Reduced time at customs through implementing the Trade Facilitation Agreement (TFA) would be a significant boost to intra-African trade for AfCFTA countries*

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Abstract

All WTO members participate in the Trade Facilitation Agreement (TFA), a rules-based bottom-up approach built on monitorable provisions (e.g. the publication of information, advance rulings, appeal or review of decisions, transparency, and border agency cooperation) aimed at reducing time in customs. The paper draws on the OECD indicators of the state of implementation of provisions in the TFA summarized in a TFI (Trade Facilitation Index). to estimate the reduction in waiting-time at customs for a large sample of 160 countries.

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Implementing the TFA could be a significant complement to the AfCFTA's objectives. The paper's estimates suggest that a realistic implementation of TFA measures could reduce time in customs for imports by 3.7 days and by 1.9 days for exports. Using extraneous estimates from customs-level transactions, this translates to a reduction tariff Ad-Valorem Equivalent (AVE) in the range 3.5%-7% for imports and 8% extra growth of exports.

The large differences in interests across AfCFTA participants--landlocked-coastal, resource-rich and resource-poor, large-small--suggest large gains from reducing tariffs on intra-African trade. However, tariff-reductions face the zero-sum hurdle of negotiations involving rent transfers across and within countries. By avoiding rent-transfer issues, this paper suggests that taking seriously the TFA provisions would be a powerful complement to the AcFTA's tariff-reduction agenda.

1. Introduction

The Trade Facilitation Agreement (TFA) signed in 2013 with entry into force in 2017 is the first multilateral agreement since the creation of the WTO. All WTO members participate. Successful implementation should shorten transit through customs for the benefit of developing countries in general, especially (number of countries in each group in parenthesis) the Least Developed Countries (LDCs) (46) and Landlocked Developing Countries (LLDCs) (32), two groups receiving special status at the UN. The third category of countries receiving special status at the UN, the Small Island Developing States (SIDS) (19) is very heterogenous. Only some countries in the group are expected to benefit from implementing the TFA. Implementing the TFA has the particularity that progress can be monitored relatively easily at the country level which makes it easier to estimate gains from the proposed improvements.[1]

Implementing the TFA should also help boost intra-African trade, the key objective of the African Continental Free Trade Area (AfCFTA). This paper is about estimating expected gains for developing countries. Focus is on AfCFTA members and on those in the LDCs and LLDCs UN categories.

The AfCFTA's main mandate is to eliminate trade barriers to boost intra-Africa trade. All but one African country has signed the AfCFTA which entered into force on May 30, 2019. As of May 2023, 46 countries have deposited their instruments of ratification and negotiations for phase II were concluded in March 2023. Yet, many odds and ends of phase I are still to be concluded notably negotiations on Rules of Origin (RoO) for some products with high applied tariffs. Also, as of May 2023 only 2 out of the 8 Regional Economic Communities (RECs), the EAC and ECOWAS, have deposited tariff schedule offers judged compliant. Negotiations difficulties on reaching agreement on a necessary common set of ROO still beset products where MFN tariffs are highest and tariff offers have excluded those products with the highest MFN tariffs.[2]

It took some 35 years to establish the European single market. Reaching a single market across the African continent will also be a long road. This paper argues that the recently signed TFA has the potential to serve as a significant accelerator in the quest to reduce trade barriers on intra Africa trade. The paper presents new ballpark estimates of achievable reductions in trade costs at the border from reduced time in customs across AfCFTA members approximating countries' implementation capabilities. And since the main

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[1] WTO (2021) is the first review of detailed progress at commitments by measure. See https://tfadatabase.org/en for a regular update of the state of notifications by member.

[2] Melo et al. (2021) discuss the state of play in the negotiations on RoO, apparently not yet concluded officially as of early 2023. They document that negotiations have resulted in simpler regime-wide rules but show that agreeing on Product-specific rules has stalled for those products with restrictive rules and (usually) high MFN tariffs. On tariff offers for the EAC and ECOWAS the 10 percent of excluded tariff lines from offer schedules have average applied MFN rates are 28% for EAC and 23% for ECOWAS.

beneficiaries from implementing the TFA are expected to be the categories of vulnerable countries under the UN, estimates are also provided for these two groups of countries.

The main focus of the TFA is to reduce the time it takes to cross-borders, that is time spent in customs. Since slow delivery of goods is disutility to consumers, time in customs is a measure of trade costs. Best practices on Trade Facilitation recommended by the World Customs Organization are part of the TFA but Services-related dimensions of trade facilitation are not included. The TFA is rules-based rather than discretionary with specified appeal and review procedures. It is a 'bottom up approach' where low-income countries have extensive leeway in implementing the Agreement and high-income countries are not under the obligation to provide technical assistance. Importantly reduced time in customs does avoid the confrontational setting of negotiations involving transfers of rents across and within countries.

While the TFA's flexibility is welcome, those countries not implementing these time-saving measures will lose competitiveness relative to those implementing them. For example, in the case of the AfCFTA – whose principal objective is to reduce the currently high intra-African trade costs – if tariff reductions are slow, trade costs will not fall as rapidly as they would under full implementation, slowing the growth of intra-African trade. This will slow integration among AfCFTA members with likely other deleterious effects.[3] This is where implementing the TFA can be a significant complement to the AfCFTA's objectives. The paper's estimates suggest that a realistic implementation of TFA measures could reduce time in customs for imports by 3.7 days and by 1.9 days for exports. Using extraneous estimates from customs-level transactions, this translates to a reduction tariff Ad-Valorem Equivalent (AVE) in the range 3.5%-7% for imports and 8% extra growth of exports.

Section 2 situates trade facilitation measures covered by the TFA in the larger definition of what is understood by trade facilitation. The section discusses data sets measuring trade costs at the border covering a large number of countries. Results from case studies estimating reduction in time spent in customs from transaction-level data are reviewed. Section 3 describes briefly the structure of the TFA with the leeway incorporated in the agreement that rationalizes the different speed of implementation across countries built into the Agreement to take into account countries' implementation capabilities which are important for the countries that are the focus of this paper.

The two remaining sections focus on estimating expected improvements in customs efficiency (captured by reduced times in customs) from implementing the TFA using Trade Facilitation Indicators (TFI) values for 2019 provided by the OECD. Section 4 presents results of the model's prediction of time in customs for imports and exports. Section 5 then uses

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[3] Simulations reported by Minor and Wamsley (2017) suggest that if African countries (or LDCs) delay implementation, customs revenue will be less than if they avoid implementation delays as assumed for other groups (developing and developed) because they will attract less foreign direct investments which would raise customs revenues.

these estimates to predict a range of plausible reductions in time at the country level from two scenarios bracketing developing countries' likely implementation capabilities. Results are reported at the group and country levels. Section 6 concludes.

## 2. Trade costs and Trade Facilitation

Trade costs are defined as the full wedge between producer prices in the exporting country and consumer prices in the importing country (Anderson and Van Wincoop, 2003). These include 'natural barriers' like history, geography, distance, connectivity and policy – imposed barriers like tariffs, non-tariff measures at the border – plus the host of 'getting-to-the border' and 'behind-the-border' measures shown the Figure 1. To give orders of magnitude, using the Arvis et al. (2016) calibration methodology, Melo et al. (2020, Figure 10) estimate that average bilateral trade costs for Low-income African countries relative to trade costs of the largest trading countries was reduced from 274% in 1995 to 238% in 2015.[4]

Trade facilitation is part of the trade costs shown in the Figure 1. The broad definition of trade costs includes the full range of policies in the exporting and importing country identified in Figure 1. The narrow definition includes all administrative procedures at the border identified in the center of Figure 1. The TFA is about reducing trade costs at the border, i.e. at customs.

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[4] The sample includes 25 LICs and bilateral trade costs are relative to the average for the 15 largest world importers: US, China, Germany, Japan, UK, France, Hong Kong, Netherlands, Republic of Korea, Italy, India, Canada, Belgium, and Spain. The corresponding reduction estimates for 9 upper middle-income countries are from 203% in 1995 to 161% in 2015. Drawing on the same trade facilitation indicators from the OECD used in this paper, Kumar and Shepherd develop a conditional general equilibrium gravity model of bilateral trade to estimate that a full implementation of the TFA would boost world trade by 3.5% from the baseline.

Figure 1. Trade Costs at the border and beyond
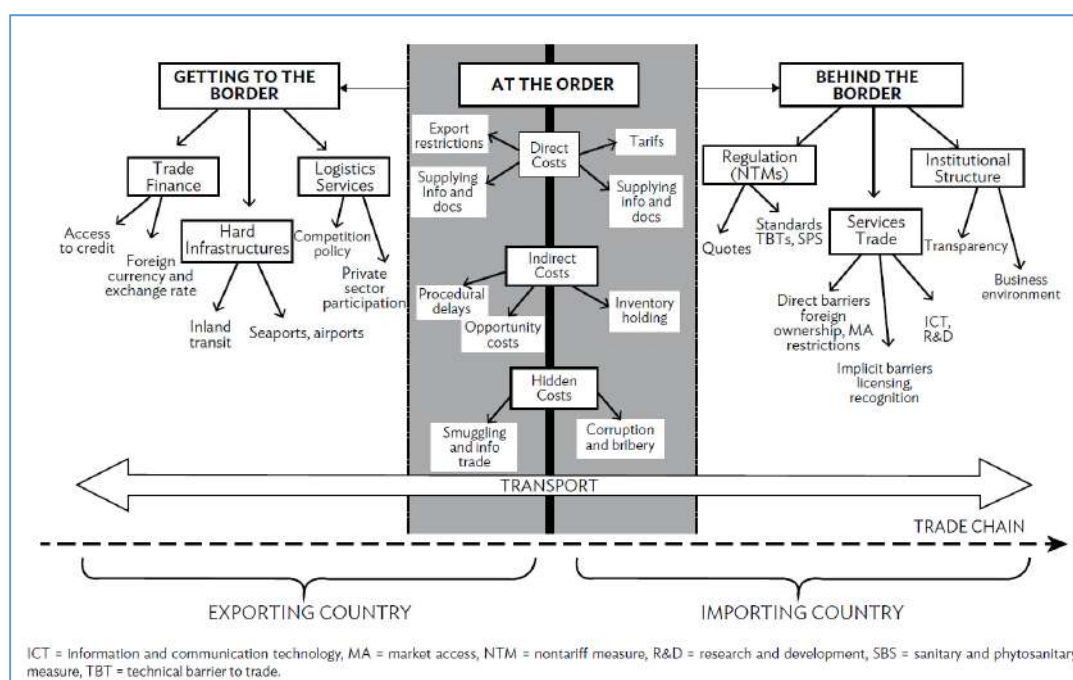
Source: Moise and Le Bris (2013, p.12)

Time spent at the border is an important component of total time between origin and destination, accounting for 37 percent of total time for Peruvian maritime import data in 2013 (Volpe, 2016, p.3). For the office on the High Representative for the 91 vulnerable countries in the three country groupings (LDCs, LLDCs, SIDS), the issue is the relative importance of policy-imposed trade barriers (tariffs and NTMs) and the other elements of trade costs identified in the Figure 1. In particular, trade costs at the border covered by the TFA – for which technical support for implementation should be forthcoming – may be higher for the UN-classified vulnerable countries and different across groupings. For members of AfCFTA, estimates from reductions in trade costs at customs are separate and additional to the reduction in trade costs from tariff liberalization.

Section 3 describes the measures covered by the TFA to reduce time at the border. Three data sources cover time and costs associated with crossing borders for a large number of countries:

> (i) customs data over time at the country level on all (or a large number of) shipments by product and mode of shipment;

> (ii) survey-based single-valued unidimensional measures (Doing Business (DB) and Logistics Performance Index (LPI)), both gathered for a large number of countries;

(iii) survey-based firm-level custom-specific measure of border time (World Bank Entreprise Surveys (WBES)) transactions for all products, sometimes to all destinations.

Customs data (i) are the most detailed. These data, available for a handful of countries allow estimating time in customs. Under the plausible assumption that assignment through customs (imports or exports processed through a red line with inspection or with no inspection) is exogenous (which can be verified in the data), one can establish a causal relation between time in customs and assignment to customs channels. Since slow delivery of goods caused by customs procedures with their associated requirements is disutility to consumers, estimates of the extra time in customs combined with trade elasticities can be translated into tariff equivalents. Three case studies have used customs data on time in customs to estimate the trade costs of customs procedures, two focusing on imports, one on exports.

Carballo et al. (2021) use detailed transaction-level customs data from Peru to study processing times in customs. They present a model building on the time uncertainty to firms due to conditionally random inspections and port congestion. In this setting, firms choose lead time--the time it takes to physically handle-- the move and clear shipments through the port of entry, weighing the risk of late delivery against the cost of a slow supply chain. They estimate that a one percent increase in median time in customs lowers import values ($\widehat{M}$) by 0.24 percent which translates into a processing cost elasticity, η, of 0.06 under a demand elasticity, σ, of 4 $\left(\eta = \frac{\widehat{M}}{\sigma} = 0.24/4 = 0.06\right)$. They also estimate extra costs, λ=1.10 associated with missing a desired delivery. Combined with the costs of a missed delivery, Peruvian customs data deliver processing costs equal to a 20 percent (rounded) import tariff at the 4-day median time in customs.[5] Based on their estimates, when compared with average import tariffs of 3% for Peru and 6% worldwide, Carballo et al. (2021) echo the optimism for reduction in costs at customs to be expected from successful implementation of the TFA.

Fernandes et al. (2019) estimate reductions in the tariff equivalent of the reduction in the costs of the time in customs following Albania's shift towards the use of risk management systems in customs. They estimate that those HS6 firm-product-country observations for which the median shipment went from inspection to no-inspection over the period 2007-2012 saw trade growth that was consistent with a tariff reduction of approximately 1.8 percentage points annually.[6]

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[5] Processing Cost= λ(median time)$^{\eta}$ -1 = 1.10x4$^{0.06}$ – 1 = 0.1954 or 19.54%.
[6] To prevent giving too much weight to outlier observations, extreme observations of time in customs are usually dropped from the sample in these customs-based case studies and estimates of extra time in customs are taken from the sample median. Time in customs are then converted in tariff equivalents using estimates of trade elasticities. So, if (ln M_2 -lnM_1) is the response of imports (or exports), and σ is the trade elasticity to a price change, then the tariff equivalent, τ, of extra

Volpe et al. (2015) carry out a similar exercise for all HS6 product-level exports of Uruguayan firms where the choice is between a 'green' (no customs inspection) and 'red' lanes (customs inspection)' over a long period. They estimate that a 10% increase in the median time spent in customs is associated, on average, with a 1.8 percentage point reduction in the growth of firm-level exports.

More customs-data-based case studies like those mentioned above, will document precisely processing costs at customs and their components. This will allow better-informed estimates of the likely gains from implementation. In the meantime, lacking enough different country studies based on characteristics of individual transactions at customs to get a more comprehensive estimate of likely gains --perhaps through a meta-analysis— across environments, this paper proceeds with survey-based single-valued unidimensional measures (ii) available for a large number of countries. These data lack the granularity of customs-based estimates, but allow for group-level estimates and comparisons across countries.

We proceed with the survey-based data (ii) that has the broadest country coverage, aware that this choice delivers patterns at the country-grouping level at the expense of establishing causality as in the case studies with detailed customs data (i) summarized above.

We have data for 162 countries listed in table A3 classified in 5 non-overlapping groups:[7]

- 16 landlocked LDCs (called "LL-LDCs")
- 19 non-landlocked including least developed SIDS (called "NL-LDCs")
- 13 non-high-income SIDS and non-LDCs (called "SIDS")
- 60 Other Developing Countries (called "ODCs")
- 54 High-Income Countries (called "HICs")

We also added as a group African countries participating in the AfCFTA:

- 43 African countries (called "AfCFTA" but synonymously referred to as "Africa").

Table 1 and figures 2-5 describe the sample. Since 2016, DB gives times at the border for three different procedures: (i) domestic transportation; (ii) documentary compliance that captures the time to satisfy requirements of government agencies in exporting and importing partners (including transit country if applicable); (iii) time and costs for border

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time is customs due to inspection is $\tau=(\ln M_2 - \ln M_1) / \sigma$. Combining their second stage estimate of a 7% reduction in time at customs when the imports change status from inspection to no-inspection with the $\sigma=-3.8$ estimate from Bernard et al. (2003) the 1.8 percentage point reduction [$1.8(=7\%/3.8)$] from the shift towards a risk-management system of assignment to the two inspection channels.

[7] Table A3 lists the countries with the corresponding groups. The group "NL-LDCs" includes 3 least developed SIDS which were excluded from the group "SIDS". In addition, 7 high-income SIDS are excluded from "SIDS"; they are only included in the group "HICs".

compliance in the domestic economy only as well as port or border handling. A handful of freight-forwarders at best accounting for a small share of exports are included. Most recent data are for 2019.[8]

For the LPI, also a survey-based measure, information is gathered from an online survey covering over 1000 multinational freight-forwarders and express carriers. Those surveyed are to report time at different steps in the supply chain to the warehouse (exports) port (imports). They are also to give customs clearance times broken down between those subject to (and those not subject to) inspection.

Table 1 reports average/median compliance time (in hours) at customs for imports and for exports for each of the 6 groups with the corresponding averages from the LPI data. Except for a few LPI data, the distributions are right-skewed, a reason to measure time in customs at the median rather than the mean. Note that the DB sample is much larger for each grouping than the corresponding LPI sample. The small sample of countries covered by the LPI disqualifies it as appropriate for this exercise. Likewise, the WBES survey data only cover 32 developing countries. So, by default, we rely on the DB data.[9]

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[8] Hallward-Driemer and Pritchett (2015, fig. 1C) show large discrepancies in the time to cross customs according to DB (21 days) and those from enterprise surveys (6 days). This suggests that DB data are more likely to represent official rather than actual times.
[9] Since 2015, DB takes as standards for imports, a shipment of 15 metric tons of containerized auto parts from the economy from which it imports the largest value of these goods, and for exports the main product (containerized or not) with the largest foreign sale to the largest purchaser of this product.

Table 1. Average/Median time (in hours) at the border by group: DB vs. LPI.

group		Lead-time to import (in hours)			Lead-time to export (in hours)		
		Border compliance (DB data)	Documentary compliance (DB data)	Customs clearance (LPI data)	Border compliance (DB data)	Documentary compliance (DB data)	Customs clearance (LPI data)
AfCFTA	Mean	130	94	154	93	69	202
	Median	99	81	108	78	66	96
LL-LDCs	Mean	90	94	176	60	57	319
	Median	88	87	144	55	55	96
NL-LDCs	Mean	139	96	124	110	86	104
	Median	108	72	108	78	60	72
HICs	Mean	26	17	64	25	13	59
	Median	3	1	72	21	2	48
SIDS	Mean	60	43	48	49	43	36
	Median	48	35	48	42	38	36
ODCs	Mean	79	74	115	62	53	116
	Median	63	36	96	46	35	72

Notes: In parenthesis, for each group, number of countries in LPI database / number of countries in DB database.

Country groups: AfCFTA (22/43); Landlocked LDCs / LL-LDCs (7/16); non-landlocked LDCs / NL-LDCs (6/19); SIDS (2/13), HICs (37/54), and ODCs (42/60).

Source: Authors' calculations from World Bank, Doing Business (DB) data 2020 and Logistic Performance Index (LPI) Surveys 2018. Note that DB data 2020 capture regulatory reforms implemented between May 2018 and May 2019.

Figure 2 shows large heterogeneity in time for border compliance within groups, especially the AfCFTA and NL-LDCs, and LL-LDCs. Figure 2 confirms that average time in customs is always less for exports across all groups. This is to be expected since exports are not subject to inspection via 'red lanes' as incentives to under-invoice are higher for exports than for imports. Average times at customs, and spreads are lowest for SIDS, perhaps because some of the required inspections will have been carried out at port of entry or transit countries.

Figure 2. Distribution of Lead-time for border compliance for exports and imports by group
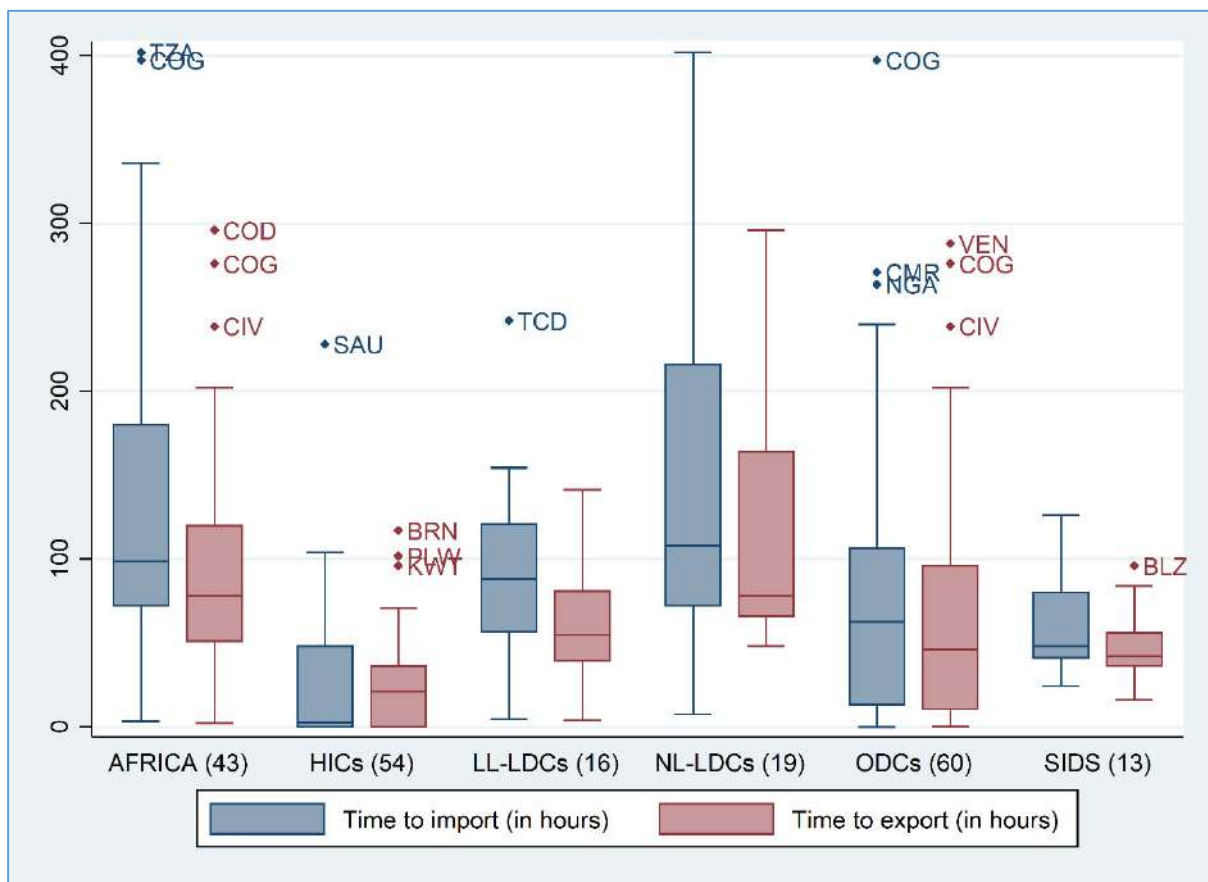
Notes: See annex Table A3 for definition of samples and country abbreviations.

Box plot: Bar in the middle is the median value, shaded area is interquartile range and minimum maximum values correspond to +/- 1.5 times interquartile range.

Number of countries per group in parenthesis. For the SIDS group, SIDS that are also LDCs (3) or HICs (7) are excluded. The ODCs group excludes all developing countries that are also LDC and/or SIDS…

Source: Authors' calculations from World Bank, Doing Business (DB) data 2020. Data captures regulatory reforms implemented between May 2018 and May 2019.

3. Trade facilitation at customs, obligations and flexibilities in the TFA

The TFA signed by all WTO members is rules-based with specified appeal and review procedures. Section 3.1 describes the obligations and exceptions. Section 3.2 describes the proxies to monitor progress at satisfying the obligations.

3.1 Obligations and Flexibilities in the TFA

The TFA has three parts. Section I lays out substantive disciplines, Section II specifies Special and Differential Treatment (SDT) provisions and defines the approach taken to implementation of disciplines by developing countries, and Section III deals with institutional arrangements (WTO, 2014). The TFA embodies a number of disciplines on border clearance procedures and transit that complement existing WTO rules on transit (Art. V GATT), fees and formalities (Art. VIII GATT), and transparency (Art. X GATT). None of these measures has been fully implemented by any country. The TFA is limited in focus to matters that are under the purview of the GATT – it does not address services-related dimensions of trade facilitation such as logistics, transport or distribution services and it does not re-open or extend specific agreements on customs valuation, import licensing, rules of origin, SPS or TBT. Among its provisions, the TFA includes publication of information, advance rulings, appeal or review of decisions, transparency, border agency cooperation, and the setting up of formalities that implement least trade-restrictive measures to achieve underlying policy objectives (e.g. "single-window" systems, a ban on mandatory Pre-Shipment Inspection (PSI) for classification/valuation). The introduction of measures making the use of customs brokers mandatory will be forbidden. Freedom of transit (i.e. the prohibition of non-transport related fees) is an objective which is most important for landlocked countries.

Best practices on Trade Facilitation recommended by the World Customs Organization (WCO) included in the revised Kyoto Convention of 2006 on Trade Facilitation will require member States to establish and maintain procedures that will help expedite the release and clearance of goods in transit. These best practices are laid down in a detailed article that also obliges Member States to allow (to the extent possible) traders to make payments electronically for duties, fees and other customs charges. Neufeld (2014) notes that most Regional Trade Agreements (RTAs) signed after the launch of the TFA negotiations in 2004 included trade facilitation provisions and that many measures in the final TFA had been inspired by trade facilitation initiatives included in RTAs (see Hoekman, 2016). 172 WTO members are TFA signatories, among which 42 African countries. [10]

Since implementing the TFA requires significant resources, which are scarce especially in LDCs, but also in many landlocked developing countries and SIDS, it is important to keep in mind the non-bindingness of the TFA for signatories. Indeed, it is only after LDCs obtained

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[10] Algeria and Ethiopia are the two largest non-signatory African countries.

recognition of Special and Differential Treatment (SDT) with wide-ranging exemptions from commitments that the TFA agenda took off. That language said that LDCs would "only be required to undertake commitments to the extent consistent with their individual development, financial and trade needs or their administrative and institutional capabilities" (Neufeld, 2014a, p. 7). As noted by Neufeld, this is a new interpretation of SDT away from a longer transition period to one in which developing countries and LDCs would not be required to implement aspects of the TFA when required support for infrastructure is not forthcoming.

This bottom-up approach, giving extensive leeway eschewed the usual 'one-size-fits all' format of WTO multilateral negotiations. Carve-out from commitments was so extensive that Hoekman (2016) notes that the occurrence of the wording "should" in the TFA provisions is twice as high as in the related WTO agreements on customs valuation and import licensing. Technical assistance not forthcoming, TFA provisions cannot be enforced through the WTO dispute settlement mechanism. Thus, the TFA presents no effective commitment threat for signatories. In sum, the TFA is a best-shot endeavor based on promises rather than on legal content. On the one hand, developing countries do not have to engage into bargaining as they only have to submit schedules of the substantive provisions of Section I dealing with limits and procedures for customs administration that they would accept – what Finger (2014) notes is akin to a tariff agreement without tariff schedules. On the other hand, the TFA will not solve the implementation problem within the GATT/WTO legal system which does not obligate the Donor members who would step forward to provide financial assistance.

3.2. Measuring Customs performance: The OECD Trade Facilitation Index (TFI)

In preparation for the TFA and following the signing of the TFA in December 2013, the OECD produced and released a series of 11 Trade Facilitation Indicators (TFIs). These indicators were initially set up to capture the category of trade facilitation policies and procedures reflected in the text of the TFA. Currently this is the most detailed catalogue of the policies and procedures used in border management agencies around the world and arguably the best we have to assess the trade cost handicaps for trade in goods across countries. The TFIs can also serve to monitor progress toward the completion of reforms relating to the performance of customs mandated by the TFA. These indicators (identified from A to K in figure 3 with definition of each indicator in table A4) are proxies that monitor how close a country is to the targets identified by the TFA. Each of the eleven indicators can take a value between 0 (no implementation of TFA) and 2 (full implementation of TFA). Some indicators are averages of subcomponents. A higher value indicates better customs performance for the indicator.

Figure 3. Trade Facilitation Indicators in 2019 by country groups
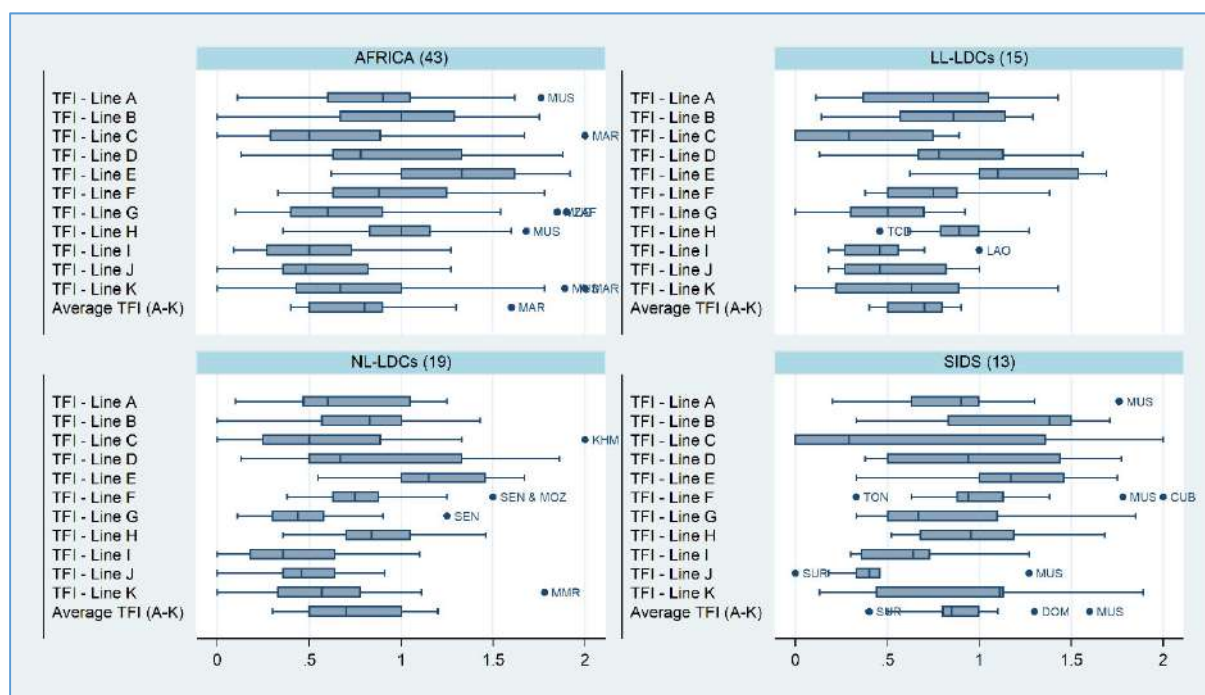
Notes: See Table A4 for definition of lines A-K

Indicator scores range from 0 (no implementation) to 2 (full implementation of TFA). Box plot: Bar in the middle is the median value, shaded area is interquartile range and minimum maximum values correspond to +/- 1.5 times interquartile range. Average TFI (A-K) at bottom is the simple average of components (A)-(K) for each country in each group. Number of countries per group in parenthesis.

Source: Authors' calculations from OECD TFI data 2019.

Figure 3 displays the distribution of each component (A to K) and the aggregated TFI across the sample countries classified in the 4 country groupings used in figure 2. In each panel, the average TFI (L) which is the simple average of all TFI components (A to K) is at the bottom In the AfCFTA group, Morocco and Mauritius often outperform. There are few outperformers in the LL-LDCs group and a greater spread in the SIDS group. The average TFI for each country in the sample, is the TFI-related variable used in the econometric estimates reported in section 4.

Figure 4 displays the distribution of the average TFI (in Figure 3) for each country in each of the 4 groups of greatest interest. The two LDC groups have the lowest median values for the average TFI index with less spread for the LL-LDC group. The median score for the HICs is higher than the best score (Mauritius) in the Africa group, an indication of the relative efficiency of customs across Africa. Though not appearing in the figure, Singapore stands out with a value of (1.8) out of a maximum possible score of 2.0.[11]

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[11] Classified as a high-income SIDS, Singapore is included in the group "HICs" for our study. It does not appear in figure 3 because of its extreme score beyond 1.5 times the interquartile range.

Figure 4. Distribution of the average Trade Facilitation Indicator (TFI) by group

Notes: Indicator scores range from 0 (no implementation) to 2 (full implementation of TFA).

Box plot: Middle bar is the median value, shaded area is interquartile range and minimum maximum values correspond to +/- 1.5 times interquartile range. Average TFI is the average of components (A)-(K) fo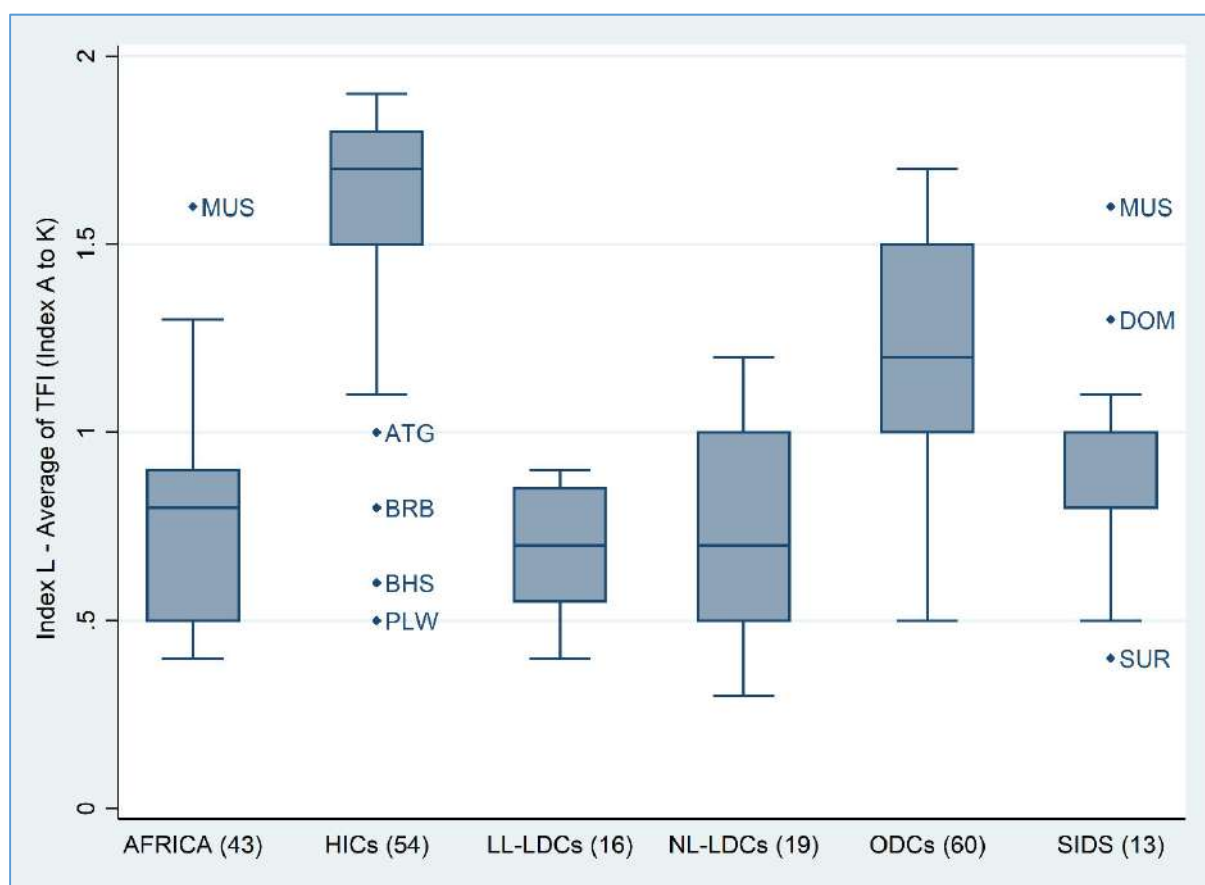r each country. Number of countries per group in parenthesis: For the SIDS group, SIDS that are also LDCs (3) or HICs (7) are excluded. The ODCs group excludes all developing countries that are also LDC and/or SIDS.

Source: Authors' calculations from OECD, TFI data 2019.

3.3. Expected benefits from implementing the TFA

As a final inspection of the data, figure 5 plots time and costs to import broken down into border and documentary costs, for each country in each group (with LL-LDCs and NL-LDCs lumped together)

Figure 5. Time vs. costs to import (Border and Documentary compliance)
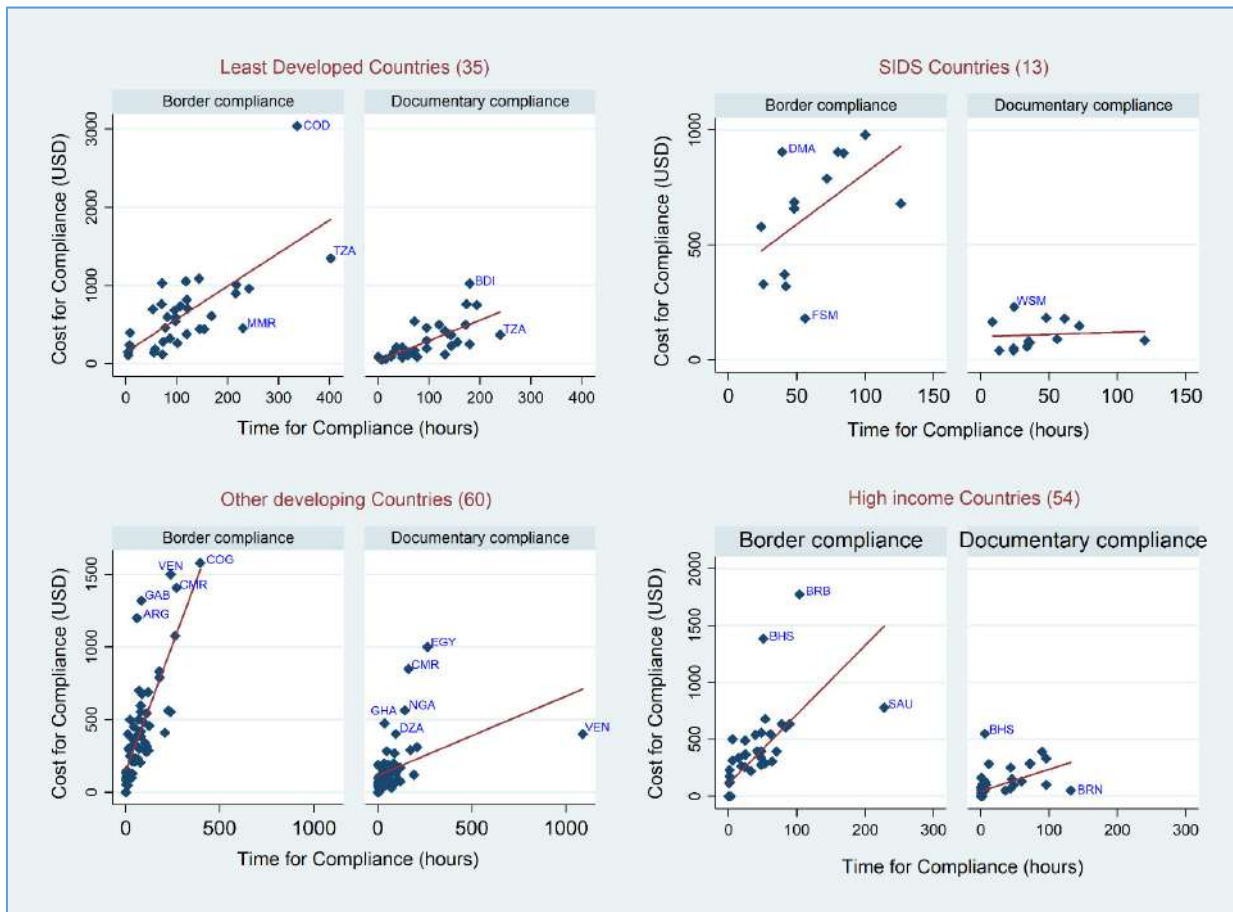
Notes: To fit all observations in each group, vertical and horizontal scales are group-specific so the slopes of least square lines are not comparable across groups. List of abbreviations in table A3.

 Source: Authors' calculation from World Bank, DB 2020 data.

Subject to caveats on the quality of the data, several patterns stand out. First, even though monetary compliance costs do not capture all costs associated with time in customs, both border and documentary costs are positively correlated with time in customs. Second, there are quite a few outliers, especially in the LDC and SIDS groups. In some cases, these reflect unexpected events or error in data recording. Several years of data would attenuate this problem in the data. Third, the other developing countries (ODCs) and High Income Countries (HICs) groups are more comparable than the other two groups.

As an order of magnitude of estimated gains from reduced clearance times, take the median of the border compliance time of 88 hours in customs for LL-LDCs imports. Suppose the TFA reduced the median time in customs to the median of 63 hours for the LL-LDCs. Applying the processing cost estimates of Carballo et al. (2021) mentioned earlier would reduce the estimated tariff equivalent from 43.90% to 41.04%. Alternatively, apply the mean estimate of Hummels and Schaur (2015) of a per day reduction in trade costs equivalent to a 1.3% tariff on imports at destination. This reduction in time of 25 hours (or 1.04 days) would be equivalent to a reduction in trade costs of 1.4% ≈ [1.04*1.3]. These ballpark estimates suggest a stiff penalty on traded activities.[12] Furthermore, in a world of trade in tasks where intermediates are processed in different jurisdictions, the 1.04 extra days for imports (before the TFA implementation) are a penalty for downstream exports, a cost 'surcharge' of 1.4%.

TFI indices have also been used to examine diversification. Greater diversification is expected from a reduction in trade costs, as the fixed costs that prevent exporters from diversifying the same product to more markets, or other products in the same market, are reduced. Firms that have not exported before may be able to export when fixed costs fall (Melitz, 2003). Trade facilitation can therefore increase existing exports (intensive margin effect) and create new trade flows (extensive margin effect). The expansion of existing exports and the creation of new exports should also result from the reduction of export uncertainty. Taking into account other factors affecting bilateral trade, Moïsé and Sorescu (2013) find a positive correlation between bilateral trade and higher values for TFI indicators in 2012. Using the same data, Beverelli et al (2015) find that increases in the number of products exported per destination and the number of destinations are associated with higher values of the TFI. They estimate that the largest gains occurred in Latin America and SSA.

4. Empirical framework

Higher TFI values would be expected to result in lower trade costs. Then, controlling for other observable factors affecting customs performance, a reduction in time at customs should then be associated with an increase in the volume of trade as shown in several

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[12] These estimates are illustrative since part of the time spent in customs for exports is likely to be higher because comparative advantage is likely to be in agricultural products that require additional SPS-related controls at customs.

studies. Hillberry and Zhang (2017) and Melo and Wagner (2016) used earlier TFI values reported in days to estimate reductions in time to import and export when TFI scores are improved. Below we carry out a similar exercise with values of time in customs for 2019 reported in hours applying estimators that give more accurate predictions of time in customs for low-income countries. [13]

We propose a zero-inflated estimator which takes into account that the population consists of two groups of countries (those in a deep customs union like the European Union where time in customs is zero) and those where time in customs tends to zero. As shown below, this estimation strategy is more appropriate for estimating the effects of implementing the TFA in developing countries.

4.1 Model and Estimator

The Poisson model constitutes the starting point of any analysis based on count data as is the case with the time to import (and export) from the doing business. Poisson regression is similar to regular multiple regressions except that the dependent variable is an observed count that follows the Poisson distribution. It is assumed that large counts are rare. Hence, Poisson regression is similar to logistic regression, which also has a discrete response variable. However, the response is not limited to specific values as it is in logistic regression.

The Poisson distribution models the probability of y events during a specified exposure period t. (here the number of hours in customs) with the formula:

$$\Pr(Y = y|\mu, t) = \frac{e^{-\mu t}\mu t^y}{y!} \; (y = 0, 1, 2, \dots)$$

The parameter μ or the Poisson incidence rate may be interpreted as the risk of a new occurrence of the event and is determined by a set of k regressor variables such as:

$$\mu = texp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)$$

This vector of k regressors is kept close to the ones used in Hillberry and Zhang (2017) and Melo and Wagner (2016). It includes the TFI indicator and three distinct groups:

1) Geographical variables (land size in sq-km, OECD dummy variable);

2) Basic structural economic variables (GDP, GDP per capita, GDP per capita squared, LPI infrastructure quality index);

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[13] From an average error of around 4 days using days in import customs to an average error of 813 hours (or 33 days) when using hourly data.

3) Policy variables (e.g. strength of rule of law, a component of the reflected by the aggregation of the six indictors from the World Bank's World Governance Indicator (WGI) and;

4) The aggregated TFI (average of TFI components A-K) that captures customs performance addressed by the TFA.

Estimates cover 163 counties (see Table A3) - including 32 LLDCs, 35 LDCs, and 24 SIDS – and using most recent data (2019/2020). Dummies for landlocked countries and OECD countries are from the United Nations classifications. Data on Land size and GDP are from the World Bank's World Development Indicators (WDI). LPI infrastructure quality index are from the Logistic Performance Index Surveys. Data on six dimensions of governance (Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption) are from the World Bank's World Governance Indicator (WGI). Data on TFIs are from OECD.[14] Table 2 displays the summary statistics for all covariates used in the models reported in table 3.

Table 2. Descriptive statistics

Variable	Obs.	Mean	St. Dev.	Min	Max
Time at border to import (in hours)	162	67.77623	77.11185	0	402
Time at border to export (in hours)	162	54.08664	56.49191	0	296
Average trade facilitation index (TFI)	162	1.196296	0.4453889	.3	1.9
Total Population	161	4.54e+07	1.58e+08	18008	1.40e+09
GDP (current US$)	156	5.46e+11	2.14e+12	1.95e+08	2.14e+13
Surface area (sq. km)	160	769661.8	2093958	300	1.71e+07
OECD dummy	162	0.2098765	0.408483	0	1
LDC dummy	162	0.2098765	0.408483	0	1
SIDS dummy	162	0.0802469	0.2725175	0	1
Voice and Accountability	162	0.0479895	0.9348939	-1.841044	1.732547
Political Stability and Absence of Violence/Terrorism	162	-0.020526	0.8690878	-2.281261	1.541482
Government Effectiveness	162	0.0734799	0.9267212	-1.720417	2.231474
Regulatory Quality	162	0.0980891	0.9209519	-2.33437	2.206004
Rule of Law	162	0.0443266	0.9292003	-2.338622	2.046279
Control of Corruption	162	0.022603	0.9641823	-1.503398	2.21243
Nb. of Mobile cellular subscriptions	147	5.17e+07	1.73e+08	58838	1.65e+09
Infrastructure	143	2.79979	0.6653237	1.82	4.37

Source: Authors' from WBI and DB indicators.

To save space, we discuss the choice of the estimator only in the case of imports (see Table A1). The regression coefficients are estimated using the method of maximum likelihood. The Poisson model performs poorly when the data are over-dispersed which seems to be

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[14] The data that support the findings of this study are available from the corresponding author upon reasonable request.

the case for time to import.[15] With a mean of 32.62 hours and a standard deviation of 36.28 hours, the data are over-dispersed which is confirmed by the greater than one Pearson statistic (about 33) associated with the estimated Poisson for which the results are displayed in Table A1 (column 1) in appendix. In cases of overdispersion, the standard negative binomial regression model is more appropriate. The negative binomial regression model is then based on the Poisson-gamma (Γ) mixture distribution where the Poisson distribution is generalized by including a gamma noise variable which has a mean of 1 and a scale parameter of v to be estimated. The new distribution is given by:

$$\Pr(Y = y | \mu, \alpha) = \frac{\Gamma(y + \alpha^{-1})}{\Gamma(y+1)\Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu t}\right)^{\alpha^{-1}} \left(\frac{\mu t}{\alpha^{-1} + \mu t}\right)^y \quad (y = 0, 1, 2, \dots)$$

$$\text{where,} \quad \alpha = \frac{1}{v}$$

As evaluated by the AIC or BIC statistics, the negative binomial model fits the data much better than the Poisson model (see columns 1 and 2 in Table A1).[16] Finally, as discussed above, the presence of a significant number of zeros in our left-hand side variable can also lead to biased estimates, the Poisson and negative-binomial models being unable to replicate this characteristic in the data as displayed in Table A2 (panel a). We see that 15.8% of the countries in the sample display a time to import equal to zero, but the Poisson model predicts that only 0.07% would have zero time in customs and the negative-binomial only 6.3%. Those models clearly underestimate the probability of zero counts.

One way to model this type of situation is to assume that the data come from a mixture of two populations, one where the counts is always zero (with probability π), and another where the count has a Poisson or Negative-Binomial distribution (with probability 1-π). In this model zero counts can come from either population, while positive counts come only from the second one. Therefore, the probability distribution of the zero-inflated Poisson or zero-inflated Negative binomial (ZINB) random variable y can be written:

$$\Pr(y = j) = \begin{cases} \pi + (1 - \pi)g(y = 0) & if\ j = 0 \\ (1 - \pi)g(y) & if\ j > 0 \end{cases}$$

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[15] The Poisson distribution assumes that the mean and variance of the response variable are equal for a given set of covariates. When the mean and variance are equal, the data are said to be equi-dispersed. When the variance is greater than the mean, the data are said to be over-dispersed.

[16] The AIC and BIC criteria for model selection measure the trade-off between model fit and complexity of the model. A good model is the one that has minimum AIC or BIC among all models.

where π is the logistic link function defined below and g(y)= $\Pr(Y = y|\mu, t)$ is the Poisson distribution or g(y)= $\Pr(Y = y|\mu, \alpha)$, the negative binomial distribution given above.[17]

In the context of using the TFI data to estimate the gains in reduced time at customs from implementing the TFA, we can suppose that those countries that are deeply integrated in customs union as those in the European Union are drawn from a different population than the developing and/or vulnerable countries that are the focus of this paper. Members of this first group wouldn't spend any time in import customs, whereas members of the second group would spend 0,1,2,..., n hours - a count that may be assumed to have a Poisson or Negative-Binomial distribution. The distribution of the outcome can then be modeled in terms of two parameters, the probability of 'always zero', and the mean number of hours for those not in the 'always zero' group as suggested by the zero-inflated binomial presented above. According to Table A1 (column 3 and 4) and Table A2 (panel a), the zero-inflated Negative-binomial model fits the data better than the zero-inflated Poisson model.

Another way to check appropriateness is to create groups based on the linear predictor, compute the mean and variance for each group and to plot the mean-variance relationship. Figure A1 shows that the Poisson variance function does a good job for the bulk of the data, but fails to capture the high variances of the countries with the largest reported time to import which are the countries of interest here. The zero-inflated negative binomial variance function is not too different but, being a quadratic, does a better job at the high end. In sum, the zero inflated negative binomial model fits the data better than the Poisson model.[18]

Consistent with Hillberry and Zhang (2017) and Melo and Wagner (2016), the TFI proxy variable is negatively and significantly associated with time in customs for imports and exports in every model (see Table A1 in appendix). Thus, a higher TFI score is significantly associated with less time spent in customs for imports and exports. For these reasons, we rely on ZINB estimates for simulating the effects of implementing the TFA.

4.2. Results

Table 3 gives the ZINB results of the relationship between the number of hours required to clear customs (from the Doing Business 2020) and the set of regressors selected above. Estimates for imports in columns 4 and 7 for exports are retained for the simulations reported in section 5. Covariates display the expected signs. Among variables of interest that turn out to be significant predictors of time in import customs, governance indicators

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[17] The estimating equation remains similar and the vector of control variables can be split in four groups: geographical variables (land size in sq-km, landlocked dummy variable, OECD dummy variable, SIDS dummy variable), basic structural economic variables (GDP, GDP per capita, GDP per capita squared, LPI infrastructure quality index), policy variables (WGI) and the TFI variables.

[18] Table A2(b) compares predictions against observed time in customs for imports for the different estimators.

– notably the average values of both WGIs and TFIs – are significantly correlated with the amount of time required to clear customs according to the DB indicators.

Table 3. ZINB estimates: Impact of TFA on waiting time at customs

Specifications	Time to import						Time to export
	Col. (1)	Col. (2)	Col. (3)	Col. (4)	Col. (5)	Col. (6)	Col. (7)
TFI (2019)	-1.2457*** (0.2186)	-1.2137*** (0.2807)	-1.3742*** (0.3488)	-0.8824** (0.4226)	-1.4474*** (0.4592)	-1.1419*** (0.4206)	-1.2926*** (0.4066)
Area in Km^2		0.1268*** (0.0360)	-0.0141 (0.0551)	0.0076 (0.0550)	0.0127 (0.0574)	-0.0158 (0.0569)	0.1109** (0.0509)
OECD dummy		-0.7723*** (0.2941)	-0.7057** (0.3221)	-0.5505 (0.3421)	-0.7027** (0.3318)	-0.4695 (0.3630)	-0.3467 (0.3140)
LDC dummy		-0.1109 (0.2358)	-0.3876 (0.2965)		-0.4871 (0.3171)	-0.2091 (0.3322)	
SIDS dummy		-0.0518 (0.3111)	0.2644 (0.3363)		0.1804 (0.4089)	0.3228 (0.3816)	
GDP			0.2314*** (0.0755)	0.1460 (0.0961)	0.2197** (0.0915)	0.1879** (0.0814)	0.0123 (0.0868)
GDP/capita			-1.1758 (0.9048)	-0.7095 (0.7877)	-1.3566 (0.9198)	-1.3957 (0.9987)	0.2060 (0.7445)
(GDP/capita)^2			0.0509 (0.0510)	0.0372 (0.0466)	0.0648 (0.0531)	0.0696 (0.0560)	-0.0073 (0.0441)
WGI (2018)				-0.5319** (0.2490)		-0.3622 (0.2413)	-0.0973 (0.2297)
Infrastructure Index				0.1441 (0.3078)	0.0190 (0.3188)		-0.0323 (0.2839)
Rule of Law					-0.0909 (0.2593)		
Mob. Cellular sub. (per 100 people)						0.1807 (0.3542)	
Constant	5.6331*** (0.2573)	4.1740*** (0.5063)	6.5565 (4.0892)	4.3316 (3.3639)	7.0806* (4.0595)	6.9216 (4.4999)	2.7307 (3.1188)
Nb. of obs.	162	160	155	139	139	143	139
Incl. Zero-obs.	22	22	22	22	22	22	16
AIC	1564	1523	1465	1291	1298	1341	1281
BIC	1579	1556	1523	1346	1365	1409	1337

 Notes: *Dependent variable: number of hours in customs from the World Bank's Doing Business 2019.*
Significance of estimates: * p<0.10, ** p<0.05, *** p<0.01; t-statistics in parentheses.
ZINB: Zero-inflated negative binomial. To save space, coefficients from the inflate equation to predict zero observations are not reported. Trade Facilitation Index (TFI) is the simple average of the 11 components of the TFI indicators of the OECD. Variable "Rule of law" is taken from the 6 components of the World Governance

Indicators (WGI) of the World Bank. "Infrastructure Index" corresponds to the Infrastructure component of the World Bank's Logistic Performance Index. Only countries for which all 11 TFI components are available are included in the sample.

Source: Authors' estimations from OECD and World Bank data.

The relationship between time in import customs and GDP per capita is negative and nonlinear, but not significant, an indication that other (mostly policy) variables and the TFI capture variations of time in customs. Better institutional development (captured by the WGI) are significantly correlated with less time in import customs. Finally, contrary to Hillberry and Zhang (2017) and Melo and Wagner (2016), by using updated data and a larger sample of countries, we do not find any significant relationship between proxies for hard infrastructure development and time to clear customs.

5. Simulating time-reductions in customs from implementing the TFA

Table 4 reports the simulated time gain at borders for all the groups, excluding the small and heterogenous SIDS group.[19] We consider two illustrative scenarios, reporting average group gains in Table 4 and selected country-level estimates in Figure 6. The two scenarios are:

1. Each country's TFI converges to the average value of the top 2 TFIs in the sample (simulation 1);
2. Each country's TFI converges to the average of the top 2 TFI within his group (simulation 2);
3. For AfCFTA, an aggregate of very heterogenous countries (LL-LDCs, NL-LDCs and ODCs), for each country, let its TFI converge to the top 2 values of its respective group.

Simulation 1 is a more aspirational long-term objective, but simulation 2 can be considered a plausible objective for the medium-term. Together, the estimates give a range of estimates at the country and group levels. Panel a) reports estimates for imports and panel b) for exports.

Three estimates are used to convert the simulated time reductions from TFA implementation to Average Tariff Equivalents (AVEs). For reduced time in customs for imports we compare the Hummels and Schaur (2013) estimate with the processing cost estimate of Carballo et al (2021) reviewed earlier. To recall, using US imports by mode of

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[19] Even though figure 4 shows several underperforming customs in the HIC group, the focus here is on developing countries, so simulations are not carried out for the HIC group.

transport, Hummels and Schaur (2013) estimate that one day (24 hours) is equivalent to a 0.6 to 2.1 percentage point tariff reduction in the destination country. Our conversion takes their mean estimate of 1.3 percentage point per 24-hour reduction in time. For the Peruvian estimates of Carballo et al. (2021), we apply their estimated reduction in processing costs of 20% for a one percent decrease in time at the median time in customs. For exports, we apply the Volpe et al. (2016) estimates for Uruguayan exports: a 10% reduction in median time is estimated to raise export growth by 1.8 percentage points.

Table 4 reports the results starting with those for AfCFTA, then those for the two categories of UN vulnerable categories (LL-LDCs and NL-LDCs) and a third group of Other Developing Countries (ODCs). Column 1 reports DB figures from table 1. Column 2 reports average and median estimates from table 2, columns 4 and 7. Times in customs are less for exports than for imports across all groups. For all groups, the median exceeds the mean (reflecting the outliers noted in figure 5), a reason to prefer median to average-based estimates that give more weight to extreme values. Model-predicted times are close to DB times for the large, relatively homogenous ODC group. Predicted values are further off from DB values for the smaller LL-LDC and NL-LDC groups and also for the AfCFTA group. Overall, estimates in col. 2 are approximately in the 10 percent range of those reported in col. 1. Patterns are the same for both time in customs for imports and for exports: over-prediction for the LL-LDC group and under-prediction for the NL-LDC and AfCFTA groups.

Table 4. Time-reducing estimates of TFA implementation (in hours)

	Lead Time at customs in hours (DB)	Predicted Lead time at customs in hours (Model)	Simulation (1)			Simulation (2)		
			Lead time at customs (in hours) after Simulation	Time reduction (in hours) after Simulation	AVE[a] of reduction in time (in %) after Simulation	Lead time at customs (in hours) after Simulation	Time reduction (in hours) after Simulation	AVE[a] of reduction in time(in %) after Simulation
Column	Col. 1	Col. 2	Col. 3	Col. 4 = (Col. 3 - Col. 2)	Col. 5	Col. 6	Col. 7 = (Col. 6 - Col. 2)	Col. 8
Panel a. Lead Time at Border to Import								
AfCFTA(43)	130 [99]	120 [117]	30 [31]	-90 [-86]	-4.9 [-11.2]	54 [52]	-66 [-65]	-3.6 [-7.0]
LL-LDCs(16)	91 [88]	136 [124]	29 [31]	-107 [-93]	-5.8 [-11.7]	71 [74]	-65 [-50]	-3.5 [-4.5]
NL-LDCs(19)	139 [108]	120 [118]	28 [28]	-92 [-90]	-5.0 [-12.1]	54 [55]	-66 [-63]	-3.6 [-6.6]
ODCs(60)	79 [63]	77 [75]	34 [32]	-43 [-43]	-2.3 [-7.1]	42 [40]	-35 [-35]	-1.9 [-5.3]
Panel b. Lead Time at Border to Export[b]								
AfCFTA(43)	93 [78]	89 [86]	20 [21]	-69 [-65]	[+11.7]	47 [41]	-42 [-45]	[+8.1]
LL-LDCs(16)	60 [55]	97 [90]	18 [19]	-79 [-71]	[+12.9]	67 [68]	-30 [-22]	[+4.0]
NL-LDCs(19)	110 [78]	89 [84]	18 [18]	-71 [-66]	[+11.9]	47 [46]	-42 [-38]	[+6.9]
ODCs(60)	62 [46]	60 [54]	23 [22]	-37 [-32]	[+5.8]	32 [31]	-28 [-23]	[+4.1]

Notes: These estimates are based on ZINB covering 139/162 countries (see Table 2, col. 4 and 7). They are reported for four categories of countries (number of countries in each group in parenthesis in col. 1): LL-LDCs: landlocked least developed countries – NL-LDCs: Non-landlocked least developed countries – AfCFTA: African Continental Free Trade Area members – ODCs: Others developing countries. All values are simple average per group. Simulations from Table 2, Col. (4) for Time to import; Col. (7) for Time to export.

Cols 1 to 8 report the average value for each group. Group medians in brackets.

Simulations: Scenario (1) – Convergence to the top-2 average in Sample: The TFA index of each country takes the average value of the top 2 TFA index in sample | Scenario (2) – Convergence to the top-2 average within each country group convergence: within each country group, all countries converge to the average of the top 2 TFA index. For group "AfCFTA: African NL-LDCs converge to the top 2 TFA index values of group "NL-LDCs" – African LL-LDCs converge to the top 2 TFA index values of group "LL-LDCs" – Non-LDCs countries in Africa converge to the top 2 TFA index values of group "ODCs".

[a] The ad valorem equivalent (AVE) of reduction in trade costs (TC) is the simulated gain (to import/export) divided by 24, times 1.3% from Hummels and Schaur (2013). These AVEs in % (reported in col. 5 and 8) are calculated from the results of simulation 1 and simulation 2, respectively. For example, for the LL-LDCs group, simulation 1 gives a gain of 29-136 = -107 hours resulting in an AVE of around -5.80%≈ [(-107/24)*1.3]. The AVEs for imports in brackets (Cols 5 and 8) are calculated following the processing cost expression from Carballo et al. (2021): $\lambda(\text{median time})^{\eta} - 1 = 1.10 \times (\text{median time})^{0.06} - 1$. For the LL-LDCs group, the gain is 11.7.

[b] For exports, estimates of reduction in median time at customs are translated into increases in growth of firm-level exports in columns 5 and 8 using the estimates in Volpe et al. (2016) for the universe of Uruguayan exports: a 10% reduction in time at the median time is estimated to raise export growth by 1.8%. For example, for the LL-LDCs group, simulation 1 gives a gain in median time of 71 hours resulting in an export growth of around 12.78%≈ [(71*1.8)/10].

Figure 6: Africa, country-level estimates from TFA implementation.

AfCFTA: Imports - Simulation (2)

AfCFTA Export growth - Simulation (2)

Notes:

Congo, D.R., Algeria and Comoros are not TFA signatories.

The vertical red line is the median value for the 43 African countries in the AfCFTA group. The AVE of reduction in processing costs for imports are calculated following the processing cost expression from Carballo et al. (2021). For exports, estimates of reduction in time at customs are translated into increases in growth of firm-level exports using the estimates in Volpe et al. (2016): a 10% reduction in time raise export growth by 1.8%. Estimates are for countries with no missing data.

Simulations: Scenario (2) – Convergence to the top-2 average within each country group convergence: Within each country group, all countries converge to the average of the top 2 TFA index.
Source: Authors' estimates

Take the estimates in columns 7 and 8 from simulation 2 as more attainable in the medium term. TFA implementation would then reduce time in customs for imports by 2.7 days, equivalent to an AVE of 3.6% using the Hummels and Schaur conversion and 7.0% using the Carballo et al. conversion. These large magnitudes (the weighted average applied tariffs for Africa is 5.7% in 2017) would apply to all imports. On the export side, time in customs would be reduced by 1.9 days estimated equivalent to an 8.1% increase in exports applying the Volpe et al. conversion.

Figure 6 reports AVE estimates at the country level for imports and added exports growth under simulation 2 for the 38 AfCFTA countries with no missing data (corresponding estimates for the NL-LDCs and LL-LDCs groups are reported in figure A2). Under simulation 2 scenario, countries at the top of their respective groups (e.g. Rwanda, Senegal and South Africa on the import side in figure 6a and South Africa, Morocco Uganda, Rwanda, Senegal on the export side in figure 6b) are assumed not to reduce time in customs. This is unrealistic, so estimates at the group level are arguably on the low-side.

In summary, two patterns emerge from the simulations: gains from reduction in customs on the export side as well as on the import side, and heterogeneity across countries after controlling for differences in per capita income and governance.

6. Conclusions

Implementing the Trade Facilitation Agreement (TFA) should benefit developing countries, especially those recognized as vulnerable by the UN. Case studies of time in customs based on transaction-level data show that customs reform, some along the lines suggested by the TFA, should result in large reductions in time spent in customs for imports and also for exports. Inspired by this evidence, the paper provides cross-country ballpark estimates that taking seriously the TFA mandate would help boost intra-African trade, the key objective of the African Continental Free Trade Area (AfCFTA). If the data and estimation approach does not allow to establish causality, its flexibility is useful to capture the TFA set-up that gives countries leeway for implementation.

Estimates of time in customs for imports and exports derived from the OECD Trade Facilitation Indexes (TFI) values for 2019 approximate observed values reported in Doing Business data. These encouraging results provided support for two counterfactual simulations, one plausible, another ambitious, of improvements in customs performance from reduction in time in customs. Taking results from the less ambitious counterfactual suggest that implementing the measures advocated by the TFA would reduce time in customs for 38 African countries engaged in the AfCFTA by 3.7 days for imports and by 1.9

days for exports. Applying extraneous estimates from customs-level transactions, this translates to a reduction tariff Ad-Valorem Equivalent (AVE) in the range 3.5%-7% for imports and 8% extra growth of exports.

The large differences in interests across AfCFTA participants--landlocked-coastal, resource-rich and resource-poor, large-small--suggest large gains from reducing tariffs on intra-African trade. However, tariff-reductions face the zero-sum hurdle of negotiations involving rent transfers across and within countries. By avoiding rent-transfer issues, taking seriously the TFA provisions can be a powerful complement to the AcFTA's tariff-reduction agenda, at least for the large majority of countries that are signatories of the TFA.

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Annex Tables

Table A1. Comparison of estimates using Poisson, Negative binomial and ZINB

Estimators	Poisson	Negative Binomial	Zero-inflated Poisson	Zero-inflated Negative Binomial
	(1)	(2)	(3)	(4)
	Dependent : Time to import (in hours), border compliance			
TFI (2019)	-0.7905*** (0.0540)	-1.4855*** (0.5491)	-0.8191*** (0.0548)	-0.8824** (0.4226)
GDP	0.1699*** (0.0130)	0.2430** (0.1197)	0.1595*** (0.0129)	0.1460 (0.0961)
GDP per capita	-0.3857*** (0.1029)	-0.9732 (0.9625)	-0.3288*** (0.1008)	-0.7095 (0.7877)
(GDP per capita)^2	0.0183*** (0.0064)	0.0557 (0.0566)	0.0160** (0.0062)	0.0372 (0.0466)
Area in km^2	-0.0171** (0.0085)	0.0504 (0.0660)	-0.0145* (0.0083)	0.0076 (0.0550)
OECD dummy	-1.0401*** (0.0680)	-1.3992*** (0.3654)	-0.5138*** (0.0667)	-0.5505 (0.3421)
WGI (2018)	-0.7311*** (0.0336)	-0.2848 (0.3126)	-0.6900*** (0.0328)	-0.5319** (0.2490)
Infrastructure index	0.1154*** (0.0429)	-0.1425 (0.3773)	0.1341*** (0.0423)	0.1441 (0.3078)
Constant	2.5700*** (0.4130)	3.7800 (4.2207)	2.5186*** (0.4093)	4.3316 (3.3639)
Nb. of observations	139	139	139	139
AIC	5053	1334	4326	1291
BIC	5080	1363	4379	1346

Notes: The Table displays coefficients. The dependent variable is the number of days in import customs from the World Bank's Doing Business. Significance of estimates: * p<0.10, ** p<0.05, *** p<0.01. The t-statistics in parentheses. The Trade Facilitation Index (TFI) is the simple average of the 11 components of the Trade Facilitation Indicators of the OECD. The rule of law variable is of the 6 components of the World Governance Indicators of the World Bank. The Infrastructure Index corresponds to the Infrastructure component of the World Bank's Logistic Performance Index. Only countries for which all 11 TFI components are available are included in the sample. Higher values for the WGI and the infrastructure index indicate better performance.

Source: Authors' estimations based on OECD & World Bank data.

Table A2. Goodness of fit: Poisson, Negative binomial and ZINB

Panel a. Observed and predicted probability of Time to import being equal to zero

Model	Probability
Observed from data	15.83%
Poisson	0.07%
Negative Binomial	6.35%
Zero-inflated Poisson	15.83%
Zero-inflated Negative Binomial	14.66%

Note: These statistics are based on Results in Table A1.

Source: Authors' calculation from estimates in Table A1

Panel b. Absolute difference between observed and predicted time to import (in hours)

Model	Obs.	Mean	Std. Dev.	Min.	Max.
Poisson	139	32.62	36.28	0.43	272.90
Negative Binomial	139	34.47	41.10	0.02	288.13
Zero-inflated Poisson	139	32.09	36.78	0.07	271.23
Zero-inflated Negative Binomial	139	32.39	38.08	0.17	282.43

Note: These statistics are based on Results in Table A1.

Source: Authors' calculation from estimates in Table A1

Table A3. List of countries (162)

ISO3 code	Name of country	AFRICA	LDC		SIDS	HIC	ODC
			LL-LDC	NL-LDC			
AGO	Angola	X		X			
ALB	Albania						X
ARE	United Arab Emirates					X	
ARG	Argentina						X
ARM	Armenia						X
ATG	Antigua and Barbuda					X	
AUS	Australia					X	
AUT	Austria					X	
AZE	Azerbaijan						X
BDI	Burundi	X	X				
BEL	Belgium					X	
BEN	Benin	X		X			
BFA	Burkina Faso	X	X				
BGD	Bangladesh			X			
BGR	Bulgaria						X
BHR	Bahrain					X	
BHS	Bahamas					X	
BIH	Bosnia and Herzegovina						X
BLR	Belarus						X
BLZ	Belize				X		
BOL	Bolivia						X
BRA	Brazil						X
BRB	Barbados					X	
BRN	Brunei Darussalam					X	
BTN	Bhutan		X				
BWA	Botswana	X					X
CAF	Central African Rep.	X	X				
CAN	Canada					X	
CHE	Switzerland					X	
CHL	Chile					X	
CHN	China						X
CIV	Cote d'Ivoire	X					X
CMR	Cameroon	X					X
COD	Dem. Rep. of Congo	X		X			
COG	Rep. of Congo	X					X
COL	Colombia						X
COM	Comoros	X		X			
CRI	Costa Rica						X
CYP	Cyprus					X	
CZE	Czech Republic					X	
DEU	Germany					X	
DJI	Djibouti	X		X			
DMA	Dominica				X		
DNK	Denmark					X	
DOM	Dominican Republic				X		
DZA	Algeria	X					X
ECU	Ecuador						X
EGY	Egypt	X					X
ESP	Spain					X	

Code	Country						
EST	Estonia					X	
ETH	Ethiopia	X	X				
FIN	Finland					X	
FJI	Fiji				X		
FRA	France					X	
FSM	Fed. Sts. of Micronesia				X		
GAB	Gabon	X					X
GBR	United Kingdom					X	
GEO	Georgia						X
GHA	Ghana	X					X
GMB	Gambia	X		X			
GRC	Greece					X	
GTM	Guatemala						X
HKG	Hong Kong (China)					X	
HND	Honduras						X
HRV	Croatia					X	
HUN	Hungary					X	
IDN	Indonesia						X
IND	India						X
IRL	Ireland					X	
ISL	Iceland					X	
ISR	Israel					X	
ITA	Italy					X	
JAM	Jamaica				X		
JOR	Jordan						X
JPN	Japan					X	
KAZ	Kazakhstan						X
KEN	Kenya	X					X
KGZ	Kyrgyz Republic						X
KHM	Cambodia			X			
KIR	Kiribati			X			
KOR	Rep. of Korea					X	
KWT	Kuwait					X	
LAO	Lao PDR		X				
LBN	Lebanon						X
LBR	Liberia	X		X			
LKA	Sri Lanka						X
LSO	Lesotho	X	X				
LTU	Lithuania					X	
LUX	Luxembourg					X	
LVA	Latvia					X	
MAR	Morocco	X					X
MDA	Moldova						X
MDG	Madagascar	X		X			
MDV	Maldives				X		
MEX	Mexico						X
MKD	North Macedonia						X
MLI	Mali	X	X				
MLT	Malta					X	
MMR	Myanmar			X			
MNE	Montenegro						X
MNG	Mongolia						X
MOZ	Mozambique	X		X			

MUS	Mauritius	X			X		
MWI	Malawi	X	X				
MYS	Malaysia						X
NAM	Namibia	X					X
NER	Niger	X	X				
NGA	Nigeria	X					X
NIC	Nicaragua						X
NLD	Netherlands					X	
NOR	Norway					X	
NPL	Nepal		X				
NZL	New Zealand					X	
OMN	Oman					X	
PAK	Pakistan						X
PAN	Panama					X	
PER	Peru						X
PHL	Philippines						X
PLW	Palau					X	
PNG	Papua New Guinea				X		
POL	Poland					X	
PRT	Portugal					X	
PRY	Paraguay						X
QAT	Qatar					X	
ROU	Romania						X
RUS	Russian Federation						X
RWA	Rwanda	X	X				
SAU	Saudi Arabia					X	
SDN	Sudan	X		X			
SEN	Senegal	X		X			
SGP	Singapore					X	
SLB	Solomon Islands			X			
SLE	Sierra Leone	X		X			
SLV	El Salvador						X
SRB	Serbia						X
SUR	Suriname				X		
SVK	Slovak Republic					X	
SVN	Slovenia					X	
SWE	Sweden					X	
SWZ	Eswatini	X					X
TCD	Chad	X	X				
TGO	Togo	X		X			
THA	Thailand						X
TJK	Tajikistan		X				
TON	Tonga				X		
TTO	Trinidad and Tobago					X	
TUN	Tunisia	X					X
TUR	Turkey						X
TWN	Taiwan, China					X	
TZA	Tanzania	X		X			
UGA	Uganda	X	X				
UKR	Ukraine						X
URY	Uruguay					X	
USA	United States					X	
UZB	Uzbekistan						X

VEN	Venezuela						X
VNM	Vietnam						X
VUT	Vanuatu				X		
WSM	Samoa				X		
ZAF	South Africa	X					X
ZMB	Zambia	X	X				
ZWE	Zimbabwe	X					X
Total (countries) per group		43	16	19	13	54	60

Notes: Number of countries per group in parenthesis. AFRICA (43); Landlocked LDCs / LL-LDC (16); non-landlocked LDCs / NL-LDC (19); SIDS (13), HIC (54), and ODC (60).

Total sample: 16 LL-LDCs + 19 NL-LDCs + 13 SIDS + 54 HICs + 60 ODCs = 162 countries

Table A4. Overall structure of the OECD Trade Facilitation Indicators

Indicator	Description
(A) Information availability	Enquiry points; publication of trade information, including on Internet
(B) Involvement of the Trade Community (Consultations)	Structures for consultations; established guidelines for consultations; publications of drafts; existence of notice-and-comment frameworks
(C) Advance rulings	Prior statements by the administration to requesting traders concerning the classification, origin, valuation method, etc., applied to specific goods at the time of importation; the rules and process applied to such statements
(D) Appeal procedures	The possibility and modalities to appeal administrative decisions by border agencies
(E) Fees and charges	Disciplines on the fees and charges imposed on imports and exports; disciplines on penalties
(F) Formalities – documents	Acceptance of copies, simplification of trade documents; harmonisation in accordance with international standards
(G) Formalities – automation	Electronic exchange of data; use of automated risk management; automated border procedures; electronic payments
(H) Formalities – procedures	Streamlining of border controls; single submission points for all required documentation (single windows); post-clearance audits; authorised operators
(I) Internal co-operation	Control delegation to Customs authorities; co-operation between various border agencies of the country
(J) External co-operation	Co-operation with neighbouring and third countries
(K) Governance and impartiality	Customs structures and functions; accountability; ethics policy

Notes: Trade facilitation eases the cross-border movement of goods by cutting costs and simplifying trade procedures. It rests on four core pillars: (i) transparency; (ii) simplification; (iii) harmonization; and (iv) standardization.

Source: Table from the online document [https://www.oecd.org/trade/topics/trade-facilitation/documents/trade-facilitation-indicators-methodology.pdf]

"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

Pascal

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