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Policy and Performance in Customs

Evaluating the Trade Facilitation Agreement

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Abstract

The 2013 World Trade Organization ministerial in Bali produced a comprehensive framework agreement on trade facilitation. If fully implemented, the agreement should increase the speed and reduce the cost of moving goods across international borders. But which reforms are most likely to improve these outcomes, how much improvement should be expected, and what might such improvements be worth? This paper adopts the Organisation for Economic Co-operation and Development's trade facilitation indicators as quantitative descriptions of trade facilitation policy. It estimates the impact of the indicators and other variables on the time necessary to clear customs, the associated cost, and a customs performance index. Of the 12 policy bundles, the good governance and impartiality indicator is most clearly related to customs clearance time. A move to best practice in all policies by all World Trade Organization members would reduce the predicted time spent in customs by an average of 1.6 days for imports and 2 days for exports. Using a conservative estimate of the value of time in trade, such comprehensive reforms imply a mean tariff equivalent reduction of 0.9 percentage points on imports and 1.2 percentage points on exports. The same estimates are used to calculate welfare gains of policy reform by World Trade Organization members. Reform in China alone accounts for roughly one-fourth of the global benefits from the Trade Facilitation Agreement.

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Policy and Performance in Customs: Evaluating the Trade Facilitation Agreement*

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1 Introduction

The decline of tariffs and other policy-related trade barriers has shifted the focus of global trade policy towards trade facilitation. At the 2013 WTO ministerial in Bali member countries signed the Trade Facilitation Agreement (TFA), which commits them to pursue a range of border management policies that are currently considered best practice. But how much improvement should be expected in the time and cost needed to clear customs? And if there is progress, how valuable would it be? Direct evidence - in the form of impact evaluations of specific procedural reforms - is still lacking. In this paper we conduct a cross-country empirical analysis of customs performance.[1] We link measures of customs performance to quantitative indicators of border management policies, and to other variables that might affect outcomes at the border. This framework offers a guide to the quantitative impact of trade facilitation policies on customs performance.

The customs performance outcomes that primarily interest us are estimates from the *Doing Business - Trading Across Borders* (TAB) database.[2] These indicators provide estimates of the time and cost of various trading activities.[3] In this paper we focus on measures of the time and cost required to clear customs, as these would seem to be the outcomes most affected by the TFA. TAB data have been used in many studies as independent variables, with the typical study asking how time-in-trade affects bilateral trade flows.[4] By contrast, we are interested in the TAB measures as outcome variables. Our central questions are: to what degree do border outcomes depend on border management policies like those in the TFA? and, to what degree can policy change be expected to improve customs performance? We also conduct a more speculative exercise in which we attempt to attach economic values to the TFA at both global and national levels.

The measures of trade facilitation policy that we employ are the OECD Trade Facilitation Indicators, as discussed in Moïsé et al. (2011) and Moïsé and Sorescu (2013). These indicators are quantitative representations of 12 different aspects of border management policies (e.g. automation,

[1] Throughout the paper we will describe the outcome variables as measures of 'customs performance.' In reality, clearance of goods by customs agencies often requires the assent of other governmental agencies, including the border police and several 'technical' agencies such as those responsible for food safety or environmental protection. We shall refer throughout to 'customs' performance but the reader should interpret this as the performance of all relevant agencies. In most countries the customs agency plays the central role in coordinating the activities of all the relevant inspecting agencies. Border inspection agencies have important objectives besides trade facilitation, and we acknowledge that our study is limited in that regard.

[2] We also consider a similar measure from the World Bank's Logistics Performance Index.

[3] One important reason for our interest in the TAB indicators is that they are used by the World Bank and other such institutions as relevant indicators for the choice of aid projects in the area of trade facilitation, and for the *ex post* evaluation of such projects in some cases. As such, these indicators are important for determining the flow of international aid money.

[4] We will subsequently review these in some detail. The initial study was Djankov et al. (2010).

the existence of clear appeal procedures, etc.). The indicators are taken from a thorough review by the OECD of available country-level information on the capacities and procedural requirements of customs and other agencies that oversee trading activities. The OECD indicators have been usefully employed in studies of the impact of policies on trade flows and implied trade costs.[5] Our innovation is to estimate their impact on outcomes at the border. This allows a better understanding of the likely effects of trade facilitation policies and other variables on border outcomes.

The estimation of these impacts is complicated by two key features of the data. The first issue is that the main outcome variable, the reported number of days necessary to clear customs, is a discrete variable that typically takes low values including '1'. Our interest is actually in a latent variable, time in customs, but the data are only reported in units of days. We adopt a discrete time transition model that allows us to estimate the effects of policy and other variables on a latent continuous variable representing time. The second issue is that the OECD trade facilitation indicators, our primary independent variables of interest, have many missing observations. Moreover the missing data do not occur randomly; missing policy data are most common in the part of the sample in which our interest is highest, in developing countries. To address the second issue we implement multiple imputation methods that have been developed for use in situations like ours. The discrete time transition model and multiple imputation procedures can be implemented jointly, and we do so.

The OECD data group into 12 policy bundles the vast array of policies and procedures used by border agencies around the world. Of these bundles, we find two that are linked, in a statistically significant manner, to lower reported values of time in import customs: indicators of *Good governance and impartiality* and *Automation*. The 12 indicators are important collectively, but the model suggests that these two policy measures affect the days-in-customs variable individually, even after controlling for other policy and non-policy data. On the export side the results are a bit weaker. The *Good governance and impartiality* variable is again important, although with somewhat lower levels of statistical confidence than in the case of imports. The significance of the coefficients on the Good governance indicator across specifications is notable because we include a sizable array of control variables, including the other 11 trade facilitation indicators as well as general measures of the quality of national governance. Good governance and impartiality in customs agencies seems to matter for private sector perceptions of the time required to clear customs.

[5] See Moïsé et al. (2011) and Moïsé and Sorescu (2013), respectively.

The model's coefficient estimates are not easy to interpret so we provide quantitative context via counterfactual analysis. In our thought experiment we move policy in all WTO member countries to the best-practice frontier. We conduct this exercise for all 12 policy bundles collectively, and then for each of the individual policy bundles we identify as significant. In our model, a move by all WTO members to best practice in all policies reduces the average number of expected days in import customs by 1.6. The same exercise implies an average reduction in days in export customs of 2.0. While the effects of policy are important in the case of import customs, reform does not eliminate cross-country variation in performance. In the case of export time in customs, though, policy explains almost everything. When we simulate countries' adoption of best-practice customs procedures, the variation in the expected time in export customs almost entirely disappears. We speculate that the oversight of import customs is inherently more difficult than of export customs, so policy improvements alone are not as able to reduce cross-country variation in performance on the import side as on the export side.

In order to put our counterfactual estimates in perspective we apply an estimate of the tariff-equivalent of a day in transit from Hummels and Schaur (2013) to our estimates of reduced time needed to clear customs. Using U.S. import data Hummels and Schaur estimate the tariff equivalent value of time in trade to be between 0.6 and 2.1 percentage per day *ad valorem*. It is likely that time is less valuable in developing countries with poorly performing customs, so we use the lower end of these figures for our subsequent calculations. Combining a 0.6 percent tariff equivalent of a day with our estimate of average days reduced through TFA implementation provides a suggestive estimate: full implementation of the TFA would be roughly equivalent to a cross-country mean tariff cut of 0.9 percentage points on the import side and a 1.2 percentage point reduction in an export tax equivalent on the export side.

These average estimates obscure substantial cross-country variation in the size of implied trade cost reductions. Most developed countries are already quite near global best practice in trade facilitation policy, and we estimate only small improvements in developed countries. The TFA implies much larger policy changes in the developing world.[6] There is also substantial variation in policy within the developing world. We find that large traders tend to have better trade facilitation policies, a fact that limits the potential size of global gains from the TFA. A simple back-of-the-

[6]The TFA offers countries some flexibility on the timing and speed of reforms. Moreover some commitments are made on a 'best endeavours' basis. Our quantitative model assumes full implementation, and as such, our estimates reflect a best case scenario for implementation of the TFA.

envelope calculation produces a rough estimate of the global welfare gains that would have arisen if the agreement had already been fully implemented in 2012. We estimate gains of approximately US $101 billion for imports and $109 billion for exports.[7] To put these estimates in context we note that the estimates of global welfare gains represent US $16.01 and $17.30 per WTO resident per year, respectively. Roughly one quarter of the estimated welfare gain arises because of implementation in China alone.

The paper proceeds as follows. Section 2 provides a short review of the relevant empirical literature on trade and logistics. Section 3 describes the data, especially the measures that describe border outcomes and the quantitative representations of border management procedures. Section 4 describes the estimating framework. Section 5 provides the estimation and counterfactual results. Section 6 provides some back-of-the envelope calculations of the economic value of the Bali agreement. Section 7 concludes.

2 Literature

Most of the literature that relates to our work treats TAB measures of time-to-trade as independent variables in an econometric model in which the dependent variable is the value of trade. We differ in that we treat a time-to-trade measure as the dependent variable, and attempt to explain it with other data including the OECD policy data. It is nonetheless useful to review the literature with the TAB variables on the right hand side.

Most of the empirical literature using TAB data to study international trade uses the time-to-trade measures rather than estimates of the monetary costs of trading. This is true of the initial study using these data, Djankov et al. (2010), which focuses its attention on a single component of the TAB indicators, *days spent in inland transit*. Using a modified gravity regression, Djankov et al. (2010) estimate that a one-day increase in inland transport times reduces exports by approximately one percent. Subsequent regressions indicate that exports of time sensitive goods are more sensitive to inland transit time than are other goods.[8]

Subsequent studies using these and related data have linked longer trading times to reduced

[7] Our estimates for exports are more speculative than for imports, because countries' export bundles are much more specialized than are their import bundles. The estimates of the value of time in Hummels and Schaur (2013) are cross-commodity average estimates, and are thus less suitable for valuing changes that affect highly specialized export bundles. We view our estimates for imports as a rough lower bound on the gains from the TFA, and the export figures as indicative of the possible gains through an additional (less likely) channel. There are additional channels possible but these are more speculative and/or more difficult to quantify.

[8] Djankov et al. (2010) also provides a useful review of the TAB time-to-trade data that we use.

trade and to other negative outcomes. Freund and Rocha (2011) investigate the impact of three subcomponents of the TAB data on exports, finding that the inland transit time variable was most robustly associated with lower levels of African exports.[9] Hornok and Koren (2011) link subcomponents of the TAB data to larger and less frequent import shipments. Li and Wilson (2009) link the total time-to-export measure to firm-level data and find that producers of time-sensitive goods are less likely to become exporters in countries where the TAB time-to-export measure is larger.

The policy data that we employ as explanatory variables have also been used to explain trade patterns and implied trade costs. Moïsé et al. (2011) describe the data construction in detail and investigate the effect of policy on trade flows in a gravity regression. Moïsé and Sorescu (2013) use trade flows to calculate implied trade costs, as in Novy (2013), and find significant effects of the policies on implied trade costs. This gives evidence that policy affects trade flows; but does not necessarily imply that policy affects trading time.

Our purpose is to exploit cross-country variation in policy to understand the empirical relationship between policy and the two subcomponents of the time-to-trade measures: days in import customs and days in export customs. We estimate these links in an appropriate econometric model. Relying on the model's estimated parameters, we then ask how expected time in customs would change for each country, if that country were to move to best practice in one or all of 12 measures of policy. In order to put the estimated time reductions in context we use parameter estimates from Hummels and Schaur (2013), who calculate a tariff-equivalent measure of a day using U.S. import statistics. These authors estimate that a one-day reduction in trading time is equivalent to 0.6 to 2.1 percentage point tariff equivalent reduction in trade costs. We argue that the smaller of these two values is likely to be more appropriate in this context, and apply it in our back-of-the-envelope calculations.

3 Data

Our estimation exercises employ three types of data: indicators of the *performance* of customs (and other inspecting) agencies, quantitative measures of countries' border *policies*, and other country-level variables that control for other potential sources of variation in customs performance. This section describes these indicators, and illustrates some initial properties of the data.

[9] Hornok (2012) uses a measure of time-to-trade that does not come from the TAB data - truck waiting times at European borders - as an explanatory variable for trade outcomes.

3.1 Measures of customs performance

The outcome variables of interest in this study are three measures of customs performance. The central focus of our analysis is data from the World Bank's *Doing Business - Trading Across Borders* database. These indicators are often used as benchmarks for trade facilitation activities, by aid agencies such as the World Bank and by international aid donors.[10] The TAB database includes sub-indicators that measure the time and cost of moving goods through import and export customs, respectively. Our data set includes 182 countries with data for both the time needed to clear customs and the associated cost.[11]

TAB data are collected every two years. Because the OECD procedural data that we use on the right hand side offer no variation over time, in our estimation procedures we use only the 2012 data from TAB. The TAB sub-indicators are the result of surveys of private sector professionals working in the area of trade logistics. Respondents are asked to report the amount of time (in days) and the cost (in US dollars) of moving goods through various stages of the trading process: document preparation, inland transport, customs (and other border agencies), and ports and terminal handling. We focus on the implications of the TFA for customs, because the policies enumerated in the TFA are more likely to affect this component of the time-to-trade indicators than to affect the other subcomponents.[12]

The respondents to the TAB survey are asked to consider an import (export) shipment with the following characteristics:[13] It is a dry-cargo 20-ft full container load shipment weighing ten tons, and is valued at US$20,000. The product is one of the country's leading import/export products and, is not hazardous, does not include military items, does not require refrigeration or other special treatment, and is not subject to phytosanitary or environmental safety standards.

[10] One goal of this study is to inform these discussions, in terms of the relative roles of specific policies and/or other factors such as levels of development. There is controversy about the ability of TAB data to summarize border environments. Our estimation strategy is designed to exploit the heterogeneity in reported performance, while at the same time addressing some of the criticisms of detractors.

[11] Some of the observations represent overseas territories, rather than independent countries. Puerto Rico is an example.

[12] The TAB data also include estimates of the time and cost required for three additional trading activities: *inland transit*, *assembling documentation*, and moving through *terminal and ports*. Of these other components the TFA reforms might also be expected to affect the cost and time of document assembly, but the impact of such changes is difficult to evaluate in our framework. The OECD's measure of documents policy includes TAB data so very similar variables would enter on both the right and left hand sides of the econometric model. Moreover there are not good estimates of the value of time for activities such as document assembly (as opposed to valuations of time while goods are in transit). We therefore limit our investigation to the variables that measure customs policy. It is likely that there are additional gains that would arise through reductions in the time required to assemble documents but we are not able to credibly quantify these.

[13] The methodology used to produce the TAB data is described briefly in Djankov et al. (2010). Further information was provided to the authors by the Trading-across-borders team of Doing Business.

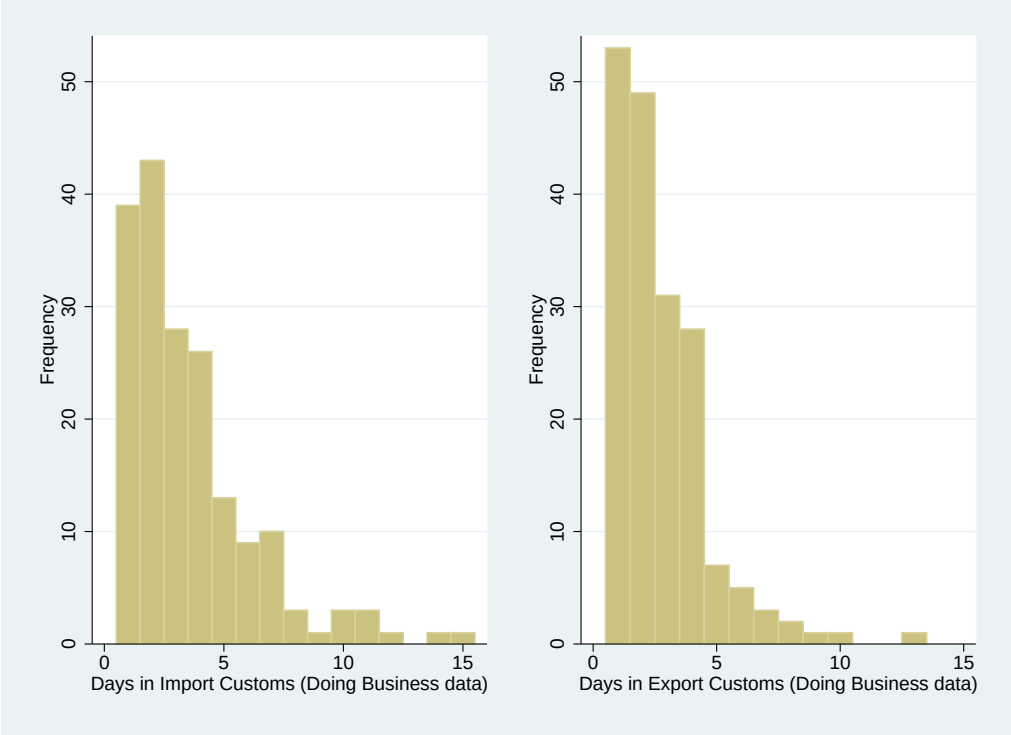
There are no special privileges for the trading firm, and it does not operate in a zone with special trading privileges. The shipment is considered to move via ocean transport between the country's largest overseas trading partner and the most frequently used seaport. The TAB indicators consider all the time required at the port, in customs, for inland transport and for document processing when moving goods between the chosen port and the most populous city in the country. The figures reported by TAB summarize survey responses about the time and cost associated with trading such a shipment.[14]

The unit measures of time reported in the TAB customs indicators are the number of days that are normally required for goods to clear customs. The use of days as units complicates our attempt to exploit them as measures of border outcomes. Figure 1 shows a histogram of days in import and export customs, respectively, for the data in our sample. The data are discrete and generally take low values, which rules out estimators that require continuous variation on the left hand side. While the data are in discrete form, our real interest is in the continuous latent variable, time. A related complication is that it is likely that there is considerable heterogeneity in average clearance times across countries for which the same number of days is reported. For example TAB reports that it takes one day to clear import customs in both Singapore and Romania, but we might expect clearance to be faster in Singapore. Our estimation technique acknowledges that time is continuous even though the data are discrete. We estimate empirical relationships between a latent variable representing continuous time and the explanatory variables including border policies, based on a probabilistic model that the time in customs will end on a given day. This allows within-day heterogeneity in the predicted values of time spent in customs.

We also explore the implications of policy for three continuous measures of border performance: the monetary costs of clearing import and export customs as reported in the TAB database, and an index value of customs performance. The TAB estimates of the monetary cost of customs clearance use an identical definition of a shipment as do the estimates of clearance time, but asks respondents to report administrative charges, customs broker charges, and other charges, as well as a total. The reported total is the measure of cost we use. The index measure of customs performance we investigate as an outcome variable is the *customs* subcomponent of the World Bank's Logistics Performance Index (LPI). All three of these measures are continuous.

[14]Because survey response numbers for some countries are quite small, unrepresentative, and noisy, the summary indicators reported by TAB reflect, in some cases, judgements of the TAB team.

Figure 1: Reported Days in Customs - Trading Across Borders



Note: Distributions of days in import customs and days in export customs, respectively. Data from *Doing Business - Trading Across Borders 2012* for 182 countries.

3.2 Quantitative measures of border policy

The primary goal of this paper is to relate border management policies and procedures to border outcomes. Heretofore this has been a difficult issue to address empirically because quantitative representations of border policies/procedures have not been available.[15] In anticipation of the Bali negotiations the OECD set out to correct this problem, identifying 12 categories of trade facilitation policies and procedures. After documenting national policies and procedures, the OECD scored countries on their proximity to the world's best practice in each of the 12 policy categories.

The raw material for the OECD's 12 trade facilitation indicators was a detailed catalogue of the policies and procedures used in border management agencies around the world. The OECD's initial catalogue, based in 2010, attempted to document 95 different indicators of border management procedures in OECD countries. A subsequent catalogue, representing the situation in 2012, attempted to track 78 procedures in non-OECD countries.[16] The OECD dropped 7 questions be-

[15] Measures such as the World Bank's Logistics Performance Index, or information from TAB on the number of documents required to trade provide some high-level information. But these do not represent the breadth of the policy reforms considered in the TFA, nor do they provide sufficient policy detail for our purposes.

[16] Our empirical specifications pool the two data series, but includes an OECD dummy variable. Among other things, this should control for any systematic differences between the situations in 2010 and 2012. The working hypothesis is that procedural changes are slow, so pooling is not overly dangerous in and of itself.

cause insufficient information was available. Among the remaining 71 procedures, countries were scored 0 (worst), 1, or 2 (best). A country's scores on the individual components were averaged within each of the 12 categories to produce policy scores at the country-indicator level.

The policy scores summarize information about 12 different areas of border policy:

a) Information availability
b) Involvement of the trade community
c) Advance rulings
d) Appeal procedures
e) Fees and charges
f) Formalities regarding documents
g) Formalities regarding automation
h) Formalities regarding procedures
i) Border agency cooperation - internal
j) Border agency cooperation - external
k) Consularization
l) Good governance and impartiality

Appendix Table A1 provides a comprehensive listing of the policy inputs, and links each to one of the 12 policy bundles. The policy bundles are each related to one or more articles of the draft negotiating text that formed the basis of the TFA.[17] In our analysis, we use the OECD's reported score for each of the 12 policy groups as the quantitative measure of border policy in each category.

Before moving to our analysis we adjust one of the variables, *formalities regarding documents*, to address a possible endogeneity concern. Four of the six inputs the OECD used to construct this variable are taken from the TAB surveys. While the variables the OECD used as inputs are not the same variables that appear on the left hand side of our estimation model, the construction of TAB data from survey responses makes it possible that our outcome variables and these data inputs are endogenous.[18] To address this concern we regress the *formalities regarding documents* variable on the four TAB inputs used by the OECD, and construct a new measure of the documentation burden

[17] Moïsé and Sorescu (2013), p.9 illustrates these links.

[18] Respondents that report high levels of documentation requirements might also report high numbers of days required to clear customs.

from the constant and the error terms from this regression. This procedure purges any possible endogeneity that would arise from the OECD's use of TAB data as inputs.[19]

While the OECD has scored most policies for most countries, they do not report a score in those country-indicator pairs where the available information is not adequate to produce a score. The incompleteness of the policy data represents a significant challenge for our analysis. It is common practice in econometric work to exclude observations with missing data, but this practice would be highly problematic in our case. The missing policy data are idiosyncratically, but not randomly, missing from country policy scores. Panel A of Table 1 offers a short summary of the quality of the indicator data. The policy data are particularly lacking in the areas of *border agency cooperation (external)* and *consularization*, but other policies also have missing data. Discarding countries with incomplete policy data from the sample would mean discarding a substantial amount of useful policy data, as many countries have some policy data even though the policy data is not complete. Moreover, discarding countries with incomplete data would bias the sample towards countries with more transparent (and, usually, better) policy. This situation motivates our use of multiple imputation techniques, which we describe later in the paper.

3.3 Other determinants of border performance

In order to isolate the effect of policy on the performance of customs we must also include other control variables that could affect customs performance. In particular we wish to include variables that are exogenous to customs and other border agencies, but still plausibly predictive of the border outcomes we study. We consider three sets of control variables: a set of broad controls that control for countries' level of development, size and geography; a second set of variables that summarize the quality of national governance; a third set of variables that control for the quality of trade-related infrastructure.

3.3.1 Basic control variables

The first set of control variables includes levels of development, geographical indicators, and membership in relevant international economic organizations. These variables might be expected to affect both the level of international trade and the performance of border agencies. One key determinant of the performance of border agencies is likely to be the country's level of economic development, which

[19] By construction, the correlation between the new variable and the TAB data is 0.00. The correlation of our purged Documents variable with the initial Documents variable reported by the OECD is 0.779.

Table 1: Summary Statistics and Number of Observations for Policy Indicators

Variable	**# of Obs**	**Mean**	**Std. D**	**Min**	**Max**
Panel A					
OECD trade facilitation indicators					
Information	128	1.53	0.41	0	2
Involvement	119	1.20	0.70	0	2
Advance Rulings	106	1.08	0.74	0	2
Appeal	119	1.42	0.43	0	2
Fees & charges	104	1.34	0.52	0	2
Documents	130	1.32	0.36	0.01	2
Automation	132	1.20	0.60	0	2
Procedures	112	1.10	0.36	0.30	2
Cooperation - internal	124	1.33	0.69	0	2
Cooperation - external	73	1.08	0.77	0	2
Consularization	95	1.45	0.90	0	2
Governance	103	1.58	0.40	0.33	2
Panel B					
Trade infrastructure variables					
Phys. Infra.	112	0.49	0.24	0.10	1
ICT	112	0.54	0.23	0.12	1
Bus. Environment	112	0.42	0.26	0.01	1

Notes: Summary statistics for OECD Trade Facilitation Indicators and Trade Infrastructure measures from Portugal-Perez and Wilson (2012). Missing data imply a lack of information for individual countries in the raw data used by the OECD to compile the indicators.

might affect performance through factors such as the educational attainment of agency officials, the capabilities of the firms engaged in international trade, and the quality of the infrastructure at the border, among other possibilities. We measure levels of development flexibly, including log per capita GDP and squared log per capita GDP on the right hand side. We also include a log GDP measure to control for variation in the overall size of the economy. The underlying data for these measures are taken from the 2011 World Development Indicators.[20]

We include three measures of geography. Logged square kilometers is our measure of country size, and is also taken from the World Development Indicators. It may be that larger countries trade less and so have less developed customs agencies. We include dummy variables that indicate if a country is landlocked or if it is an island. These data are taken from the French research institute CEPII. The landlocked dummy is particularly interesting because the TAB indicators take into account the time and cost of border procedures in the landlocked country itself and at other border posts between the relevant port and the country of interest.[21] The landlocked dummy thus acts as a control for the fact that landlocked countries' Doing Business measures may be influenced by the quality of customs in neighboring countries.

Finally we include dummy variables that indicate a country's membership in either the OECD or the World Trade Organization (WTO). These data are taken from the respective organizations' web sites. The OECD dummy acts as an additional indicator of development, but also attempts to control for any biases that might arise through the sequencing of the data collection efforts.[22] WTO membership might be thought to affect trade volumes in a manner that is independent of customs performance.

3.3.2 General measures of governance

The policy indicators that are our primary interest are used to estimate the effect of border policy, specifically, on perceptions of the performance of customs. These perceptions might be driven, in part, by the overall quality of governance in the country. Since we are trying to isolate the effect of policy in customs, we also include measures of the quality of broad governance in each country as control variables. Our source for these data are the Worldwide Governance Indicators (WGI), as

[20] The 2012 data on per capita income are incomplete.

[21] The data are collected under this definition to get an estimate of the costs of *overseas* trading. This treatment may mean that our estimates understate the average effect of policies on clearance times within the country of interest.

[22] Recall that the OECD policy indicators were first calculated for OECD member countries in 2010 and for the remaining countries in 2012.

described in Kauffman et al. (2010).

There are five WGI variables. *Voice and Accountability* quantifies the ability of a country's citizens to participate in the selection of the government, as well as related freedoms such as freedom of speech. *Political Stability and Absence of Violence/Terrorism* measures the degree to which political violence threatens the stability of the government. *Government Effectiveness* is an indicator of the perceived quality of public services, the civil service, and related matters. *Regulatory Quality* measures the quality of regulations that permit and promote private sector development. *Control of Corruption* is the perceived influence of corruption on governance, including capture of the state by elites and private interests. These variables are all increasing with the quality of governance, and we expect them to reduce clearance times.

3.3.3 Trade infrastructure variables

The final set of variables we include as potential controls are measures of trade infrastructure taken from Portugal-Perez and Wilson (2012). These authors construct four variables that are intended to measure aspects of the quality of trade infrastructure. The fourth of these, *Border and Transport Efficiency* is constructed with inputs that are entirely from the TAB database, and are also closely related to policies contained in the TFA (documents required for trading, and days required for trading). We therefore exclude that variable but consider the other three trade infrastructure variables in our estimation procedure.

Physical Infrastructure is an indicator of the quality of the relevant transport infrastructure, including ports. *Information and Communications Technology* (ICT) summarizes information on the absorption and use of technology in a country's private sector and in government. The *Business Environment* variable summarizes indicators of government transparency, public trust, and corruption.[23] Portugal-Perez and Wilson (2012) construct these variables for only 120 of the countries/territories that we include in our sample so we use multiple imputation for these variables as well. Panel B of Table 1 reports summary statistics for the trade infrastructure variables.

4 Estimating framework

Our estimating framework takes into account two features of the data that are relevant to our exercise. First, our primary outcome data are reported in discrete units (days in customs), even

[23]The Business Environment variable may well be correlated with the WGI data described above.

though the phenomenon we are modeling (time) is continuous. For our purposes we need a framework that allows a continuous latent variable to be observed as a discrete outcome. Second, as noted, the policy data are missing in many observations, and the missing data are not randomly distributed, which means that discarding observations with missing data will bias the parameter estimates. Our estimation framework addresses both of these problems.

4.1 The estimating model

A first key feature of the data that we confront explicitly is the choice of units in our outcome variable, the reported number of days that a shipment spends in customs. It is likely that the choice of units in the TAB data obscures important variation in countries' performance, especially when the reported number of days is 1 or 2. For example, the number of days reported for import shipments bound for Romania and Singapore are both 1 day, but trading firms might expect goods to spend considerably less time under border controls in Singapore than in Romania. To address this issue, we apply a discrete-time transition model (Cameron and Trivedi, 2005, p.602), treating the reported number of days necessary to clear customs as a discretization of continuous time. The model estimates the conditional probability that goods will clear customs on a given day, and includes a latent measure of continuous time. This latent variable is useful in our subsequent counterfactual analysis, where policy-related changes can improve expected performance by fractions of a day.

The discrete-time transition model we use is a type of grouped duration model. The model accounts for dependent variables that represent grouped time data, with grouping points, $t_a = a$, $a = 1, 2, ..., A$, where A is the maximum observed time in days, the discrete-time hazard function $\lambda^d(t_a|x)$ is defined by

$$\lambda^d(t_a|x) = Pr(t_{a-1} \leq T < t_a | T \geq t_{a-1}, x), a = 1, 2, ..., A, \tag{1}$$

where x is a $k \times 1$ vector of covariates including measures of border policy and other country characteristics.

A discrete-time transition model uses a binary choice model for transition, i.e. the discrete-time

hazard function is given by

$$\begin{aligned}\lambda^d(t_a|x) &= Pr(t_{a-1} \leq T < t_a | T \geq t_{a-1}, x) \\ &= F(\lambda_a + x'\beta), \end{aligned} \tag{2}$$

where $\lambda_a (a = 1, 2, ..., A)$ is the baseline hazard function. We assume $\lambda_a = (q-1) \cdot ln(t)$, which is analogous to assuming a Weibull distribution in the model for continuous duration data. q measures the response of the probability that goods clear to time t, and is a parameter to be estimated. We choose the F function to be logistic CDF. Specifically, the hazard function for the logit discrete-time transition model is

$$\begin{aligned}\lambda^d(t_a|x) &= Pr(t_{a-1} \leq T < t_a | T \geq t_{a-1}, x) \\ &= \left[1 + exp(-z(a,x))\right]^{-1}, \end{aligned} \tag{3}$$

where $z(a, x)$, using the logit model formalization, is specified as:

$$z(a,x) = \lambda_a + \gamma_{Basic} X_{Basic} + \gamma_{WGI} X_{WGI} + \gamma_{TFI} X_{TFI} + \gamma_{TI} X_{TI} + \eta_{ai} \tag{4}$$

where the γ's indicate estimation parameters, the X's are sets of variables that enter independently into the estimating model, and η_{ai} is an error term.[24] The subscripts on the parameters γ and the variables X ($Basic, WGI, TFI$, and TI) indicate in turn: the basic control variables, the worldwide governance indicators, the OECD's trade facilitation indicators (the policy variables of interest) and trade infrastructure variables.

The logit model is estimated over an extended data set. In an extended data set, the ith country with observed time in customs of T_i days has T_i repeated records: a binary dependent variable that is equal to 0 for the first $T_i - 1$ records and equal to 1 for the last record of the ith country. Thus a country for which the reported number of days in customs is 2 will appear in the data set with two records, with a 0 recorded in the first day, and a 1 recorded in the second day. The binary data are estimated assuming a logit form of the estimating model.

[24] Besides the logit model, we also estimate probit and complementary log-log variants of the discrete time transition model. Discussion in the following sections focuses on the results from logit model. Results from alternative models are available from the authors upon request.

4.1.1 Calculating conditional mean clearance times

Because of its non-linearity the model's estimated parameters do not offer an intuitive representation of the quantitative effects of border policies on time in customs. In order to make the quantitative implications of the model transparent we use the estimated model parameters to conduct counterfactual analyses so that fitted and counterfactual values of the outcome variables can be compared. We ask, if the policies were changed in each country, how much would the expected time in customs change? To do this we calculate fitted values of the conditional expected mean duration over the existing data, and then replace the policy data with values that are consistent with best practice, and recalculate the expected values under the new policies.

The conditional mean duration given x is calculated as

$$t^*|x = \sum_{t=1}^{A} t \cdot \lambda^d(t|x) \tag{5}$$

where $\lambda^d(t|x)$ is defined in Equation 3 for the logit discrete-time transition model. We use the difference of conditional mean duration given different covariates of x to indicate the impact of changing x on the expected time required to clear customs.

4.2 Multiple Imputation

As noted above, one of the significant estimation challenges we face is the large amount of policy data that is missing in the OECD trade facilitation indicator data.[25] Data collection in an international setting is always challenging. In this case, where the goal of the collection effort was to provide detailed information on a topic that had not been widely studied, it is understandable that the data are incomplete. The difficulty of the collection effort nonetheless leaves us with important estimation challenges.

A common response to missing data on the right hand side is simply to exclude it, thereby restricting inferences to the sample of observations with complete data. The standard approach is highly problematic in this case, because the sample size is already small and the missing policy data are scattered idiosyncratically but not randomly across the sample. The sub-sample of countries with complete policy data is not representative of the whole.[26] What is more, for many countries

[25] The trade infrastructure variables we employ in robustness checks also have missing data.

[26] For example, the mean time for clearance through customs in countries for which data exist for the first policy indicator, Provision of Information, is 3.2 days, while the mean for countries with this policy missing is 4.3 days.

there is a substantial amount of policy information available even though data is missing for one or two policy measures. This means that under the conventional approach useful policy data would be thrown away because a country lacks information on a single policy. In order to avoid this we turn to well-developed methods for making inferences in the presence of non-random missing data.

Our strategy for dealing with the missing policy data is to employ multiple imputation (MI) methods, first introduced by Rubin (1976). In broad terms, what MI does is to predict the missing policy data (i.e. impute it) in a manner that recognizes uncertainty about the values of the missing data, while at the same time maintaining the overall covariance structure of the right hand side variables. The procedure adopts *multiple* imputations so that causal inferences are not being driven by the randomness inherent in a given imputation. Multiple imputation also provides a framework for adjusting the standard errors in the estimated relationship, to account for the fact that there is additional parameter uncertainty because some of the independent variables are imputed.

In our specific context we know that the missing policy data lie along a continuum ranging from 0 to 2. Where policy data are available, it is typically the case that the policy scores are not independent of other right hand side variables (e.g. countries with higher per capita GDP have higher scores for most policy bundles). What MI procedures do in our exercise is to replace missing policy data with an empirical distribution of policy scores. This distribution lies between 0 and 2, but it is not uniform; it is massed around the most likely values of the policy data, conditional on the other right hand side variables such as GDP per capita, WTO membership or even other policy data when they are present. There is uncertainty about the true value of the missing policy scores, but the uncertainty is conditional on what the rest of the data reveal about the links between a particular policy and the other variables on the right hand side. The MI procedures also ensure that additional uncertainty about the true values of the missing policy data is reflected in the estimated standard errors.

Multiple imputation is a simulation-based statistical technique for handling missing data that consists of three steps. The first step is to generate M imputations (completed data sets); the second step is to conduct the desired analysis on each imputation separately; and the third step is to combine results obtained from the second step for each completed data set into a single multiple-imputation result.[27] We use the well-established Stata MI package to conduct the above procedures.[28] Given

The difference between the two means is significantly different from 0 at the 5 percent level of significance. Similar disparities apply for the other policy measures.

[27] For more theoretical details of multiple imputation, see Rubin (1987).

[28] For technical details, refer to Stata (2013).

the significant proportion of missing values for our 12 policy measures and 3 trade infrastructure variables, we choose $M = 80$ in the first step so that we can obtain stable results (Kenward and Carpenter, 2007; Horton and Lipsitz, 2001). Summary statistics for the selected imputations shown in Table 2 look reasonable in that the summary statistics of the imputed data are quite stable across the first and last imputations, and are not overly different from those that are observed for the initial data set (in Table 1).

Table 2: Summary Statistics and Number of Observations for the 1st and 80th imputations

	the 1st imputation					**the 80th imputation**				
Variable	**# of Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**# of Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
OECD trade facilitation indicators										
Information	182	1.50	0.46	0	2	182	1.51	0.43	0	2
Involvement	182	1.01	0.75	0	2	182	1.14	0.70	0	2
Advance Rulings	182	1.03	0.76	0	2	182	0.99	0.76	0	2
Appeal	182	1.31	0.53	0	2	182	1.32	0.46	0	2
Fees & charges	182	1.30	0.55	0	2	182	1.31	0.48	0	2
Documents	182	1.31	0.36	0.01	2	182	1.34	0.34	0.01	2
Automation	182	1.11	0.64	0	2	182	1.12	0.61	0	2
Procedures	182	1.14	0.40	0.30	2	182	1.12	0.38	0.3	2
Coop. - internal	182	1.22	0.72	0	2	182	1.21	0.75	0	2
Coop. - external	182	1.05	0.83	0	2	182	1.06	0.77	0	2
Consularization	182	1.31	0.95	0	2	182	1.31	0.95	0	2
Governance	182	1.51	0.46	0.33	2	182	1.44	0.49	0.33	2
Trade infrastructure variables										
Phys. Infra.	182	0.44	0.23	0.10	1	182	0.43	0.23	0.10	1
ICT	182	0.47	0.23	0.12	1	182	0.48	0.23	0.12	1
Bus. Environment	182	0.38	0.24	0.01	1	182	0.37	0.24	0.01	1

Notes: The data report summary statistics for the first and last of 80 imputations of the policy and trade infrastructure data.

5 Results

In this section we report empirical results from the estimation models, as well as some counterfactual calculations. The primary focus of attention is the set of results from the grouped duration models with import and export days in customs as the outcome variables. We also report results from the linear models of continuous outcomes (the logged cost of clearing import and export customs, from TAB, and an index of customs performance taken from the LPI). There are two reasons for the focus on the model of clearance times: a) the estimation model is less familiar than the linear model used in the other applications, b) our discussions with logistics professionals suggest that time savings are a useful summary indicator of the private sector costs associated with clearing goods at the border.

5.1 Impacts of policies on time

In order to demonstrate the discrete time transition model without the added complications of multiple imputation, we first estimate the model using independent variables that are complete for our country sample. We apply the model to both the import and the export days in customs data, using the independent variables described above on the right hand side. First we consider, alone, a set of basic country-level variables that reflect underlying propensities to trade. We then add an additional set of variables that measure aspects of institutional quality, the WGI variables. The results of this specification are reported in Table 3.

Coefficient estimates in the discrete time transition model illustrate the effect of each variable on the probability that the expected duration (time spent in customs) will end on a given day. Positive coefficients indicate that countries with higher values of the variable tend to require fewer days in customs, while negative coefficients indicate that higher values of a variable are associated with more expected days in customs. The results in the first column suggest that OECD and WTO member countries have shorter expected time in customs for imports and for exports, while countries with larger land areas tend to require more time in import customs. These coefficients all have the expected signs. WTO and OECD members are likely to have better performing customs. Countries with larger land areas may trade less and therefore have less incentive to operate customs efficiently. Estimates that are statistically significant at only the 10% level suggest that countries with larger economies and island countries are likely to have faster customs clearance.

In the second column we add the WGI variables as controls. Of these, only the indicator of regulatory quality is found to be statistically significant. The sign on the parameter estimate is as expected; TAB respondents indicate that goods clear customs in less time in countries with higher levels of regulatory quality. The inclusion of the governance indicators affects the estimated levels of significance of some the basic control variables. The landlocked variable becomes significant in this specification, taking the expected negative sign. Landlocked countries have larger reported days in customs on average.[29] When the WGI variables are included the coefficients on the other basic control variables become less significant.

On the export side fewer right hand side variables are significant in either specification. The WTO and OECD dummy variables are significant and of the expected sign in column 3. These effects

[29] Note that this result may be mechanical because TAB asks respondents to report total time in customs for goods moving to a seaport. Freight movements involving landlocked countries require interaction with customs officials in more than one country. They might have higher reported time in customs as a result.

Table 3: Discrete time transition model of reported days in customs - policy data excluded [a]

	Days (Imports)		Days (Exports)	
Variable	**Spec1**	**Spec2**	**Spec1**	**Spec2**
Basic controls				
lngdppc	-0.725	0.01	-0.549	-0.036
	(0.825)[b]	(0.925)	(0.856)	(0.952)
lngdppc2	0.052	-0.028	0.044	-0.006
	(0.050)	(0.057)	(0.052)	(0.059)
lngdp	0.152	0.131	0.096	0.046
	(0.090)*	(0.116)	(0.096)	(0.123)
lnsqkm	-0.236	-0.158	-0.113	-0.035
	(0.081)***	(0.091)*	(0.084)	(0.094)
landlocked	-0.204	-0.729	-0.210	-0.471
	(0.271)	(0.297)**	(0.274)	(0.298)
island	0.557	0.295	0.493	0.210
	(0.319)*	(0.347)	(0.339)	(0.365)
wto	0.938	-0.218	1.247	0.571
	(0.265)***	(0.346)	(0.286)***	(0.346)*
oecd	1.651	1.062	1.408	0.681
	(0.464)***	(0.521)**	(0.492)***	(0.541)
World Governance Indicators				
Corruption		0.243		0.295
		(0.339)		(0.363)
Effectiveness		0.677		0.454
		(0.470)		(0.482)
Stability		0.259		-0.081
		(0.188)		(0.199)
Regulatory quality		0.847		0.441
		(0.363)**		(0.353)
Voice		-0.082		0.219
		(0.218)		(0.243)
Ephron's Pseudo-R2	0.1579	0.2324	0.1651	0.2201

Notes: [a] Parameter estimates from a discrete-time transition model assuming a logit specification for the transition. There are no missing data among the independent variables.

[b] standard error is reported in brackets below estimated parameter, *** indicates 1% significant, ** 5% significant and * 10% significant.

largely disappear when the WGI variables are included in the estimation. The governance indicators jointly improve the ability of the model to predict outcomes, as indicated by the rising Pseudo-R^2, but none of them are statistically significant on their own. The inclusion of these variables weakens the statistical significance of the coefficient on the WTO dummy, and the coefficient on the OECD variable becomes insignificant.

Table 4 reports the estimated parameters and standard errors for specifications of the model that include the policy data, as well as information on trade infrastructure. Both groups of the new variables contain missing data points, so these estimates all require multiple imputation methods. The inclusion of these data reduces the apparent role of the variables included in earlier specifications. The coefficient on the landlocked variable is of the expected sign, and statistically significant across the specifications (although less so in the export model). None of the WGI variables is statistically significant individually once the policy data are included.[30]

Of most interest to this paper are the coefficients on the policy variables. On the import side, two of the 12 policy bundles - Governance and Automation - have statistically significant coefficients of the expected sign and statistically significant. On the export side only the Governance variable has a statistically significant coefficient. Two of the three trade infrastructure variables have significant coefficients when days in import customs is the outcome of interest. None of the trade infrastructure variables have significant coefficients in the export model.

It is notable that the coefficients on the Governance variable are at least weakly significant in all four of the specifications (2 each on the import and export side).[31] These specifications include a broad array of control variables. In particular the WGI variables have been included to capture cross-country variation in the general quality of governance. The specifications also include all 11 of the other trade facilitation indicators. The fact that the coefficients on the Governance variable remain statistically significant amongst all these controls suggest that this variable is an important predictor of private sector perceptions of customs performance.

While the grouped duration model has no formal test that can evaluate the joint significance of the policy variables (such as an F-test in the standard linear model) the evolution of the pseudo R^2 measures is instructive. As variables are added the Pseudo-R^2 measure rises, although in most cases only moderately. One exception is that, when the policy data are included in the model of export

[30] In order to save space we do not report coefficients on the WGI variables.

[31] Recall that the name of the indicator is Governance and impartiality, but we shorten it to Governance for space reasons. A description of inputs into this variable is in Table A1.

clearance times, the Pseudo-R^2 measure rises sharply. While this evidence is informal, it suggests that policy is very important for explaining variation in the days in export customs variable. We confirm the reality of this insight when we evaluate the effects of policy changes in the following subsection.

5.1.1 Quantitative implications: Impacts on predicted days in customs

The discrete time transition model that we use to link days in customs to policy variation is appropriate given our data, but because the model is non-linear the coefficient estimates are difficult to interpret in terms of their quantitative implications. In order to put the estimates in context we conduct a series of thought experiments in which we change one or more of the policies, and recalculate the expected time in customs for each country. In each of the thought experiments we evaluate a move to the world's best practice by all WTO members.

To examine the magnitude of these impacts for each country we calculate the conditional mean days in customs given the observed covariates using the method presented in equation 5. In counterfactual analysis we calculate this value for alternative measures of policy, while holding the other variables fixed at their observed values. For example, we consider a move by all countries to best practice in the area of Governance by setting the policy score for the Governance variable in each country to the best possible level, 2, and recalculating the expected time in customs. The difference in the two conditional means for a given country is our estimate of the effect on the reduced number of days in customs that is associated with a move to best practice in the Governance indicator alone. We do this analysis jointly for the set of all policies at once, as well as for each individual policy that is statistically significant in column 2 of Table 4.

Cross-country averages of time in import customs and expected time in import customs under different policy scenarios are reported in Table 5. We report results for all countries and several subgroups of the sample, including those with and without policy data, and those countries that are and are not WTO members. Column 1 reports the mean number of reported days in import customs using the data from TAB. Differences between country groups I and II indicate that longer average times were observed in the sample countries for which the OECD did not report policy data. This illustrates the importance of the multiple imputation correction. Differences between groups III and IV indicate that WTO members score very differently than non-members in the TAB indicator for time in import customs. Later in the paper we focus on group III, the WTO member countries, as

Table 4: Discrete time transition model of reported days in customs - policy data included [a]

	Days (Imports)		Days (Exports)	
Variable	**Spec3**	**Spec4**	**Spec3**	**Spec4**
Basic controls				
lngdppc	-0.542	-0.661	-0.414	0.054
	(1.299)[b]	(1.473)	(1.449)	(1.556)
lngdppc2	0.010	0.022	0.029	0.001
	(0.080)	(0.090)	(0.089)	(0.096)
lngdp	0.155	-0.081	-0.077	-0.094
	(0.160)	(0.200)	(0.177)	(0.219)
lnsqkm	-0.204	-0.152	0.021	-0.005
	(0.117)*	(0.130)	(0.126)	(0.132)
landlocked	-0.755	-0.928	-0.656	-0.694
	(0.3612)**	(0.443)**	(0.388)*	(0.412)*
island	0.311	0.131	0.369	0.309
	(0.417)	(0.440)	(0.465)	(0.482)
wto	-0.283	-0.492	0.906	0.887
	(0.517)	(0.642)	(0.548)*	(0.588)
oecd	1.177	1.515	1.068	1.469
	(0.729)	(0.847)*	(0.842)	(0.922)
Trade Facilitation Indicators				
Information	-0.390	-0.396	-0.034	0.052
	(0.459)	(0.511)	(0.533)	(0.542)
Involvement	-0.200	-0.073	-0.059	-0.048
	(0.268)	(0.303)	(0.324)	(0.335)
Adv. Rulings	-0.113	-0.066	0.444	0.362
	(0.309)	(0.355)	(0.344)	(0.387)
Appeals	-0.332	-0.344	-0.414	-0.485
	(0.470)	(0.490)	(0.561)	(0.549)
Fees & charges	0.388	0.462	0.158	0.106
	(0.353)	(0.387)	(0.399)	(0.398)
Documents	0.143	-0.050	0.539	0.530
	(0.491)	(0.548)	(0.578)	(0.624)
Automation	0.662	0.756	0.247	0.242
	(0.328)**	(0.397)*	(0.389)	(0.430)
Procedures	0.404	0.374	0.027	0.287
	(0.604)	(0.706)	(0.652)	(0.716)
Coop. - internal	-0.044	0.248	-0.020	0.055
	(0.228)	(0.286)	(0.274)	(0.307)
Coop. - external	-0.065	-0.011	0.080	0.029
	(0.265)	(0.337)	(0.361)	(0.388)
Consularization	0.034	0.058	-0.029	-0.051
	(0.206)	(0.223)	(0.256)	(0.257)
Governance	0.914	1.026	0.918	0.960
	(0.482)*	(0.516)**	(0.499)*	(0.515)*
Trade Infrastructure				
Phys. Infra.		0.393		-2.218
		(1.958)		(2.177)
ICT		5.280		2.103
		(2.253)**		(2.246)
Bus. Environment		-5.347		1.465
		(3.155)*		(3.566)
Ephron's Pseudo-R2	0.2977	0.3489	0.5677	0.5817

Notes: [a] Combined results from estimates over 80 imputations.
[b] standard error is reported in brackets below estimated parameter,
*** indicates 1% significant, ** 5% significant and * 10% significant.
WGI data included in the specification, but results not reported to save space.
There were no significant coefficients on the WGI variables.

these are the countries that made commitments under the TFA.

Table 5: Observed and fitted cross-country averages of days in import customs[a]

	(1) Observed	(2) Fitted	(3) Counterfactual Estimates	(4)	(5)
			All 12 policies at frontier	Automation alone	Governance alone
All countries	3.52	3.64	1.91	3.12	2.99
Group I	3.26	3.55	1.88	3.05	2.93
Group II	4.24	3.93	1.99	3.34	3.19
Group III	3.20	3.34	1.77	2.88	2.76
Group IV	5.25	5.26	2.65	4.45	4.24

Notes: [a] Estimates are based on 80 imputations using coefficient estimates from column 2 of Table 4.
Group I includes countries with at least part of the policy measures observed
Group II includes countries with none of the policy measures observed, so all are imputed
Group III includes only WTO member countries
Group IV includes only countries that are not WTO members

Column 2 reports cross-country means for the expected time in customs, as calculated by equation 5 given the available data on policy and other outcomes.[32] We can understand the implications of the TFA by comparing the estimates in column 2 to those in subsequent columns. For example, moving all policies to best practice in all countries (summarized in column 3) would reduce the average predicted time in import customs from 3.64 days to 1.91 days, a 48 percent reduction. We also calculate the cross-country mean of the reduction in the number of days in import customs, which is 1.9 for WTO members - the countries that will implement the TFA.[33]

One might also wish to understand the quantitative implications of improvements in individual policy bundles. Columns 4-5 report mean estimates of the predicted number of days in import customs, assuming a global move to best practice in each of policy bundles with statistically significant effects. The estimates suggest that the potential gains associated with each of these policies are reasonably similar in magnitude, although there is perhaps less improvement possible (in terms of the global average) for policy improvements in the Automation policy bundle than in the Governance bundle. Each of the estimates from individual policy changes imply sizable changes in the number of predicted days in customs, but the estimated reductions in time are considerably larger if all 12 policy changes are implemented jointly as in column 3.

[32]Differences between the estimated and fitted cross-country averages can be attributed to the non-linearity of the estimator. The data contain many observations of 1 day in customs, so the reported cross-country means are driven by large outliers.

[33]This is is a mean of the differences. Differences in means can be calculated from the reported estimates in Table 5. The two statistics are nearly identical but we report them both here.

Next we turn to counterfactual results for days in export customs, which are reported in Table 6. These are based on counterfactual exercises that use the parameters from the second set of estimates in Table 4. Column 1 reports mean values of the data on days in export customs for the country groupings described above. Column 2 reports the means of the fitted values. Column 3 considers a counterfactual calculation with all policies improved to the global best practice. Impacts of reform are larger for export days in customs than for import days in customs. Our estimates suggest that the same policy changes would have a larger impact on export clearance times than on import clearance times.[34] Full implementation of the TFA implies an average reduction of 2 days in export customs among WTO members. Column 4 reports the average numbers of days in export customs conditional on reforming only the governance policies. While reforming governance alone would improve import clearance times these improvements are dwarfed by the impact of joint improvement in all 12 policies.

Table 6: Observed and fitted cross-country averages of days in export customs[a]

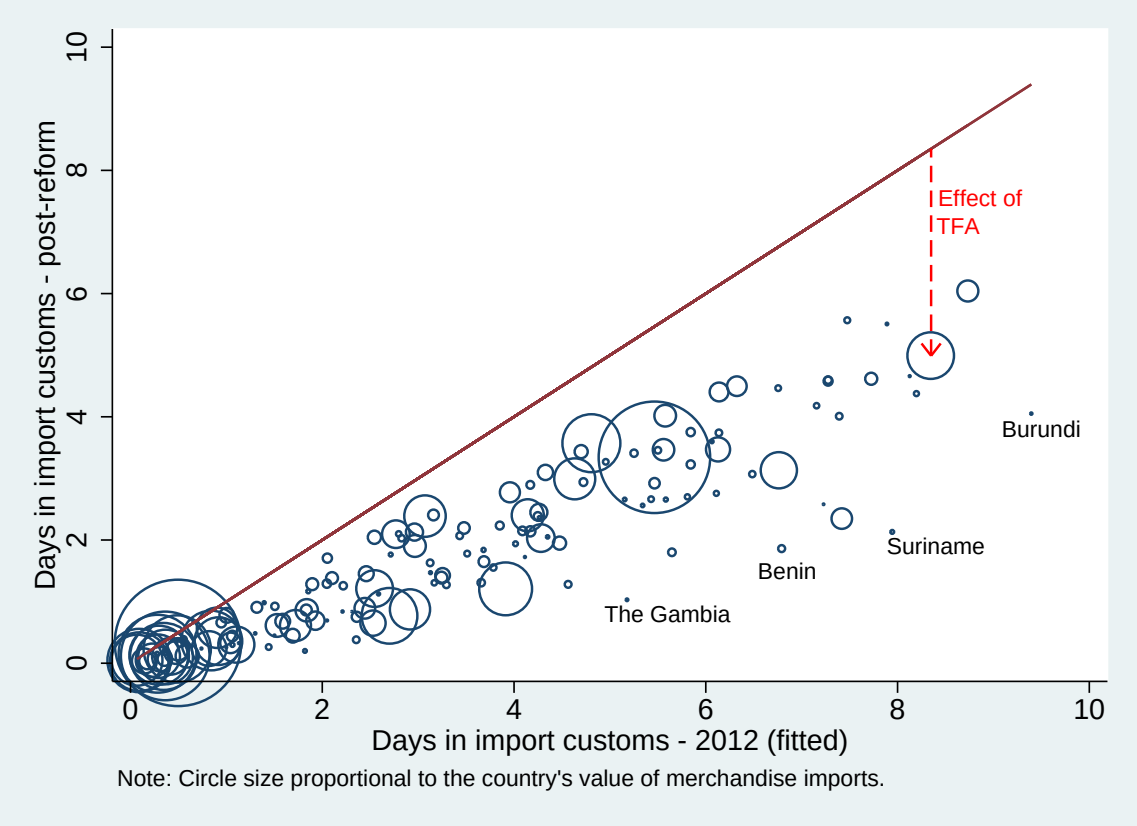
	(1) Observed	(2) Fitted	(3) Counterfactual Estimates	(4) Counterfactual Estimates
			All 12 policies at frontier	Governance alone
All countries	2.70	2.84	0.26	1.96
Group I	2.53	2.50	0.23	1.76
Group II	3.18	3.78	0.35	2.51
Group III	2.40	2.17	0.19	1.53
Group IV	4.36	6.50	0.66	4.30

Notes: [a] Estimates are based on 80 imputations using coefficient estimates from column 4 of Table 4.
Group I includes countries with at least part of the policy measures observed.
Group II includes countries with none of the policy measures observed, so all are imputed.
Group III includes only WTO member countries.
Group IV includes only countries that are not WTO members.

Tables 5 and 6 report cross country means of the number of days spent in customs, and provide illustrative evidence on the reduction in global means when policy is changed. But the impact of trade facilitation policy changes should not primarily be understood through changes in cross country means. Because there is enormous policy variation across countries - and because customs performance also depends on non-policy variables like per capita income - the impacts of full implementation can vary substantially across countries. Cross-country variation in policy can be

[34] As Figure 1 indicates there is less room for improvement in exports than in imports. Our estimates suggest, however, that policy change would do more to improve clearance times for exports than for imports.

Figure 2: TFA impact: Time in import customs



Notes: The figure plots fitted time in import customs along the x-axis, and predicted time in import customs (assuming full TFA implementation) along the y-axis. Only WTO member countries are included.

understood by conducting a thought experiment in which all countries' policies move from their existing policies to the policy frontier. Country-specific estimates of the change in days required are indicative of the impacts of country-level reforms, and these can be used in a cross-country comparison.

Figure 2 shows predicted days in import customs for WTO members at existing levels of policy on the x-axis and predicted days assuming full implementation of the TFA on the y-axis. The scale of the two axes is held fixed and a 45°-line included to demonstrate the large reduction in cross-country variation that occurs when policies are equalized at best practice levels. As indicated on the figure, the impact of reform in each country can be observed as the vertical distance between the 45°-line and the country's location on the graph. Circle sizes indicate the size of merchandise imports for each country.

A key implication of the model is that the variation in the conditional expected outcomes would be substantially reduced by full implementation of the TFA. At current policy, there is enormous variation in fitted customs performance (displayed along the x-axis, ranging from less than one day

in import customs to more than nine). When we calculate predicted days assuming best practice in all countries (as represented along the y-axis), there is much smaller variation in performance; expected days in customs range only from zero to six. The figure also indicates the impacts of policy changes are larger in countries where performance is weaker. In short, the model suggests that the TFA would make customs performance more similar across countries, which is a key goal of the effort.

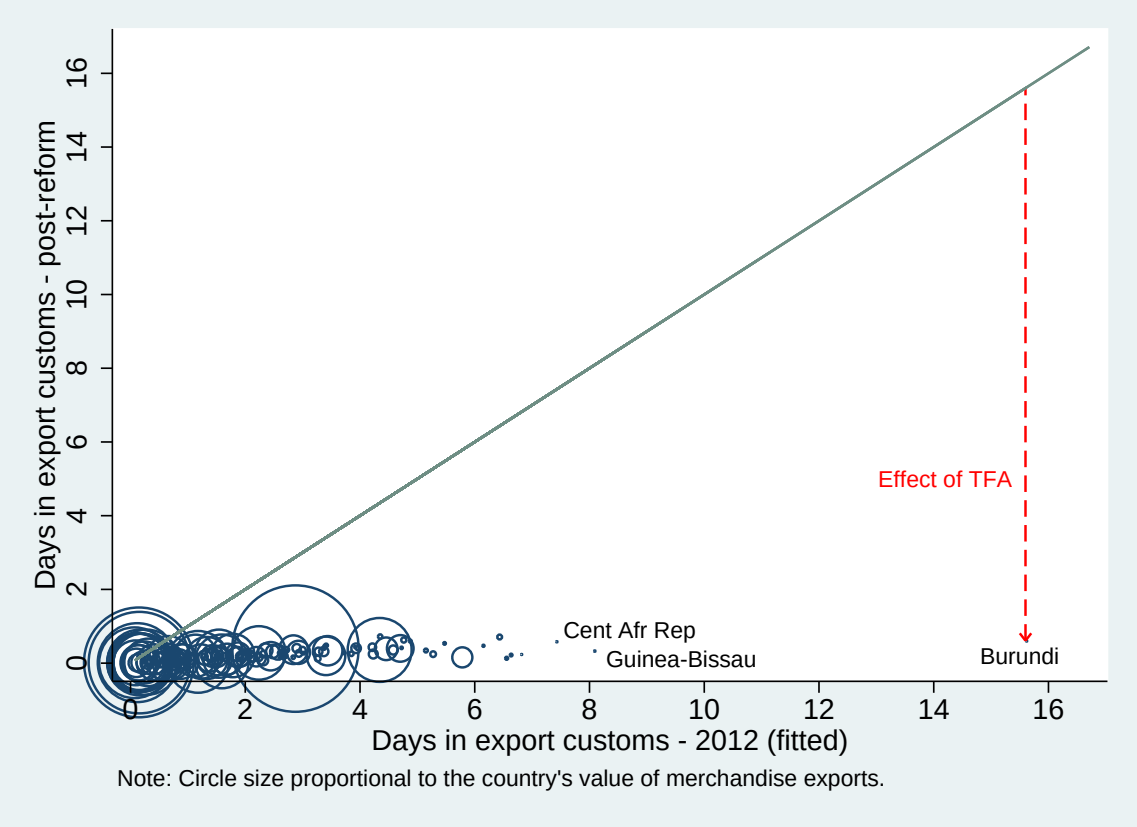
A final lesson to take from Figure 2 is the negative relationship between trade volumes and customs performance. For the most part, countries that are large traders already have well-performing customs. This can be seen in the mass of large circles near the origin of the graph. Most of the countries that would see improved customs performance have relatively small trade volumes. This limits the implied global welfare gains from implementation of the TFA. Most of the gains from reform that do arise occur in the subset of countries that trade significant amounts and have customs policies that fall short of best practice.

Figure 3 illustrates the situation for export customs. We use the parameter estimates from column 4 of Table 4 to calculate fitted and counterfactual values. The primary insights of Figure 2 follow through, but in this case policy reform is much more effective. Virtually all of the variation in performance disappears when policies are set everywhere at the best-practice levels. As with imports, the effects of policy reform are largest for countries with relatively little trade. This negative correlation limits our estimate of the overall gains from the TFA. The relatively larger influence of policy on performance of export customs does imply larger gains on the export side.[35]

Why is policy more closely linked to time in export customs than time in import customs? It is likely that oversight of imports is typically more difficult for customs agencies than oversight of exports. Most countries' exports are concentrated in a (relatively) small number of firms, and a relatively small number of products. Exports can be monitored from production through transport until their arrival at the border for clearance. Managing imports, by contrast, involves real-time decisions at the customs office about the acceptability of thousands of products from many different countries. This is inherently more difficult than managing exports, and so might depend on factors other than trade facilitation policies alone. As a result customs performance may be more responsive to policy change on the export side than on the import side.

[35] As noted above, gains on the export side are likely to be limited by the fact that countries with poor performing customs might be expected to specialize in goods that are not overly sensitive to customs performance. Since a large share of the welfare gains we calculate are due to lower costs on existing trade, our calculations will overstate the benefits of reform if countries are specialized in this way.

Figure 3: TFA effects: Time in export customs



Notes: The figure plots fitted time in export customs along the x-axis, and predicted time in export customs (assuming full TFA implementation) along the y-axis. Only WTO member countries are included.

5.2 Estimates for other measures of border performance

In this paper we seek to use the OECD policy data to explain cross-country variation in measures of customs performance. Our primary interest is in estimates of the reported value of time required to clear customs. But we also would like to check three alternate measures of customs performance: the (logged) cost of clearing import and export customs (also taken from the TAB data), and an index measure of country-level performance in customs (taken from the LPI). Since all three variables are continuous we estimate linear specifications with the performance measure on the left hand side, and use the same right hand side variables as in the other regression model. As with the earlier model, we employ multiple imputation techniques to account for missing policy data. The results are reported in Table 7.[36]

In column 1, the dependent variable is the log of the TAB measure of the monetary cost of clearing import customs. In this specification the coefficients on the Advanced rulings and Automation variables are significant at the 5% and 10% levels, respectively. Both variables have coefficients that are economically significant - a one point move in each index (on a 0-2 scale) produces a reduction in reported cost of over 30%. Column 2 reports estimates from a log-linear model with the cost of clearing export customs as the outcome variable. In the case of exports none of the policy variables have statistically significant coefficients, on their own. In both specifications the independent variables explain nearly half of the variation in reported cost.[37]

Column 3 of Table 7 reports estimates from a linear model with the *customs* subcomponent of the World Bank's Logistics Performance Index as the dependent variable.[38] The evidence in this column suggests that the variables that determine variation in the LPI are rather different than those that determine the TAB outcomes. Coefficients on total GDP, the per-capita GDP variables and WGI-effectiveness are all significant for the LPI measure. None of the policy variables have significant coefficients. In the case of the LPI measure it seems that the basic control variables explain most of the variation in the outcome variable.[39]

[36] None of the coefficients associated with the trade infrastructure variables are significant in any of the three specifications. In order to save space we do not report them.

[37] We refer to a Pseudo-R^2 measure in the table because the multiple imputation technique requires an alternative version of the R^2 measure. The interpretation of the measure as guide to the share of variation explained by the model remains nonetheless useful as a device for understanding the model results.

[38] This variable associates larger numbers with better performance in customs, so the expected sign pattern differs from the other two columns. The index does not distinguish between import and export customs.

[39] A regression of the LPI measure on the basic control variables alone returns an R^2 of 0.73. Including the WGI variables in the regression increases the R^2 to 0.83. It seems that neither the OECD policy data nor the trade infrastructure data explain any meaningful variation in the LPI customs measure once the control variables are included.

Table 7: Linear models of alternate measures of customs performance [a]

	log Import Cost (TAB)	log Export Cost (TAB)	Customs (LPI)
lngdppc	-1.044	-1.124	-0.438
	(0.625)* [b]	(0.522)**	(0.230)*
lngdppc2	0.065	0.068	0.024
	(0.038)*	(0.032)**	(0.014)*
lngdp	0.040	0.042	0.065
	(0.079)	(0.067)	(0.029)**
lnsqkm	0.026	0.002	0.001
	(0.049)	(0.044)	(0.019)
landlocked	0.037	-0.080	-0.043
	(0.168)	(0.148)	(0.065)
island	0.049	-0.071	0.006
	(0.179)	(0.154)	(0.070)
wto	0.186	0.169	0.114
	(0.232)	(0.205)	(0.097)
oecd	-0.235	-0.295	0.007
	(0.331)	(0.293)	(0.122)
WGI - corrupt	-0.089	-0.053	0.041
	(0.314)	(0.257)	(0.107)
WGI - effect	-0.226	-0.243	0.248
	(0.340)	(0.285)	(0.130)*
WGI - stable	-0.307	-0.281	0.003
	(0.119)**	(0.102)***	(0.047)
WGI - regqual	-0.256	-0.157	0.010
	(0.202)	(0.173)	(0.079)
WGI - voice	0.224	0.091	-0.056
	(0.144)	(0.126)	(0.055)
Information	-0.090	-0.180	-0.064
	(0.220)	(0.189)	(0.086)
Involvement	-0.016	0.008	0.041
	(0.146)	(0.120)	(0.050)
Adv. Rulings	-0.329	-0.114	0.031
	(0.141)**	(0.117)	(0.049)
Appeals	0.222	0.257	-0.035
	(0.237)	(0.179)	(0.073)
Fees & charges	-0.055	0.045	0.025
	(0.169)	(0.139)	(0.058)
Documents	-0.074	-0.245	-0.048
	(0.224)	(0.194)	(0.080)
Automation	-0.315	-0.204	0.054
	(0.174)*	(0.143)	(0.062)
Procedures	0.166	0.199	0.025
	(0.327)	(0.253)	(0.106)
Coop. - internal	-0.141	0.008	-0.026
	(0.128)	(0.109)	(0.047)
Coop. - external	-0.176	-0.079	-0.017
	(0.151)	(0.107)	(0.044)
Consularization	-0.045	-0.025	0.024
	(0.100)	(0.089)	(0.038)
Governance	0.319	-0.102	0.032
	(0.203)	(0.179)	(0.083)
Pseudo R-squared	0.457	0.473	0.846

Notes: [a] Combined results from estimates over 80 imputations.
[b] standard error is reported in brackets below estimated parameter,
*** indicates 1% significant, ** 5% significant and * 10% significant.
Trade infrastructure variables included in the regressions,
but coefficients not reported for space reasons.

While the estimates in these three regressions are interesting, the links between policy and performance outcomes are weaker than they are for the model of time in customs. We confine the rest of our analysis to variables that track time outcomes, and apply the results from the discrete time transition model. Our governing assumption will be that the economic value of the TFA is reasonably well summarized by the value of estimated reductions in the expected time to trade.

6 Implications

The goals of this study are threefold (in diminishing value of importance, and confidence): First, identify the trade facilitation policy bundles that can be linked, statistically, to better performance in customs. This exercise also requires an evaluation of the quantitative implications of the coefficients (i.e. what is the implied reduction in reported days in customs associated with a move to best practice). Second, apply external estimates of the value of time-in-trade to calculate tariff-reduction equivalents of the policy changes. Third, calculate an estimate of the monetary value of time savings our empirical model attributes to such reforms.

Having already accomplished the first objective, we proceed to make a tentative effort to accomplish the second and third. In doing so, we must take a stronger stand on the merits of the TAB data than was heretofore necessary. So far, the data need not be understood to measure anything but private-sector *perceptions* of the time that goods spend in import and export customs. Perceptions may or may not reflect actual time in customs for a representative shipment.

To go a bit further we rely on an assumption that the reported days in customs are indicative of the actual number of days in customs. We also take an estimate from the literature of the tariff equivalent value of a day in customs, assuming the common iceberg form of trade costs. Using trading firms' freight mode choices in US imports, Hummels and Schaur (2013) estimate that an additional day in transit is approximately equal to an *ad valorem* tariff equivalent trade cost of between 0.6 percent and 2.1 percent. We take these as the best available evidence on the value of time in trade. Since most of the reforms we consider are in developing countries, where firms and consumers may not be willing to pay as much for time reductions, we take the lower figure as better for our purposes. We use this figure, and our estimate of the reduction in expected days in customs that accompanies a move to best practice in all policies to calculate country-specific estimates of the tariff equivalent reduction implied by the TFA. We calculate that the average tariff-equivalent

reduction on the import side is 0.9 percentage points and the average export-tax equivalent reduction is 1.2 percentage points.

As Figures 2 and 3 indicate, trade facilitation policy tends to be better in countries with large trade volumes. We calculate that the correlation between implied tariff reductions and log import volume is -0.31, and the correlation between the export tax equivalent of TFA implementation and the log export volume is -0.33. These correlations might reflect causation flowing in either direction, or that the variables are jointly determined. In any case, the negative correlations between implied tariff reductions and trade volumes limit the possibilities for global gains from trade facilitation policy reform.

6.1 What might the TFA be worth?

The negative correlation between the size of countries' trade volumes and their implied tariff reductions is significant for our next exercise, in which we attempt to calculate a monetary value of full implementation of the TFA. Our goal is not to provide an exhaustive estimate of the gains from reform, but rather to provide a transparent and conservative calculation of the most plausible source of significant gains from policy changes - reductions in the time needed to clear customs.[40] Our back-of-the-envelope calculation assumes that policy-induced changes in the estimated numbers of days in customs are equivalent to reductions in iceberg trade costs. The magnitude of these reductions is primarily determined by the scale of the tariff equivalent estimates discussed above and the value of a country's trade.

We value these effects by calculating a welfare quadrilateral that is made up of the standard Harberger triangle and a rectangle reflecting the monetary value of trade cost reductions on existing trade flows. Implicitly we posit a model of export supply and import demand, with each country

[40] Some estimates of the gains from the TFA have reported comprehensive global welfare gains, and these are typically calculated in a Computable General Equilibrium model. The figure of US $1 trillion in benefits that received substantial public attention comes from Huffbauer et al. (2012) using estimates from Portugal-Perez and Wilson (2012). These authors consider a broader set of trade facilitation policy changes than are considered here, including valuable but costly infrastructure upgrades. Decreux and Fontagné (2011) consider a halving of selected TAB indicators and calculate world GDP improvements of US $68 billion. Zaki (2014) assumes an even broader set of time reductions from the TAB data (including reductions in inland transport times) and calculates a global trade cost reduction of US $325 billion. Relative to these authors our policy scenario implies larger changes in time in customs, but we consider a smaller set of indicators that improve because of the TFA. Our impacts of policy change are estimated rather than assumed, though we do rely on the Hummels and Schaur (2013) estimate to calculate implied tariff reductions. We use partial equilibrium rather than general equilibrium analysis for purposes of greater transparency.

taking world prices as given. The formula for this calculation is

$$\Delta W_i = trade_i[0.006 * days_i + 0.5 * (0.006 * days_i)^2 * elasticity] \tag{6}$$

where ΔW_i is the change in welfare in country i associated with the improvements in customs, $trade_i$ is the value of trade (imports or exports) in 2012 COMTRADE data, $days_i$ is the reduction in the number of days that occurs when country i's policies are moved to the frontier and *elasticity* is the response of imports or exports to a given trade cost reduction. The number 0.006 is the lower bound of the tariff equivalent of a day in transport estimated by Hummels and Schaur (2013). The first term in the brackets reflects the welfare costs of iceberg melt on existing trade, the second term captures the welfare gain from increased trade following reform.[41] For the cases of imports and exports, respectively, Figure 4 provides graphical representations of the calculations described in equation 6.

Assuming a value of 5 for the elasticity (on both import and export sides), we calculate a gain of US $101 billion on the import side. This is our conservative estimate of the gains from full implementation of the Bali agreement.[42] To put this figure in perspective it implies annual average gains to citizens of WTO member countries of approximately US$16.01 per person.

Our estimate of gains from reduced time in exports are possibly more tenuous than gains on the import side, because countries are more specialized on the export side. In countries with poorly performing customs the existing export bundle is not likely to be especially sensitive to customs performance (causality could go in either direction). Exports of bulk commodities, for example, may not be overly affected by improvements in customs. This means that that on the export side our estimates may overstate the true (partial equilibrium) gains from full implementation of the TFA.[43]

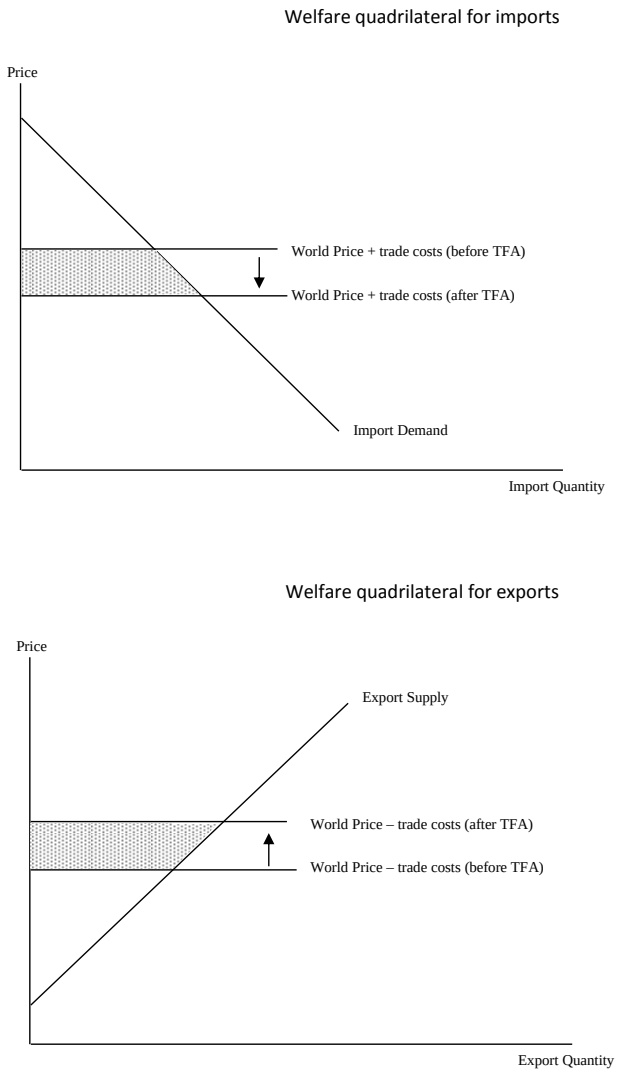
All of this noted we can use equation 6 to estimate gains from policy-related reductions in the time to clear export customs. We calculate global gains of US $109 billion on the export side,

[41] The size of the Harberger triangle is small relative to the size of the rectangle that captures implicit 'iceberg' melt on existing flows. This means that the triangle has a only a small effect on the total, so assumptions about the size of trade elasticity are relatively unimportant for the calculations. The key parameter assumption that affects scale of the estimates is the estimated tariff equivalent of a day in transit. Results scale almost 1 to 1 with changes in this parameter.

[42] We are constraining ourselves to a particular channel: reductions in time at customs. This seem the most plausible, and the most easy to value, as time spent in customs is time that the goods are in transit. Hummels and Schaur (2013) are valuing time while the goods are in transit.

[43] TFA implementation may allow the country to export additional time-sensitive goods. Unfortunately, we are not able to evaluate this margin of adjustment in our framework.

Figure 4: Partial equilibrium measures of welfare change assuming 'iceberg' trade costs



Notes: The figures offer graphical depictions of the welfare quadrilaterals describe in eq. 6

or approximately US$17.30 per resident of a WTO member country. The primary reason that the figure is larger on the export side is that our estimates suggest that export time in customs is more responsive to policy reform than is import time. Noting that the export gains are more speculative, we add these to the estimated gains for imports to get an estimate of the gains from TFA implementation that arise through the reduction in time at customs. This procedure implies an upper bound estimate of $210 billion, which is approximately US$33.31 per year per resident of WTO member countries.

Our estimates lie in the lower range of estimates in the literature. This reflects both methodological differences as well as choices about the source of the welfare gain. Our estimate relies on a single channel of welfare gains, reductions in time spent in customs. By our reckoning this channel is the most plausible and is likely to be the largest source of gains from trade facilitation. One of the reasons that the gains are relatively small is that much of world trade occurs in countries that will see little reform (i.e. developed countries such as those in the OECD). Furthermore, most of the countries with large implied policy changes do not trade very much. As a result the bulk of the estimated global gains from TFA implementation in our model occur in large trading countries that still have some room for improvement in their trade facilitation policies. We report welfare gains for the five countries that account for the largest shares of global gains in Table 8. China accounts for nearly one-fourth of the global gains on the import side and 30 percent on the export side.[44]

7 Conclusion

In this paper we use data on trade facilitation policies to estimate the impact of policy on customs performance. Our primary outcome variable of interest is the time spent in customs, as reported in the Doing Business - Trading Across Borders indicators. Since these data are reported in large discrete units, days, we adopt a discrete time transition model to estimate the impact of policy on the number of reported days in customs. Since the policy data we employ as independent variables are missing observations in a non-random manner, we use a multiple imputation technique in order to maximize the use of available data.

Our estimates identify two policy bundles that are statistically significant predictors of reported

[44]The preponderance of oil exporters on the export side highlights the way in which the welfare gains on the export side may be overstated. The TFA may not have a large impact on the cost of exporting oil, but the calculations treat all exports equally. On the import side the implied gains from reform in Italy may also overstate the total gains. Italy's imports from the EU are not likely to be overly affected by the TFA. The TAB data measure outcomes for overseas shipments, and the time burden of clearing Italian customs should be considerably lower for shipments from the EU.

Table 8: Largest gains from TFA implementation and share of world total

Import gains			
Country	Reduction in days	Welfare gain (billions of USD)	Share of global total
China	2.12	24.60	0.24
Mexico	2.70	7.16	0.07
Russian Federation	3.35	7.01	0.07
Italy	1.93	5.56	0.06
Indonesia	3.63	4.63	0.05

Export gains			
Country	Reduction in days	Welfare gain (billions of USD)	Share of global total
China	2.48	32.76	0.30
Russian Federation	3.98	14.03	0.13
Saudi Arabia	1.96	4.56	0.04
Indonesia	3.21	4.01	0.04
Mexico	1.54	3.60	0.03

Notes: 1) Estimates for countries that account for the largest share of total welfare gains.
2) Authors' calculations using model counterfactuals, and data from the World Development Indicators.

days in import customs: *Good governance and impartiality* and *Formalities regarding automation*. Coefficients on both variables have the expected sign. We also find that the Good governance and impartiality variable significantly affects reported time in export customs, again with the expected sign. The significance of the good governance and impartiality variable across several specifications with multiple control variables included suggests that the policies contained in this indicator are important predictors of private sector perceptions of customs performance. Absent direct evidence from impact evaluation of a specific policy change, cross-country estimates like this one may be useful for guiding policy choices.

Our estimates suggest that cross-country variation in policy is quite important for explaining cross-country variation in time to clear customs. When policy for all WTO members is set to best practice in all policy areas, cross-country variation in time in import customs falls. Our estimates suggest that variation in reported time in export customs would be virtually eliminated by full implementation of the TFA.

In order to illustrate the approximate magnitude of the TFA reforms we calculate implied tariff equivalent reductions, applying an outside estimate that a 1-day reduction in days in customs is roughly equivalent to a 0.6 percent *ad valorem* tariff cut. Using these figures we calculate that full Bali implementation would imply the equivalent of a 0.9 percentage point average *ad valorem*

tariff cut for import customs and a 1.2 percentage point export tax equivalent reduction for exports. These average figures obscure substantial variation across countries; the countries with the largest implied cuts in implied ad valorem tariff equivalents tend to be countries that trade relatively little.

We conduct a further thought experiment, calculating the global welfare gains associated with full implementation of the TFA by WTO member countries. We adopt a simple partial equilibrium framework so that our calculations are transparent. Our tentative estimate of the global welfare gains attributable to full implementation through reductions in time spent at customs is US $210 billion per year, with a more certain lower bound of $101 billion. These estimates range from $16 to $33 annually per resident of WTO member countries. As for national gains they are concentrated among a set of countries that are large traders, but for which the OECD policy data suggest that significant but not large policy changes would be necessary if the countries are to reach global best practice. China, the largest trader with room for significant policy improvement, accounts for roughly one-fourth of global gains from TFA implementation in our model.

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Appendix: Components of trade facilitation policy data

Table A1: OECD Trade Facilitation Indicators and their components.

Indicator	Components
Information availability	**1.** Customs has a web site. **2.** The rate of duty can be obtained through the customs web site. **3.** There are enquiry points to answer reasonable enquiries. **4.** It is possible to ask questions of the customs agency, specifically. **5.** There is enough information on procedures and required forms and documents. **6.** Some documents and forms can be downloaded from the website. **7.** There is an interval between the publication of new or amended trade related laws and regulations, and their entry into force. **8.** Agreements with third countries about the above issues are published on the web site. **9.** Rules and examples of customs classification are publicly available. **10.** Transparency of government policymaking (GCR data).
Involvement of the trade community	**1.** Adequate and timely information on regulatory changes is provided (LPI data). **2.** The introduction or amendment of laws and regulations involves consultation with the private sector. **3.** Consultations are open to any interested party. **4.** Public comments are taken into account.
Advance rulings	**1.** Advanced rulings are issued. **2.** There is a transparent online request procedure for advanced rulings. **3.** The number of requests for advanced rulings. **4.** Duration of the validity of the advanced ruling. **5.** Publication of average issuance times. **6.** Advance rulings of general interest are publicly available. **7.** It is possible to request a review of an advance ruling or its revocation / modification. **8.** Refusals to issue or revocations of advance rulings are explained/motivated.
Appeal procedures	**1.** Appeal mechanisms exist and are explained on the Customs web site. **2.** There is possibility of judicial appeal in addition to the administrative appeal. **3.** The length of the time limit for appeals, if a limit exists. **4.** Information about the motives of the administration's decision is provided. **5.** Efficiency of legal framework in challenging regulations (GCR data). **6.** Judicial independence (GCR data). **7.** Equality of treatment of national and foreign actors (IPD data). **8.** Extent of implementation and speed of court rulings in commercial matters (IPD data).
Fees and charges	**1.** Fees and charges are published on a web site. **2.** Fees and charges not related to the value of goods. **3.** Number and diversity of fees and charges (LPI data). **4.** There are no fees for Customs services during normal working hours.
Formalities (Documents)	**1.** Customs and other border agencies accept copies of documents. **2.** Ratified international conventions on trade facilitation. **3.** Number of documents to prepare for import (DB data). **4.** Same for exports (DB data). **5.** Time necessary to prepare documents for import (DB data). **6.** Same for exports (DB data).
Formalities (Automation)	**1.** Share of procedures that can be expedited electronically. **2.** Use of risk management. **3.** IT systems capable of handling electronic data exchange. **4.** Availability of full time (24/7) automated processing in Customs. **5.** Quality of telecommunications and IT (LPI data).
Formalities (Procedures)	**1.** There is a single window. **2.** Average release times for large customs offices are published on a consistent and regular basis. **3.** Clearance time in days (LPI data). **4.** Pre-arrival processing is implemented. **5.** Share of physical inspections (LPI data). **6.** Perishable goods benefit from accelerated controls. **7.** Efficiency of customs for exports (LPI data). **8.** Efficiency of customs for imports (LPI data). **9.** Share of post-clearance audits carried out.

	10. Separation of release from final determination and payment of Customs duties. **11.** Perishable goods enjoy preferential treatment concerning the separation of release. **12.** No pre-shipment inspection is required on Customs matters. **13.** Authorized Operator (AO) programmes (LPI data) **14.** Simplification of procedures (LPI data). **15.** Simplification of procedures (DB data). **16.** Working hours of Customs personnel are adapted to commercial needs. **17.** Mandatory use of a third-party customs broker is not required.
Border agency cooperation (internal)	**1.** Cooperation between domestic agencies on the ground (IPD data). **2.** Government agencies delegate controls to Customs authorities. **3.** Regular meetings are held to improve cooperation, and the private sector is included.
Border agency cooperation (external)	**1.** Working days and hours are aligned with other neighboring countries. **2.** Procedures and formalities are aligned with other neighboring countries. **3.** Common facilities are developed and shared with other neighboring countries. **4.** There are joint controls with neighboring countries.
Consularization	**1.** The country does not impose consular transaction requirements.
Governance and impartiality	**1.** Structures and functions of the Customs agency are publicly available. **2.** A code of conduct is published and made available to all employees. **3.** Information on disciplinary procedures and penalties for misconduct are publicly available. **4.** Ethics policy is consistent with international norms and a help desk exists to guide staff on ethical issues. **5.** The mechanisms for financing customs are legally defined and information is publicly available. **6.** An audit function for internal systems is established, adequately empowered and operational. **7.** Annual Customs reports are available and contain sufficient information on Customs activities. **8.** Frequency of irregular payments and bribes (GCR data).

Notes: Adapted from Moïsé and Sorescu (2013) Annex 1. More detailed information is available there.
The OECD used some external data, attributed here with relevant abbreviations.
GCR data are from the Global Competitiveness Report published by the World Economic Forum.
IPD data are from the Institutional Profiles Database compiled by CEPII.
LPI data are components of the World Bank's Logistics Performance index.
DB data are components of the Doing Business - Trading Across Borders data.