time in Trade vs. Average Tariffs Applied to Imports



SOURCE: David Hummels; MacMap HS6; World Bank, Doing Business 2007, *"Trading Across Borders" data. Totals do not include time to complete documentation.*

Figure 3-2
Tariff Equivalents for Time in Trade vs. Average Applied Tariffs Faced by Exporters



SOURCE: David Hummels; MacMap HS6; World Bank, Doing Business 2007, *"Trading Across Borders" data. Totals do not include time to complete documentation.*

trade facilitation capacity building, and to make their trade facilitation commitments contingent on their receiving technical assistance. While a comparative analysis of the likely welfare gains from tariff cuts versus trade facilitation improvements is beyond the scope of this paper, our findings suggest that most substantial, potential increases in market access—those from improved facilitation of trade—may be lost if negotiations collapse over tariffs.

POTENTIAL APPLICATIONS TO DONOR ASSISTANCE

Prioritizing Trade Facilitation Assistance

Tariff equivalents for time in trade allow donors to identify countries where trade delays are most costly. For example, two countries may have import and export delays of similar length, but the *cost* of those delays may differ according to the time sensitivity of each country's import and export basket. Donors may wish to consider the relative costliness of trade delays when deciding how to allocate funding for trade facilitation assistance.

Programming Country Competitiveness Assistance

In Chapter 2 we noted that inland transport, port, and customs delays may inhibit a country from exporting time-sensitive goods (e.g., fresh fruits and vegetables). Thus, donors seeking to assist the development of specific economic sectors should first evaluate the time sensitivity of the sector, and whether time delays are likely to hamper competitiveness in that sector. If the delays are too high, assistance to reduce delays should precede or at least parallel other sector development activities.

Timeliness, however, is only one among many factors that affect competitiveness. Because tariff equivalents express time costs in monetary terms, donors can integrate those costs directly into value chain analyses and compare them with regulatory costs (e.g., taxes and costs of compliance with licensing and permitting regulations). Such information may help donors to prioritize activities to enhance partner countries' competitiveness.

Analyzing Returns on Investments

In Chapter 2, we noted that converting days into dollars allows one to assess the return on investment of various trade facilitation improvements. The return can be estimated prospectively to compare projected benefits of proposed projects, or retrospectively to evaluate projects.

Analysis of the cost-effectiveness of different trade facilitation reforms is beyond the scope of our study, and generalizations could be misleading. For example, one might argue that customs reforms are generally cheaper than improvements in inland transport networks and ports, and that reforms should take priority when delays are of similar length. Yet customs hardware can be expensive, and inland transport networks and ports can be improved through relatively inexpensive process reengineering. Nevertheless, our findings suggest intriguing directions for future benefit-cost analyses. The country-level tariff equivalents in Tables A-1 and A-2 in the appendix can serve as *starting points* for comparative analysis of returns on proposed investments.

Applications Beyond Trade Facilitation

We have applied an innovative method for expressing time costs in monetary terms within the context of trade facilitation. Yet this method is applicable to many domains where time affects trade. For example, one may estimate tariff equivalents for

- ***Pre-production in traded goods***—The time to source production inputs (e.g., intermediate goods such as fabric used to manufacture apparel for export).
- ***Production***—Assembly times.
- ***Post-production***—The time to complete activities that occur after production but before shipment (e.g., preshipping paperwork, coordinating shipments' arrival at port with arrival of ships).

Applying tariff equivalents in these domains is a promising direction for future research.

References

Aizenman, Joshua. 2004. Endogenous pricing to market and financing cost. J*ournal of Monetary Economics* 51(4), 691–712

Bajpai, Jitendra, Carruthers, Robin, and Hummels, David. 2003. Trade and Logistics: An East Asian Perspective. In *East Asia Integrates* (eds: Krumm, Kathie, and Kharas, Homi) World Bank.

Berthelon, Matias and Freund, Caroline L. 2004. On the Conservation of Distance in International Trade. World Bank Policy Research Working Paper No. 3293.

Blonigen, Bruce and Wilson, Wesley. 2006. New Measures of Port Efficiency Using International Trade Data. NBER Working Paper 12052.

Clemens, Michael and Williamson, Jeffrey. 2002. Why did the tariff-growth correlation reverse after 1950? NBER Working paper 9181.

Disdier, Anne-Celia and Head, Keith. 2004. The Puzzling Persistence of the Distance Effect on Bilateral Trade. Centro Studi Luca D'Agliano Development Studies Working Papers, N. 186.

Djankov, Simeon and Freund, Caroline. 2006. Trading on Time. World Bank Policy Research Working Paper 3909.

Evans, Carolyn and Harrigan James. 2005. Distance, Time, and Specialization. *American Economic Review.*

Finger, J.M. and Yeats, Alexander. 1976. Effective Protection by Transportation Costs and Tariffs: A Comparison of Magnitudes. *Quarterly Journal of Economics*, 169-176.

Harrigan, James. 2005. Airplanes and Comparative Advantage. NBER 11688.

Harrigan, James and Venables, Anthony. 2004. Timeliness, Trade and Agglomeration. NBER 10404.

Hummels, David. 2001. Time as a Trade Barrier. Purdue University. http://www.mgmt.purdue.edu/faculty/hummelsd/research/time3b.pdf.

Hummels, David. 2007a. Transportation and International Trade in the Post War Era. *Journal of Economic Perspectives* (forthcoming).

Hummels, David, Ishii, Jun and Yi, Kei-Mu. 2001. The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics*, 54.

Hummels, David and Lugovskyy Volodymyr. 2006. Are Matched Partner Trade Statistics a Usable Measure of Transportation Costs? *Review of International Economics* 14 (1) 69-86.

Hummels, David, Lugovskyy Volodymyr, and Skiba, Alexandre. 2007. The Trade Reducing Effects of Market Power in International Shipping. NBER 12914.

Hummels, David and Skiba, Alexandre. 2004. Shipping the Good Apples Out: An Empirical Confirmation of the Alchian-Allen Conjecture. *Journal of Political Economy* 112, 1384-1402.

Moenius, Johannes. 2001. Information versus Product Adaptation: The Role of Product Standards in Trade. Mimeo. Northwestern University.

Mohammed, Saif I. and Jeffrey G. Williamson. 2004. Freight Rates and Productivity Gains in British Tramp Shipping 1869-1950. *Explorations in Economic History*, Volume 41, 172-203.

Rauch, James. 1999. Networks v. markets in international trade. *Journal of International Economics.*

Rauch, James. 2002. Ethnic Chinese networks in international trade. R*eview of Economics and Statistics.*

Schaur, Georg. 2006. Hedging Price Volatility Using Fast Transport. Mimeo. Purdue University.

Waters, W.G. 1970. Transport Costs, Tariffs, and the Patterns of Industrial Protection, *American Economic Review*, 1013-1020.

Wilson, John, Mann, Catherine, and Otsuki Tsunehiro. 2004. Assessing the Potential Benefit of Trade Facilitation: A Global Perspective. World Bank Policy Research Working Paper 3324.

Appendix. Technical Methodology

We calculate the tariff equivalent costs of time delays in customs procedures in three steps. First, we use data on modal choice (air versus ocean shipping in international trade) to identify the value that exporters place on time savings for each good traded, measured in ad-valorem or tariff equivalent terms. Second, we combine the estimates of time savings for each good with *Doing Business* data on time lags associated with inland shipping, port delays, and customs clearance for each exporter. This allows us to calculate, for every good and every exporter, the ad-valorem equivalent cost of time lags. Third, we aggregate over products to arrive at concise estimates of time delays.

STEP ONE: ESTIMATING THE VALUE OF TIME SAVINGS FROM MODAL CHOICE

We can estimate the value of time savings by observing three things: the values of goods imported via air versus ocean shipping; the price of air shipping relative to ocean shipping; and the number of days in transit for air relative to ocean shipping. The idea is to explain when air shipment is chosen as a function of the premium paid for air shipment, and the time saved. When the premium paid for air shipping is relatively high and the time saved by using airplanes is small we will see less air shipment. Conversely, if the air premium is small and the time saved by using airplanes is large, we will see more air shipment.

How do we convert these estimates into a calculation of the value of time savings? We follow the model in Hummels (2001), "Time as a Trade Barrier." Suppose a consumer values differentiated varieties of good k produced by exporter j according to the CES utility function

$$(1) \qquad U = \left(\sum_j \lambda_j^k q_j^{\theta^k}\right)^{1/\theta^k}$$

$\theta^k = \left(\sigma^k - 1\right)/\sigma^k$, and σ^k is the elasticity of substitution between goods, as well as the own-price elasticity of demand. That is, a 1% increase in prices induces a σ^k % decrease in quantities sold. This differs across products—some goods are relatively homogeneous (e.g. σ^k is large for oil and wheat) so that a small increase in prices from one exporter induces a large substitution away from that exporter to alternative suppliers. Other goods are highly differentiated (σ^k is low) so that price changes induce a smaller quantity response.

A key parameter in the model is λ_j^k, which captures a price-equivalent quality shifter. While quality has many dimensions we are interested in the consumer's perception of quality stemming from more timely delivery. Other things being equal, a consumer gets more utility from a good that arrives sooner rather than later, so we can write the time-related quality shifter for goods from exporter j as

(2) $$\lambda_j^k = \exp(-\tau^k days_j)$$

This says that a one day increase in days shipped lowers utility by $\lambda_j^k = \exp(-\tau^k)$, or in logs, $\ln \lambda_j^k = -\tau^k$

This yields a demand function for a variety of good k coming from exporter j of

(3) $$q_j^k = \left(\frac{p_j^k}{\lambda_j^k}\right)^{-\sigma} E^k = \left(\frac{p_j^k}{\exp(-\tau^k days_j)}\right)^{-\sigma} E^k$$

The term E^k is real expenditures by the importer on product k. The price term p_j^k is the price facing a consumer, including production costs, shipping costs, and firm's markups. Note that quality and prices enter symmetrically with inverse signs. That is, a 1% increase in λ_j is equivalent, from the consumer's perspective, to a 1% decrease in product prices. Both increase demand by σ%.

This allows us to evaluate for the consumer the value of getting the product one day earlier. Reducing delays by one day yields a quality improvement for the consumer of τ^k, and this increases quantity sold by $\sigma^k \tau^k$. Because the quality shifter is written in price equivalent terms, a one-day decrease in shipment times has the same impact on delivered quantities as a τ^k reduction in tariffs. That is, if we estimate $\tau^k = 1\%$, then each day in transit is the same as imposing a 1% ad-valorem tariff on the good in question.

How do we identify τ^k? The key is that we observe in the data whether a firm chose fast and expensive air shipping or slow and inexpensive ocean shipping. We can then work out the profit maximizing modal choice for a firm producing in exporter j as follows.

Dropping commodity superscript k for the moment, let the marginal cost of delivering a product from exporter j to the market via mode m be $mc_j + g_m$, which includes the marginal cost of production and the per unit shipping charge. The firm will charge prices that are a markup over marginal costs

$$p_j = \frac{\sigma}{\sigma - 1}(mc_j + g_m)$$

and makes a per unit profit of

$$\frac{\pi_{j,m}}{q_{j,m}} = \frac{1}{\sigma - 1}(mc_j + g_m)$$

Multiplying this by the quantity demanded we have

$$(4) \qquad \pi_{j,m} = \frac{1}{\sigma-1}(mc_j + g_m)q_{j,m} = \frac{1}{\sigma-1}(mc_j + g_m)\left(\frac{\frac{\sigma}{\sigma-1}(mc_j + g_m)}{\exp(-\tau days_{j,m})}\right)^{-\sigma} E$$

The firm can now compare the profitability of air versus ocean shipping. Air shipping incurs a higher shipping cost g, but lower days in transit (we set air shipping days equal to one for all exporters). Ocean shipping incurs a lower shipping cost but higher days in transit (we will use a shipping schedule to identify the days saved).

The firm chooses air if $\pi_{j,air} > \pi_{j,ocean} \quad \Leftrightarrow \ln \pi_{j,air} > \ln \pi_{j,ocean}$. Plugging in from (4) we have

$$\ln\left[\frac{1}{\sigma-1}(mc_j + g_{air})\left(\frac{\frac{\sigma}{\sigma-1}(mc_j + g_{air})}{\exp(-\tau days_{j,air})}\right)^{-\sigma} E\right] > \ln\left[\frac{1}{\sigma-1}(mc_j + g_{ocean})\left(\frac{\frac{\sigma}{\sigma-1}(mc_j + g_{ocean})}{\exp(-\tau days_{j,ocean})}\right)^{-\sigma} E\right]$$

With some algebraic manipulation this can be written

$$= (1-\sigma)\left(\ln p^{cif}_{j,air} - \ln p^{cif}_{j,ocean}\right) - \sigma\tau days_{ocean} > 0$$

$$= (1-\sigma)\left(\ln p^{fob}_{j,air} - \ln p^{fob}_{j,ocean}\right) + (1-\sigma)\left(\ln(1+f_{j,air}) - \ln(1+f_{j,ocean})\right) - \sigma\tau days_{j,ocean} > 0$$

where cif, fob prices refer to product prices including and excluding shipping costs respectively, and $f_{j,air} = g_{j,air} / p^{fob}_{j,air}$ is the ad-valorem air shipping cost for exporter j. If there are many firms selling the good into the US market, we can then describe the share of those firms who use air shipping as a function of the same inequality. That is, the value of imports that are shipped via air relative to the value of imports shipped via ocean is

$$\ln\frac{pq_{j,air}}{pq_{j,ocean}} = (1-\sigma)\left(\ln p^{fob}_{j,air} - \ln p^{fob}_{j,ocean}\right) + (1-\sigma)\left(\ln(1+f_{j,air}) - \ln(1+f_{j,ocean})\right) - \sigma\tau days_{j,ocean}$$

We can either estimate this equation by pooling over all observations in the US imports data, or we can estimate it separately for each product k, in which case the key parameters are product specific.

We now have a way to identify the time cost parameter. For a given exporter j and product k, we relate the value of trade that is air shipped relative to the value of trade that is ocean shipped as a function of the differences in fob prices for air and ocean shipping, the differences in ad-valorem shipping costs, and the time delays associated with ocean shipping.

As an additional control, we include the average price of variety k shipped from exporter j. The idea is that higher prices may reflect higher product quality (for reasons other than timeliness) and that high quality goods are timely delivery are complements. This gives us for product k

$$
\text{(5)}\quad \ln\left(\frac{pq^{fob}_{jk,air}}{pq^{fob}_{jk,ocean}}\right) = \beta_{1k}\left(\ln p^{fob}_{jk,air} - \ln p^{fob}_{jk,ocean}\right) + \beta_{2k}\left(\ln(1+f_{jk,air}) - \ln(1+f_{jk,ocean})\right)
$$
$$
+\beta_{3k} days_{j,ocean} + \beta_{4k}\ln p_{jk}
$$

This is the estimating equation, and can be estimated simply using ordinary least squares. The estimated coefficients each have a corresponding parameter from the utility function and so we can use these to solve for the value of time saving.

$$
\sigma_k = 1 - \beta_{2k},
$$
$$
\tau_k = -\beta_{3k}/(1-\beta_{2k})
$$

Conceptually we can think of these two parameters as follows. A firm may be reluctant to use air shipping because it raises prices faced by consumers and lowers the quantities that can be sold. The consumer's quantity response is given by $\sigma_k = 1 - \beta_{2k}$. When consumers are highly susceptible to increases in prices, firms will be reluctant to use air shipping. Weighed against that is the greater utility consumers receive from obtaining a good more rapidly $\tau_k = -\beta_{3k}/(1-\beta_{2k})$. We have written the utility parameter in terms of price-equivalent terms in order to calculate tariff equivalents. As a result, we must divide the coefficient on days in ocean transit by the sensitivity of quantities with respect to prices.

In principle consumer's value for time saving τ^k could vary across exporters, products, and exporter-products. Electronics, fresh fruit, and high fashion clothing might be especially time sensitive while bulk commodities are not. If certain exporters specialize in bulk products while others produce fresh fruit, their average time sensitivity will be different.

The relevant source of variation necessary to identify α^k comes from variation (across goods and across exporting countries) in the relative price of air shipping. The relative price of air shipping can vary across countries for two reasons. First, the elasticity of shipping costs with respect to distance is higher for air shipping than for ocean shipping. This means that the further away is an exporter from the United States, the higher the relative price of air shipping. Second, an exporter may have idiosyncratically high shipping costs for one mode. For example, exporters vary in the quality of their port infrastructure (Wilson *et al* 2004), in the number of shipping lines competing on a trade route (Hummels *et al* 2007), or in the amount of competition they allow in transportation services (Fink *et al* 2000).

Similarly, the relative price of air shipping can vary across goods for two reasons. First, products differ in their bulk and in specialized handling needs. Automobiles, for example, could be air shipped but a car would (inefficiently) take up most of the cargo space in an airplane. Iron ore could fit in an airplane, but unlike maritime ports, airports do not have specialized facilities for lifting the ore from rail or trucks and placing it into holds. Second, holding quantity fixed, product price variation affects the ad-valorem impact of higher air shipping prices. Consider this example. I want to import a $16 bottle of wine from France. Air shipping costs of $8 are twice ocean shipping costs of $4. Going from ocean to air increases the delivered cost by $4 or 25% of the original price.

$$(\frac{f_{j,air}^{k}}{p_j^k} - \frac{f_{j,ocean}^{k}}{p_j^k}) = \left(\frac{8}{16} - \frac{4}{16}\right) = 0.25$$

Now I want to import a $160 bottle of wine from France. The shipping costs are the same, but the $4 cost to upgrade to air shipping represents just a 2.5% increase in the delivered price.

$$(\frac{f_{j,air}^{k}}{p_j^k} - \frac{f_{j,ocean}^{k}}{p_j^k}) = \left(\frac{8}{160} - \frac{4}{160}\right) = 0.025$$

Measured as a percentage of the value moved, the $4 air premium becomes much smaller. The consumer is much more likely to use the faster but more expensive shipping option when the effect on delivered price is smaller.

The data for this exercise comes from two sources. From 1991–2005, U.S. imports of merchandise data reports the monthly value, quantity, and transportation mode of imports, disaggregated by product (the “HS” or Harmonized System classification), by entry point into the United States and by exporter. In addition, we observe the freight bill paid for each flow. Using this data, we calculate for each exporter “j”, product “k”, entry district “d” and time period “t” the relative value of trade moved via air and ocean transportation, and the relative price of the two modes.

The U.S. data have variation across exporters “j” (as many as 200 countries, though this is cut down to 107 exporters because other needed variables are not present in the data), products “k” (10-digit HS products, roughly 17,000 categories), entry districts “d” (52) and time periods “t” (15 years, 12 months per year, or 180 time periods) to estimate this responsiveness.

For approximately one-third of j-k-d-t observations both air and ocean transportation are employed. These represent roughly 70 percent of trade by value, and the estimation is based on these observations. For the remaining observations only one mode is observed. Since we do not see shipping prices for these goods they are dropped from the estimation. This could cause biased estimates if there is heterogeneity in the parameters α^k, τ^k across observations within a product.

For example, suppose that some observations have systematically higher values of τ^k than the average, resulting in them being shipped only by air. Omitting these observations would then bias τ^k downward. Similarly, suppose some observations have systematically lower values of τ^k than the average, resulting in them being shipped only by ocean. Omitting these observations would then bias τ^k upward. Ultimately, the number of omitted observations is evenly distributed over all air or all ocean modes, suggesting that the estimation biases might balance out.

The second source of data is a schedule of ocean shipping times between any two ports. We use schedule data for 1998 taken from the website www.shipguide.com, and described in Hummels (2001), and ship schedule data taken from the Port2Port Evaluation tool at www.ComPairdata.com for the fourth quarter 2006. From these data we are able to calculate average shipping times between ports in a particular exporter "j" and entry districts "d" in the United States. (There are significant differences in shipping times depending on U.S. entry points: Rotterdam to New York is much shorter than Rotterdam to Long Beach.)

Consumer's valuation of time saving, τ^k, are estimated using equation (5) for each product at the 4-digit level of the Harmonized System. We report these values, along with the cost of time saving (the air premia paid for each day saved), and each product's share in world trade, in the table on the CD that accompanies this report.

In cases where the estimates of τ^k are not statistically different from zero, we set $\tau^k = 0$. Recall that τ^k is constructed from two parameters—the modal substitution parameter and the coefficient on ocean shipping delays. If either is not statistically different from zero, we report τ^k as not different from zero. This can happen for two reasons. First, the good may not be time sensitive (i.e. adding an additional day of ocean travel does not increase the likelihood that air shipment is used). Second, there is insufficient variation in air shares to identify the modal substitution parameter. This does not mean that the product is not time sensitive, only that we cannot calculate a point estimate with precision. This includes some cases in which we see firms paying a substantial premium to air ship goods. For example, HS 04 Dairy Products, we see firms paying an air premium that averages 1.327 percent ad-valorem per day of ocean travel. That we observe some firms paying this premium suggests that their willingness to pay for time savings must be at least this large, but we are unable to identify the time sensitivity parameter with precision. To be conservative, we still use $\tau^k = 0$ in these cases, which suggests our estimates understate the value of time costs.

STEP TWO: AGGREGATION

We estimate values of τ^k for over 1000 products. To display these reasonably, we need to aggregate them. There are several possible aggregations.

1. ***Individual country trade weights***. We calculate an average value of τ_j over all commodities k for each exporter j, weighted by the share of k in trade for exporter j, s_j^k :

(6) $$\tau_j = \sum_k s_j^k * \tau^k$$

The idea is that fresh fruits may be very time sensitive (τ^{ff} is big), but if Tunisia doesn't produce any fresh fruits $s_{tunisia}^{ff} = 0$ then this gets zero weight in the calculation. τ^k is the same for all countries, but the value of time differs across countries because the weights attached to each τ^k vary across countries.

2. ***Comparable countries.*** Suppose an exporter has the ability to produce fresh fruits (in the sense that it has the right climate, produces them for domestic consumption, etc.), but does not export them precisely because its time delays are so large that these time costs price the country out of the export market. On the extreme, this country might have no trade whatsoever in a time-sensitive good. (i.e., for every $\tau^k > 0$, $s_j^k = 0$; and $s_j^k > 0$ only for those goods where $\tau^k = 0$). In this case, the costs imposed by delays are so severe they act like a prohibitive tariff, and so are missing entirely from that country's calculated time cost.

To address this we provide an alternative weighting in which the values for s_j^k are replaced by alternative values s_{reg}^k . This corresponds to the share of good k in region (reg) trade as defined by World Bank region groupings noted in Tables A-1 and A-2. The averaged per day time value is then

(7) $$\tau_{reg} = \sum_k s_{reg}^k * \tau^k$$

for each region group. The second and third columns in Tables A-1 and A-2 reports values from equation (6) for each country, using both import and export weights. Table 2-3 in Chapter 2 of this paper reports values for equation (7).

STEP THREE: CALCULATING TARIFF EQUIVALENTS OF TRADE DELAYS USING *DOING BUSINESS* DATA

The *Doing Business* data report time delays associated with inland transport (IT), port waiting (PW), and customs clearance (CC) times for each exporter j. Denote these delays, measured in days,

$$T_{D,j} = T_{IT,j} + T_{PW,j} + T_{CC,j}$$

Assume that the time cost of these other delays impose the same burden on exporters as the burden imposed by slow ocean shipping. Then the total time cost facing exporter j (using country trade weights) is

$TC_j = \tau_j T_{D,j}$, where $\tau_j = \sum_k s_j^k * \tau^k$

Similarly, we can calculate time costs for a region using region weights as

(8) $$TC_{reg} = \tau_{reg} T_{D,j} \; .$$

Table 2-5 in the main body of this paper reports aggregate time costs for total delays and for each component (inland transport, port waiting and customs clearance) by region. Tables A-1 and A-2 report aggregate time costs for each country, using country and region weights.

Table A-1

Tariff Equivalents for Time Costs to Import and Average Applied Import Tariffs, by Country(values expressed as ad- valorem rates)

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
EAST ASIA AND PACIFIC											
Cambodia	1.0	0.8	--	--	--	--	--	--	--	--	15.5
China	0.8	0.8	1.7	3.3	1.7	6.7	1.6	3.2	1.6	6.4	12.8
Fiji	--	--	--	--	--	--	--	--	--	--	--
Hong Kong, China	0.8	0.8	1.6	0.0	0.8	2.4	1.6	0.0	0.8	2.4	0.0
Indonesia	0.8	0.8	0.8	5.7	4.9	11.3	0.8	5.6	4.8	11.1	4.9
Kiribati	--	--	--	--	--	--	--	--	--	--	--
Lao PDR	1.2	0.8	12.3	9.9	4.9	27.1	8.0	6.4	3.2	17.5	15.0
Malaysia	0.8	0.8	1.6	0.8	3.3	5.7	1.6	0.8	3.2	5.6	5.0
Marshall Islands	--	--	--	--	--	--	--	--	--	--	--
Micronesia	--	--	--	--	--	--	--	--	--	--	--
Mongolia	--	--	--	--	--	--	--	--	--	--	--
Palau	--	--	--	--	--	--	--	--	--	--	--
Papua New Guinea	1.1	0.8	3.3	5.5	5.5	14.3	2.4	4.0	4.0	10.3	3.9
Philippines	0.6	0.8	0.6	1.3	1.9	3.9	0.8	1.6	2.4	4.8	3.2
Samoa	--	--	--	--	--	--	--	--	--	--	--
Singapore	0.8	0.8	0.0	0.8	0.8	1.5	0.0	0.8	0.8	1.6	0.0
Solomon Islands	1.5	0.8	4.5	4.5	1.5	10.4	2.4	2.4	0.8	5.6	45.6
Taiwan, China	0.7	0.8	0.7	0.7	1.4	2.8	0.8	0.8	1.6	3.2	4.5
Thailand	0.9	0.8	1.7	2.6	2.6	6.8	1.6	2.4	2.4	6.4	9.9
Timor-Leste	--	--	--	--	--	--	--	--	--	--	--
Tonga	--	--	--	--	--	--	--	--	--	--	--
Vanuatu	0.5	0.8	1.5	2.5	0.5	4.5	2.4	4.0	0.8	7.2	16.5
Vietnam	1.0	0.8	3.1	5.2	4.1	12.4	2.4	4.0	3.2	9.5	16.7
EUROPE AND CENTRAL ASIA											
Albania	0.8	0.9	3.2	1.6	4.0	8.7	3.5	1.8	4.4	9.7	11.2
Armenia	0.9	0.9	10.0	1.8	4.6	16.4	9.7	1.8	4.4	15.8	2.1
Azerbaijan	0.7	0.9	9.8	5.6	4.2	19.7	12.3	7.0	5.3	24.6	8.2
Belarus	0.7	0.9	5.2	3.7	2.2	11.2	6.2	4.4	2.6	13.2	3.2

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Bosnia and Herzegovina	1.0	0.9	3.9	1.9	7.8	13.6	3.5	1.8	7.0	12.3	4.5
Bulgaria	0.8	0.9	1.6	3.2	4.8	9.6	1.8	3.5	5.3	10.5	7.7
Croatia	0.9	0.9	2.8	0.9	2.8	6.5	2.6	0.9	2.6	6.2	3.5
Czech Republic	0.9	0.9	6.1	0.9	0.9	7.8	6.2	0.9	0.9	7.9	3.9
Estonia	0.9	0.9	0.9	0.9	1.9	3.8	0.9	0.9	1.8	3.5	0.8
Georgia	0.8	0.9	1.6	1.6	1.6	4.8	1.8	1.8	1.8	5.3	7.3
Hungary	0.8	0.9	3.2	1.6	2.4	7.2	3.5	1.8	2.6	7.9	2.8
Kazakhstan	0.9	0.9	29.6	14.4	3.6	47.5	29.0	14.1	3.5	46.6	3.0
Kyrgyz Republic	1.0	0.9	41.6	18.3	10.2	70.0	36.0	15.8	8.8	60.6	5.7
Latvia	1.0	0.9	3.0	2.0	3.0	8.0	2.6	1.8	2.6	7.0	1.9
Lithuania	0.8	0.9	2.5	1.7	1.7	5.9	2.6	1.8	1.8	6.2	0.8
Macedonia, FYR	0.9	0.9	3.4	4.3	5.2	12.9	3.5	4.4	5.3	13.2	7.8
Moldova	0.8	0.9	1.6	5.7	4.0	11.3	1.8	6.2	4.4	12.3	2.3
Montenegro	--	--	--	--	--	--	--	--	--	--	--
Poland	0.9	0.9	1.8	2.7	1.8	6.3	1.8	2.6	1.8	6.2	3.3
Romania	0.8	0.9	1.6	0.8	1.6	4.1	1.8	0.9	1.8	4.4	6.3
Russia	0.9	0.9	4.4	1.7	0.9	7.0	4.4	1.8	0.9	7.0	9.3
Serbia	1.0	0.9	3.0	2.0	2.0	7.0	2.6	1.8	1.8	6.2	12.2
Slovakia	0.8	0.9	2.4	1.6	1.6	5.6	2.6	1.8	1.8	6.2	3.1
Slovenia	1.0	0.9	1.0	2.0	5.1	8.2	0.9	1.8	4.4	7.0	10.2
Tajikistan	1.0	0.9	0.0	8.8	4.9	0.0	0.0	7.9	4.4	0.0	6.6
Turkey	1.0	0.9	2.0	2.0	3.0	7.0	1.8	1.8	2.6	6.2	2.2
Ukraine	0.7	0.9	2.2	3.7	5.1	11.0	2.6	4.4	6.2	13.2	7.0
Uzbekistan	0.9	0.9	36.6	22.3	3.6	62.6	36.0	22.0	3.5	61.5	4.6
HIGH INCOME: OECD											
Australia	1.2	0.8	1.2	3.5	3.5	8.2	0.8	2.5	2.5	5.8	5.3
Austria	0.8	0.8	3.4	0.8	0.8	5.0	3.3	0.8	0.8	5.0	1.8
Belgium	0.8	0.8	0.8	0.8	0.8	2.3	0.8	0.8	0.8	2.5	3.0
Canada	1.0	0.8	2.0	1.0	2.0	4.9	1.7	0.8	1.7	4.2	1.3
Denmark	0.7	0.8	0.7	0.0	0.7	0.0	0.8	0.0	0.8	0.0	2.4
Finland	0.6	0.8	0.6	0.0	1.2	0.0	0.8	0.0	1.7	0.0	1.9
France	0.7	0.8	1.3	1.3	2.0	4.6	1.7	1.7	2.5	5.8	1.8

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Germany	0.7	0.8	0.7	0.7	0.7	2.2	0.8	0.8	0.8	2.5	1.8
Greece	0.6	0.8	1.1	1.7	2.8	5.6	1.7	2.5	4.2	8.3	2.2
Iceland	0.9	0.8	0.9	1.8	1.8	4.5	0.8	1.7	1.7	4.2	1.5
Ireland	0.6	0.8	3.0	1.2	1.2	5.4	4.2	1.7	1.7	7.5	1.5
Italy	1.2	0.8	3.6	2.4	7.2	13.1	2.5	1.7	5.0	9.2	2.0
Japan	0.6	0.8	1.2	1.2	1.2	3.6	1.7	1.7	1.7	5.0	4.8
Korea	0.8	0.8	0.8	0.8	1.6	3.1	0.8	0.8	1.7	3.3	9.8
Netherlands	0.6	0.8	0.6	0.6	0.6	1.9	0.8	0.8	0.8	2.5	2.1
New Zealand	1.0	0.8	4.2	1.0	3.1	8.4	3.3	0.8	2.5	6.7	2.2
Norway	0.8	0.8	0.8	0.8	0.8	2.5	0.8	0.8	0.8	2.5	1.8
Portugal	0.6	0.8	0.6	1.2	2.5	4.3	0.8	1.7	3.3	5.8	4.2
Spain	0.7	0.8	1.4	1.4	1.4	4.1	1.7	1.7	1.7	5.0	2.4
Sweden	0.7	0.8	0.7	0.0	0.7	0.0	0.8	0.0	0.8	0.0	2.1
Switzerland	1.5	0.8	7.6	3.0	1.5	12.1	4.2	1.7	0.8	6.7	3.6
United Kingdom	0.9	0.8	1.8	1.8	0.9	4.6	1.7	1.7	0.8	4.2	2.7
United States	0.8	0.8	0.8	0.8	2.5	4.2	0.8	0.8	2.5	4.2	1.6
Latin America and Caribbean											
Antigua and Barbuda	0.6	0.9	1.2	1.8	4.9	8.0	1.7	2.6	6.8	11.1	10.5
Argentina	1.0	0.9	2.0	3.9	4.9	10.8	1.7	3.4	4.3	9.4	9.8
Belize	0.9	0.9	2.7	3.7	3.7	10.1	2.6	3.4	3.4	9.4	11.6
Bolivia	1.1	0.9	4.3	2.2	1.1	7.6	3.4	1.7	0.9	6.0	7.8
Brazil	0.7	0.9	0.7	2.9	3.7	7.3	0.9	3.4	4.3	8.5	9.5
Chile	0.9	0.9	1.7	3.4	2.6	7.7	1.7	3.4	2.6	7.7	6.6
Colombia	0.9	0.9	4.7	3.7	4.7	13.1	4.3	3.4	4.3	11.9	9.3
Costa Rica	0.9	0.9	2.7	4.5	2.7	10.0	2.6	4.3	2.6	9.4	3.8
Dominica	0.9	0.9	1.9	0.9	6.5	9.3	1.7	0.9	6.0	8.5	9.6
Dominican Republic	0.8	0.9	0.8	1.7	1.7	4.2	0.9	1.7	1.7	4.3	9.3
Ecuador	1.0	0.9	2.0	1.0	6.1	9.1	1.7	0.9	5.1	7.7	7.6
El Salvador	0.8	0.9	10.1	2.5	4.2	16.9	10.2	2.6	4.3	17.0	5.6
Grenada	0.8	0.9	0.8	3.1	7.0	10.9	0.9	3.4	7.7	11.9	8.5
Guatemala	1.0	0.9	3.9	1.9	2.9	8.7	3.4	1.7	2.6	7.7	6.4
Guyana	0.9	0.9	2.8	7.4	5.5	15.7	2.6	6.8	5.1	14.5	8.4

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Haiti	--	--	--	--	--	--	--	--	--	--	--
Honduras	0.9	0.9	0.9	1.7	2.6	5.2	0.9	1.7	2.6	5.1	7.3
Jamaica	0.9	0.9	1.7	2.6	2.6	6.9	1.7	2.6	2.6	6.8	8.6
Mexico	0.9	0.9	2.6	0.9	1.8	5.3	2.6	0.9	1.7	5.1	4.7
Nicaragua	0.9	0.9	2.6	7.0	6.2	15.8	2.6	6.8	6.0	15.3	3.2
Panama	0.4	0.9	0.9	0.4	2.6	3.9	1.7	0.9	5.1	7.7	9.9
Paraguay	1.1	0.9	6.3	4.2	6.3	16.8	5.1	3.4	5.1	13.6	5.9
Peru	1.0	0.9	4.1	6.2	6.2	16.5	3.4	5.1	5.1	13.6	11.9
Puerto Rico	--	--	--	--	--	--	--	--	--	--	--
St. Kitts and Nevis	0.9	0.9	0.9	1.7	7.8	10.4	0.9	1.7	7.7	10.2	10.6
St. Lucia	0.6	0.9	1.1	0.6	3.9	5.5	1.7	0.9	6.0	8.5	5.4
St. Vincent and the Grenadines	0.7	0.9	0.7	0.7	5.1	6.6	0.9	0.9	6.0	7.7	9.5
Suriname	0.9	0.9	1.9	4.7	2.8	9.5	1.7	4.3	2.6	8.5	11.1
Trinidad and Tobago	0.7	0.9	1.3	2.0	3.3	6.7	1.7	2.6	4.3	8.5	7.0
Uruguay	0.9	0.9	0.9	3.5	2.6	7.1	0.9	3.4	2.6	6.8	6.6
Venezuela	0.9	0.9	2.7	9.2	4.6	16.5	2.6	8.5	4.3	15.3	11.9
Middle East and North Africa											
Algeria	0.7	1.0	0.7	3.6	4.3	8.6	1.0	5.0	6.0	12.0	13.3
Djibouti	--	--	--	--	--	--	--	--	--	--	--
Egypt	0.8	1.0	1.5	1.5	1.5	4.5	2.0	2.0	2.0	6.0	25.8
Iran	1.2	1.0	5.0	3.7	6.2	14.9	4.0	3.0	5.0	12.0	4.7
Iraq	--	--	--	--	--	--	--	--	--	--	--
Israel	0.7	1.0	0.7	0.0	3.5	0.0	1.0	0.0	5.0	0.0	2.9
Jordan	0.9	1.0	0.9	4.6	0.9	6.4	1.0	5.0	1.0	7.0	12.0
Kuwait	1.0	1.0	4.1	5.1	4.1	13.4	4.0	5.0	4.0	13.0	4.3
Lebanon	1.5	1.0	3.0	11.9	7.4	22.3	2.0	8.0	5.0	15.0	5.5
Morocco	0.7	1.0	2.2	8.0	5.1	15.3	3.0	11.0	7.0	21.0	21.7
Oman	1.1	1.0	5.4	1.1	6.4	12.9	5.0	1.0	6.0	12.0	4.9
Saudi Arabia	1.3	1.0	5.2	5.2	12.9	23.2	4.0	4.0	10.0	18.0	12.5
Syria	0.9	1.0	1.9	7.5	3.8	13.1	2.0	8.0	4.0	14.0	16.4
Tunisia	0.9	1.0	1.8	1.8	4.6	8.2	2.0	2.0	5.0	9.0	15.9

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
United Arab Emirates	1.1	1.0	1.1	3.2	2.2	6.5	1.0	3.0	2.0	6.0	4.2
West Bank and Gaza	--	--	--	--	--	--	--	--	--	--	--
Yemen	0.7	1.0	2.1	5.6	3.5	11.3	3.0	8.0	5.0	16.0	11.5
SOUTH ASIA											
Afghanistan	--	--	--	--	--	--	--	--	--	--	--
Bangladesh	0.8	1.5	1.6	7.4	8.2	17.3	3.1	13.8	15.3	32.2	18.6
Bhutan	1.1	1.5	15.3	4.4	6.5	26.2	21.5	6.1	9.2	36.8	16.8
India	1.8	1.5	18.1	7.2	10.9	36.2	15.3	6.1	9.2	30.7	29.9
Maldives	0.9	1.5	0.9	0.9	7.4	9.3	1.5	1.5	12.3	15.3	20.0
Nepal	1.5	1.5	11.9	8.9	8.9	29.8	12.3	9.2	9.2	30.7	17.2
Pakistan	0.9	1.5	1.7	1.7	3.5	6.9	3.1	3.1	6.1	12.3	20.4
Sri Lanka	1.0	1.5	1.9	3.9	2.9	8.8	3.1	6.1	4.6	13.8	6.5
SUB-SAHARAN AFRICA											
Angola	--	--	--	--	--	--	--	--	--	--	--
Benin	1.0	0.9	2.1	6.2	12.5	20.8	1.8	5.4	10.8	18.0	14.0
Botswana	1.1	0.9	8.6	4.3	7.5	20.3	7.2	3.6	6.3	17.1	2.8
Burkina Faso	1.0	0.9	7.6	9.6	10.5	27.7	7.2	9.0	9.9	26.1	9.2
Burundi	--	--	--	--	--	--	--	--	--	--	--
Cameroon	0.8	0.9	2.4	5.6	4.0	12.0	2.7	6.3	4.5	13.5	14.0
Cape Verde	--	--	--	--	--	--	--	--	--	--	--
Central African Republic	0.8	0.9	19.5	5.9	4.2	29.7	20.7	6.3	4.5	31.5	16.1
Chad	0.9	0.9	29.7	6.1	17.5	53.3	30.6	6.3	18.0	54.8	13.5
Comoros	--	--	--	--	--	--	--	--	--	--	--
Congo, Dem. Rep.	--	--	--	--	--	--	--	--	--	--	--
Congo, Rep.	0.8	0.9	3.3	8.3	5.0	16.6	3.6	9.0	5.4	18.0	17.3
Côte d'Ivoire	0.8	0.9	3.2	4.7	2.4	10.3	3.6	5.4	2.7	11.7	8.9
Equatorial Guinea	0.8	0.9	0.8	21.4	6.4	28.6	0.9	24.3	7.2	32.4	15.3
Eritrea	0.7	0.9	3.6	5.0	7.1	15.6	4.5	6.3	9.0	19.8	6.6
Ethiopia	1.1	0.9	10.1	3.9	13.0	27.1	8.1	3.1	10.3	21.6	12.4
Gabon	0.9	0.9	1.7	5.2	7.0	13.9	1.8	5.4	7.2	14.4	15.4
Gambia	--	--	--	--	--	--	--	--	--	--	--
Ghana	1.0	0.9	5.7	9.6	8.6	23.9	5.4	9.0	8.1	22.5	14.5

Country	Daily Time Cost by Import Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Guinea	--	--	--	--	--	--	--	--	--	--	--
Guinea-Bissau	0.8	0.9	0.8	8.1	2.4	11.4	0.9	9.0	2.7	12.6	13.5
Kenya	0.8	0.9	7.2	5.6	6.4	19.2	8.1	6.3	7.2	21.6	12.9
Lesotho	0.9	0.9	6.5	3.7	9.3	19.6	6.3	3.6	9.0	18.9	14.5
Madagascar	0.9	0.9	2.7	0.9	3.6	7.1	2.7	0.9	3.6	7.2	4.3
Malawi	1.0	0.9	15.3	6.7	8.6	30.5	14.4	6.3	8.1	28.8	9.4
Mali	0.9	0.9	11.9	13.7	6.4	32.0	11.7	13.5	6.3	31.5	9.6
Mauritania	0.8	0.9	7.4	2.5	2.5	12.3	8.1	2.7	2.7	13.5	10.6
Mauritius	0.8	0.9	0.8	1.5	1.5	3.8	0.9	1.8	1.8	4.5	12.1
Mozambique	0.8	0.9	3.1	1.6	2.3	7.0	3.6	1.8	2.7	8.1	10.5
Namibia	1.1	0.9	3.3	3.3	4.4	10.9	2.7	2.7	3.6	9.0	3.0
Niger	0.9	0.9	17.0	13.4	8.9	39.4	17.1	13.5	9.0	39.5	11.6
Nigeria	0.9	0.9	4.6	10.0	8.2	22.8	4.5	9.9	8.1	22.5	24.1
Rwanda	0.9	0.9	26.9	13.4	11.6	52.0	27.0	13.5	11.7	52.1	7.5
São Tomé and Principe	--	--	--	--	--	--	--	--	--	--	--
Senegal	0.8	0.9	2.4	3.2	5.7	11.3	2.7	3.6	6.3	12.6	8.9
Seychelles	0.7	0.9	0.7	3.6	5.7	10.0	0.9	4.5	7.2	12.6	34.6
Sierra Leone	--	--	--	--	--	--	--	--	--	--	--
South Africa	0.9	0.9	2.7	3.6	7.2	13.4	2.7	3.6	7.2	13.5	6.0
Sudan	0.9	0.9	2.6	10.3	24.0	36.9	2.7	10.8	25.2	38.6	17.3
Swaziland	0.9	0.9	4.4	1.8	12.4	18.6	4.5	1.8	12.6	18.9	1.3
Tanzania	0.9	0.9	0.0	8.3	2.8	11.0	0.0	8.1	2.7	10.8	14.8
Togo	1.0	0.9	6.0	3.0	3.0	12.0	5.4	2.7	2.7	10.8	13.1
Uganda	1.1	0.9	15.4	26.3	8.8	50.5	12.6	21.6	7.2	41.3	5.4
Zambia	0.9	0.9	14.4	5.4	6.3	26.2	14.4	5.4	6.3	26.1	8.8
Zimbabwe	1.0	0.9	7.8	8.8	6.8	23.4	7.2	8.1	6.3	21.6	14.8

Note: Applied tariffs are averages including ad-valorem equivalents for specific rates and preferences for 2001.

SOURCE: Hummels (2007); MacMap HS6; World Bank, Doing Business *2007.*

Table A-2

Tariff Equivalents for Time Costs to Export and Average Applied Tariffs Face by Exporters, by Country (Values expressed as ad valorem rates)

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
EAST ASIA AND PACIFIC											
Cambodia	0.7	0.7	1.4	0.7	1.4	3.4	1.4	0.7	1.4	3.6	7.9
China	0.7	0.7	1.4	0.7	0.7	2.8	1.4	0.7	0.7	2.8	5.9
Fiji	1.5	0.7	3.0	1.5	4.6	9.1	1.4	0.7	2.1	4.3	38.1
Hong Kong, China	1.0	0.7	2.9	0.5	1.0	4.3	2.1	0.4	0.7	3.2	8.6
Indonesia	0.7	0.7	1.3	1.3	2.0	4.7	1.4	1.4	2.1	5.0	5.9
Kiribati	0.1	0.7	0.3	0.1	0.4	0.8	2.8	0.7	3.6	7.1	13.2
Lao PDR	0.6	0.7	3.4	3.4	1.7	8.6	4.3	4.3	2.1	10.7	3.0
Malaysia	0.6	0.7	1.8	1.2	1.2	4.2	2.1	1.4	1.4	5.0	3.4
Marshall Islands	0.0	0.7	--	--	--	--	--	--	--	--	13.9
Micronesia	0.2	0.7	--	--	--	--	--	--	--	--	31.8
Mongolia	1.0	0.7	18.8	6.3	3.1	28.3	12.8	4.3	2.1	19.2	6.6
Palau	0.3	0.7	0.7	0.3	1.0	2.0	1.4	0.7	2.1	4.3	9.5
Papua New Guinea	2.7	0.7	37.2	21.3	10.6	69.1	10.0	5.7	2.8	18.5	2.1
Philippines	0.5	0.7	3.6	1.0	0.5	5.1	5.0	1.4	0.7	7.1	2.5
Samoa	0.4	0.7	1.1	0.8	0.8	2.7	2.1	1.4	1.4	5.0	9.0
Singapore	0.8	0.7	2.3	0.8	0.8	3.8	2.1	0.7	0.7	3.6	3.9
Solomon Islands	0.2	0.7	0.5	0.7	0.4	1.6	2.1	2.8	1.4	6.4	3.3
Taiwan, China	0.8	0.7	0.8	1.5	0.8	3.0	0.7	1.4	0.7	2.8	4.5
Thailand	0.7	0.7	2.9	0.7	2.9	6.6	2.8	0.7	2.8	6.4	6.5
Timor-Leste	--	--	--	--	--	--	--	--	--	--	--
Tonga	1.7	0.7	3.4	1.7	3.4	8.4	1.4	0.7	1.4	3.6	5.2
Vanuatu	0.1	0.7	0.5	0.3	0.4	1.2	2.8	1.4	2.1	6.4	12.8
Vietnam	0.4	0.7	0.7	1.8	1.5	4.0	1.4	3.6	2.8	7.8	6.4
EUROPE AND CENTRAL ASIA											
Albania	0.8	0.7	12.6	1.6	3.9	18.1	11.6	1.5	3.6	16.7	1.4
Armenia	1.0	0.7	10.3	1.0	2.1	13.4	7.3	0.7	1.5	9.5	2.8
Azerbaijan	0.3	0.7	3.5	2.5	1.3	7.3	10.2	7.3	3.6	21.1	0.9
Belarus	1.0	0.7	4.1	5.2	2.1	11.4	2.9	3.6	1.5	8.0	2.7

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Bosnia and Herzegovina	0.6	0.7	2.2	1.1	2.8	6.1	2.9	1.5	3.6	8.0	1.0
Bulgaria	0.7	0.7	2.8	1.4	3.5	7.7	2.9	1.5	3.6	8.0	4.7
Croatia	0.7	0.7	5.8	2.2	5.8	13.8	5.8	2.2	5.8	13.8	3.9
Czech Republic	1.0	0.7	6.8	1.0	1.9	9.7	5.1	0.7	1.5	7.3	1.7
Estonia	0.7	0.7	--	--	--	--	--	--	--	--	2.1
Georgia	0.6	0.7	1.7	0.6	1.1	3.4	2.2	0.7	1.5	4.4	3.4
Hungary	0.9	0.7	6.5	0.9	1.8	9.2	5.1	0.7	1.5	7.3	2.6
Kazakhstan	0.6	0.7	16.2	12.9	6.2	35.3	21.1	16.7	8.0	45.8	1.5
Kyrgyz Republic	5.4	0.7	--	--	--	--	--	--	--	--	1.9
Latvia	0.6	0.7	--	--	--	--	--	--	--	--	2.2
Lithuania	0.8	0.7	--	--	--	--	--	--	--	--	4.0
Macedonia, FYR	0.7	0.7	2.1	5.0	2.1	9.2	2.2	5.1	2.2	9.5	6.8
Moldova	0.4	0.7	1.1	1.1	1.9	4.1	2.2	2.2	3.6	8.0	7.4
Montenegro	--	--	--	--	--	--	--	--	--	--	--
Poland	0.8	0.7	5.0	1.7	0.8	7.4	4.4	1.5	0.7	6.5	2.9
Romania	0.7	0.7	--	--	--	--	--	--	--	--	2.9
Russia	0.4	0.7	2.2	0.7	1.1	4.0	3.6	1.1	1.8	6.5	2.0
Serbia	0.8	0.7	2.4	0.8	4.0	7.2	2.2	0.7	3.6	6.5	5.4
Slovakia	1.2	0.7	2.4	2.4	2.4	7.2	1.5	1.5	1.5	4.4	2.1
Slovenia	1.0	0.7	2.0	1.0	2.0	4.9	1.5	0.7	1.5	3.6	2.9
Tajikistan	0.1	0.7	1.0	1.4	0.7	3.1	5.1	7.3	3.6	16.0	1.5
Turkey	0.8	0.7	2.4	0.8	2.4	5.7	2.2	0.7	2.2	5.1	5.6
Ukraine	0.6	0.7	1.7	1.1	2.8	5.7	2.2	1.5	3.6	7.3	4.5
Uzbekistan	1.8	0.7	14.1	14.1	17.6	45.8	5.8	5.8	7.3	18.9	1.4
HIGH INCOME: OECD											
Australia	1.3	1.0	2.5	1.3	1.3	5.1	1.9	1.0	1.0	3.9	7.0
Austria	1.0	1.0	2.0	1.0	2.0	4.9	1.9	1.0	1.9	4.8	4.3
Belgium	0.9	1.0	2.7	0.9	0.9	4.4	2.9	1.0	1.0	4.8	6.4
Canada	0.9	1.0	1.0	0.9	0.9	2.9	1.1	1.0	1.0	3.0	1.1
Denmark	0.6	1.0	1.8	0.6	0.6	2.9	2.9	1.0	1.0	4.8	8.0
Finland	1.0	1.0	1.0	1.0	1.0	3.0	1.0	1.0	1.0	2.9	4.5
France	0.8	1.0	1.6	1.6	2.3	5.5	1.9	1.9	2.9	6.8	5.9

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Germany	1.1	1.0	1.1	1.1	1.1	3.2	1.0	1.0	1.0	2.9	4.8
Greece	0.9	1.0	1.8	1.8	2.7	6.3	1.9	1.9	2.9	6.8	8.3
Iceland	0.1	1.0	0.1	0.1	0.4	0.7	1.0	1.0	2.9	4.8	1.7
Ireland	0.6	1.0	--	--	--	--	--	--	--	--	2.6
Italy	0.8	1.0	--	--	--	--	--	--	--	--	6.3
Japan	1.1	1.0	2.1	2.1	3.2	7.5	1.9	1.9	2.9	6.8	5.2
Korea	1.1	1.0	3.3	1.1	3.3	7.6	2.9	1.0	2.9	6.8	6.2
Netherlands	0.9	1.0	--	--	--	--	--	--	--	--	5.4
New Zealand	0.6	1.0	1.1	0.6	1.1	2.8	1.9	1.0	1.9	4.8	8.7
Norway	0.3	1.0	0.3	0.3	0.3	0.8	1.0	1.0	1.0	2.9	0.8
Portugal	0.7	1.0	--	--	--	--	--	--	--	--	5.8
Spain	0.9	1.0	1.9	0.9	1.9	4.7	1.9	1.0	1.9	4.8	8.3
Sweden	0.9	1.0	4.6	0.0	0.9	0.0	4.8	0.0	1.0	0.0	4.2
Switzerland	1.8	1.0	9.2	1.8	1.8	12.9	4.8	1.0	1.0	6.8	2.9
United Kingdom	0.9	1.0	1.9	0.9	1.9	4.7	1.9	1.0	1.9	4.8	4.8
United States	0.9	1.0	1.7	0.9	1.7	4.4	1.9	1.0	1.9	4.8	4.1
Latin America and Caribbean											
Antigua and Barbuda	0.2	0.8	0.7	0.2	1.0	1.8	3.3	0.8	4.9	9.0	0.7
Argentina	0.5	0.8	2.1	1.1	1.1	4.3	3.3	1.6	1.6	6.6	10.9
Belize	0.7	0.8	4.1	1.4	2.0	7.5	4.9	1.6	2.5	9.0	24.5
Bolivia	1.1	0.8	7.8	1.1	1.1	10.0	5.7	0.8	0.8	7.4	1.6
Brazil	0.8	0.8	1.6	1.6	1.6	4.7	1.6	1.6	1.6	4.9	8.4
Chile	0.6	0.8	1.8	1.2	2.4	5.4	2.5	1.6	3.3	7.4	4.1
Colombia	0.8	0.8	5.4	0.8	4.6	10.8	5.7	0.8	4.9	11.5	3.5
Costa Rica	0.9	0.8	2.8	3.8	2.8	9.4	2.5	3.3	2.5	8.2	5.4
Dominica	2.0	0.8	0.0	2.0	13.7	15.7	0.0	0.8	5.7	6.6	6.8
Dominican Republic	0.7	0.8	2.9	1.4	1.4	5.8	3.3	1.6	1.6	6.6	7.2
Ecuador	1.0	0.8	--	--	--	--	\	--	--	--	8.4
El Salvador	0.8	0.8	10.3	1.6	2.4	14.3	10.7	1.6	2.5	14.7	7.6
Grenada	0.8	0.8	7.5	0.0	6.7	14.1	7.4	0.0	6.6	13.9	0.9
Guatemala	0.9	0.8	3.7	2.8	1.9	8.4	3.3	2.5	1.6	7.4	6.5
Guyana	4.5	0.8	18.1	18.1	13.6	49.9	3.3	3.3	2.5	9.0	27.4

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Haiti	0.6	0.8	2.9	4.0	3.5	10.4	4.1	5.7	4.9	14.7	11.7
Honduras	0.9	0.8	0.9	3.8	0.9	5.6	0.8	3.3	0.8	4.9	8.0
Jamaica	1.4	0.8	4.2	1.4	4.2	9.9	2.5	0.8	2.5	5.7	12.0
Mexico	0.8	0.8	1.7	2.5	1.7	5.9	1.6	2.5	1.6	5.7	0.7
Nicaragua	0.9	0.8	4.7	5.7	6.6	17.0	4.1	4.9	5.7	14.7	6.6
Panama	0.9	0.8	6.1	0.9	3.5	10.4	5.7	0.8	3.3	9.8	13.6
Paraguay	0.4	0.8	7.9	1.3	2.2	11.4	14.7	2.5	4.1	21.3	3.8
Peru	3.0	0.8	15.1	12.1	9.1	36.2	4.1	3.3	2.5	9.8	2.8
Puerto Rico	--	--	--	--	--	--	--	--	--	--	--
St. Kitts and Nevis	0.5	0.8	0.9	0.5	3.2	4.6	1.6	0.8	5.7	8.2	12.8
St. Lucia	1.8	0.8	1.8	1.8	10.6	14.2	0.8	0.8	4.9	6.6	15.6
St. Vincent and the Grenadines	0.9	0.8	2.8	0.9	9.5	13.3	2.5	0.8	8.2	11.5	7.4
Suriname	3.2	0.8	9.5	9.5	15.8	34.8	2.5	2.5	4.1	9.0	1.9
Trinidad and Tobago	0.4	0.8	1.2	0.8	0.8	2.7	2.5	1.6	1.6	5.7	2.3
Uruguay	0.8	0.8	0.8	1.5	2.3	4.5	0.8	1.6	2.5	4.9	7.9
Venezuela	0.3	0.8	1.0	2.3	1.3	4.5	2.5	5.7	3.3	11.5	0.9
MIDDLE EAST AND NORTH AFRICA											
Algeria	0.1	0.4	0.4	0.2	0.2	0.9	1.1	0.7	0.7	2.6	0.3
Djibouti	2.1	0.4	17.0	6.4	8.5	31.9	3.0	1.1	1.5	5.5	11.3
Egypt	0.7	0.4	10.4	0.7	2.0	13.0	5.9	0.4	1.1	7.4	4.4
Iran	0.2	0.4	1.5	0.4	0.7	2.6	3.0	0.7	1.5	5.2	2.8
Iraq	0.0	0.4	0.3	0.2	0.1	0.7	6.3	4.8	1.8	12.9	0.3
Israel	0.6	0.4	--	--	--	--	--	--	--	--	1.8
Jordan	0.5	0.4	1.0	1.0	0.5	2.5	0.7	0.7	0.4	1.8	8.6
Kuwait	0.3	0.4	2.0	0.3	0.7	2.9	2.2	0.4	0.7	3.3	1.9
Lebanon	1.2	0.4	--	--	--	--	--	--	--	--	5.5
Morocco	0.5	0.4	3.6	2.1	1.0	6.8	2.6	1.5	0.7	4.8	3.3
Oman	0.3	0.4	0.9	0.9	0.9	2.7	1.1	1.1	1.1	3.3	2.7
Saudi Arabia	0.3	0.4	2.2	0.3	1.3	3.8	2.6	0.4	1.5	4.4	3.5
Syria	0.2	0.4	0.5	0.7	0.5	1.6	0.7	1.1	0.7	2.6	1.4
Tunisia	0.6	0.4	1.8	1.2	1.8	4.8	1.1	0.7	1.1	3.0	2.6
United Arab Emirates	0.6	0.4	1.1	1.7	0.6	3.4	0.7	1.1	0.4	2.2	2.9

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
West Bank and Gaza	--	--	--	--	--	--	--	--	--	--	--
Yemen	0.2	0.4	0.4	1.5	0.9	2.8	0.7	3.0	1.8	5.5	2.0
SOUTH ASIA											
Afghanistan	0.6	0.6	9.0	1.2	3.0	13.2	9.0	1.2	3.0	13.2	18.0
Bangladesh	0.6	0.6	1.8	2.4	2.4	6.7	1.8	2.4	2.4	6.6	5.1
Bhutan	0.8	0.6	9.7	2.4	4.9	17.0	7.2	1.8	3.6	12.6	23.7
India	0.6	0.6	3.7	2.4	3.7	9.8	3.6	2.4	3.6	9.6	6.1
Maldives	0.5	0.6	0.5	0.3	1.9	2.7	0.6	0.3	2.1	3.0	10.9
Nepal	0.9	0.6	18.2	2.6	2.6	23.4	12.6	1.8	1.8	16.2	17.1
Pakistan	0.5	0.6	5.8	1.0	1.4	8.2	7.2	1.2	1.8	10.2	6.7
Sri Lanka	0.7	0.6	2.0	2.0	1.3	5.3	1.8	1.8	1.2	4.8	9.2
SUB-SAHARAN AFRICA											
Angola	0.0	0.9	0.4	0.1	0.1	0.5	19.7	2.7	3.6	26.0	0.3
Benin	0.7	0.9	--	--	--	--	--	--	--	--	8.5
Botswana	0.1	0.9	1.1	0.2	0.5	1.8	9.9	1.8	4.5	16.1	1.8
Burkina Faso	0.7	0.9	6.7	8.6	4.7	20.0	9.0	11.7	6.3	26.9	5.1
Burundi	0.5	0.9	25.3	2.5	5.0	32.8	45.7	4.5	9.0	59.2	1.2
Cameroon	0.5	0.9	3.0	0.5	1.5	4.9	5.4	0.9	2.7	9.0	3.0
Cape Verde	0.6	0.9	1.9	1.2	3.1	6.2	2.7	1.8	4.5	9.0	1.6
Central African Republic	0.1	0.9	2.6	0.6	0.7	3.9	22.4	5.4	6.3	34.1	0.7
Chad	0.2	0.9	5.6	2.6	1.1	9.3	26.9	12.6	5.4	44.8	0.5
Comoros	1.5	0.9	1.5	1.5	3.1	6.2	0.9	0.9	1.8	3.6	0.5
Congo, Dem. Rep.	--	--	--	--	--	--	--	--	--	--	--
Congo, Rep.	0.1	0.9	0.6	0.8	0.4	1.9	5.4	7.2	3.6	16.1	2.3
Côte d'Ivoire	0.6	0.9	1.2	1.8	0.6	3.6	1.8	2.7	0.9	5.4	4.2
Equatorial Guinea	0.0	0.9	0.2	0.4	0.1	0.6	3.6	9.0	1.8	14.3	0.1
Eritrea	0.7	0.9	9.3	4.6	6.6	20.6	12.6	6.3	9.0	27.8	1.5
Ethiopia	0.6	0.9	12.1	2.3	6.9	21.3	18.8	3.6	10.8	33.2	3.0
Gabon	0.0	0.9	0.0	0.2	0.1	0.4	0.9	4.5	2.7	8.1	0.6
Gambia	0.4	0.9	0.4	0.8	5.3	6.4	0.9	1.8	12.6	15.2	3.7
Ghana	2.5	0.9	5.0	14.9	7.4	27.2	1.8	5.4	2.7	9.9	1.9
Guinea	1.5	0.9	4.4	7.4	7.4	19.3	2.7	4.5	4.5	11.7	2.0

Country	Est. Daily Time Cost by Export Basket		Estimated Tariff Equivalent of the Time to Trade Across Borders								Applied Tariff
			Country Weights				Region Weights				
	Current	Regional	Inland Transport	Customs	Port	Total	Inland Transport	Customs	Port	Total	
Guinea-Bissau	0.0	0.9	0.4	0.0	0.0	0.5	11.7	0.9	0.9	13.4	16.0
Kenya	0.9	0.9	3.5	3.5	3.5	10.6	3.6	3.6	3.6	10.8	5.5
Lesotho	0.6	0.9	3.1	1.2	5.6	9.9	4.5	1.8	8.1	14.3	11.4
Madagascar	1.0	0.9	5.0	2.0	3.0	10.0	4.5	1.8	2.7	9.0	3.0
Malawi	0.2	0.9	2.2	0.9	0.6	3.7	9.0	3.6	2.7	15.2	15.5
Mali	0.4	0.9	9.0	2.1	3.0	14.1	18.8	4.5	6.3	29.6	3.0
Mauritania	0.2	0.9	1.2	0.4	1.0	2.6	5.4	1.8	4.5	11.7	3.0
Mauritius	0.9	0.9	0.9	0.9	1.8	3.5	0.9	0.9	1.8	3.6	16.9
Mozambique	0.2	0.9	0.2	0.2	0.4	0.9	0.9	0.9	1.8	3.6	2.8
Namibia	0.6	0.9	3.4	2.3	3.4	9.1	5.4	3.6	5.4	14.3	4.4
Niger	0.4	0.9	--	--	--	--	--	--	--	--	7.3
Nigeria	0.0	0.9	0.1	0.1	0.1	0.2	1.8	1.8	3.6	7.2	1.7
Rwanda	0.2	0.9	2.8	1.7	1.7	6.1	13.4	8.1	8.1	29.6	1.4
São Tomé and Principe	0.3	0.9	0.3	0.5	0.5	1.4	0.9	1.8	1.8	4.5	1.2
Senegal	0.5	0.9	2.1	1.0	3.6	6.7	3.6	1.8	6.3	11.7	6.8
Seychelles	0.6	0.9	0.6	2.3	4.0	6.8	0.9	3.6	6.3	10.8	2.3
Sierra Leone	0.7	0.9	3.0	4.5	6.7	14.1	3.6	5.4	8.1	17.0	1.0
South Africa	1.6	0.9	3.2	6.4	8.0	17.6	1.8	3.6	4.5	9.9	5.1
Sudan	1.5	0.9	11.8	10.3	10.3	32.3	7.2	6.3	6.3	19.7	7.6
Swaziland	0.6	0.9	0.0	1.7	2.3	4.0	0.0	2.7	3.6	6.3	4.9
Tanzania	2.4	0.9	2.4	14.4	7.2	24.0	0.9	5.4	2.7	9.0	7.0
Togo	0.4	0.9	2.2	0.4	1.7	4.4	4.5	0.9	3.6	9.0	6.6
Uganda	1.0	0.9	19.4	6.1	8.2	33.6	17.0	5.4	7.2	29.6	2.6
Zambia	0.6	0.9	5.3	5.9	2.9	14.1	8.1	9.0	4.5	21.5	4.1
Zimbabwe	1.1	0.9	11.0	6.6	8.8	26.4	9.0	5.4	7.2	21.5	9.9

Note: Applied tariffs are averages including ad-valorem equivalents for specific rates and preferences for 2001.

SOURCE: Hummels (2007); MacMap HS6; World Bank, Doing Business *2007.*