

Customs Data for Measuring Administrative Performance Draft

Alice Duhaut

Development Impact Evaluation (DIME), World Bank *

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Abstract

Many government agencies have multi-dimensional missions, in which achieving one objective can reduce attainment of another organizational objective. This presents particular challenges to government analytics. Incomplete measurement of objectives risks encouraging attainment of measured objectives while unknowingly impairing other objectives. This chapter showcases how government analytics can be applied in such contexts, using the example of customs agencies. Customs agencies typically have three core objectives: facilitating trade, collecting revenue, and insuring the security and safety of the goods entering or exiting the country. Attaining one objective (e.g. greater safety of traded goods) can come at the expense of another (e.g. facilitating trade). This puts a premium on effective measurement of all dimensions of a customs mission, which requires triangulating different data sources. This chapter showcases how this can be done, deriving indicators for (1) trade facilitation (e.g. costs of the process, in particular time delays); (2) revenue collection (e.g. trade volume and revenue collected based on the assessed value); and (3) safety (e.g. number of goods in infraction seized). The chapter also underscores how a wider use of the customs database itself could help measure performance, combining it with other data collection methods such as time release studies (TRS) and exciting developments in GPS tracking data.

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Lessons for practitioners

- **The efficiency of the border crossing process, and the customs agents and other agencies involved in it, should be evaluated holistically. This requires integrating multiple data sources.** Using the traditional tools - Time Release Studies (TRS) monitoring and evaluation metrics- in combination with new or under used data sources - such as GPS data- provides a way to reduce the cost and increase the frequency of indicators used to monitor border activities. An important element of the consolidation is to ensure the validity of the data used , match the relevant time stamps to the mapped process, and program indicators and queries to automatize reports.
- **Data from different sources are likely to provide a different view, and even different takes, on the process. As such, measurement validation and triangulation is an important component in analyzing customs data.** It is thus important to invest in understanding the data routinely collected and to analyses it outside of survey periods. To complement the measures derived from the traditional TRS, we recommend using customs database data to study time delays under customs or other border agencies control, and revenue collected. This requires understanding the full customs process, ensure entries are not duplicate and/or incomplete, as it might be the case if customs declarations for a shipment can be resubmitted under a different regime, for example when the importer wants the good to leave the warehouse and be released.
- **Data should be standardized and produced into reports for easy and fast consumption.** Standardization of the extraction process, indicators, questions or data treatment help reproduce reports at high frequency. From the users surveys, information on the performance of the customs agent can also be collected.
- **Valuation of goods in custom is challenging. To provide a holistic assessment, there are multiple techniques available to measure the value of goods in customs. In particular, comparing the value of goods when they leave a country or origin to their destination may assist in identifying the true value of goods.** While valuation is a difficult process and the WTO rules describe how individual item's value should be evaluated, comparing what is declared at a country's borders to what is declared for similar goods of similar origin in peer countries can provide information on international trade taxes, duties and excises collected and timeliness of the process. This indicator can flag where the value collected at customs is lower than expected.
- **Time is an important consideration in customs, but requires defining what are the relevant checkpoints along the customs process**

against which it is measured This is the case, for example, if the clearance of the goods is considered the endpoint of a time analysis. Time delays can be studied in association with the mapping process to determine the relevant operations: one common operation studied based on the UNCTAD Automated System for Customs Data (ASYCUDA) data is time between assessment and clearance that excludes payment of the taxes and duties. This exclusion is important, because payment issues can be the cause of a lot of the delays and such finding would have different policy implications.

1 Introduction

Many government agencies have multi-dimensional missions, in which achieving one objective can reduce attainment of another organizational objective. For instance, in some countries, financial regulators are mandated to develop financial services, while also protecting consumers; or environmental agencies are mandated to both protect and develop natural resources. Organizations with such multi-dimensional missions with conflicting goals present particular challenges to government analytics. Incomplete measurement of objectives risks encouraging attainment of measured objectives while unknowingly impairing other objectives. Yet, different objectives can often only be measured through very different types of data.

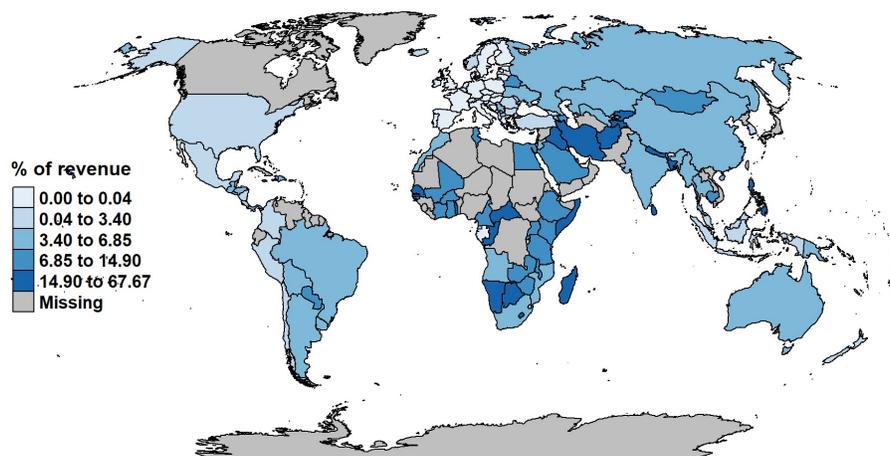
This chapter showcases how government analytics can be applied in such contexts, using the example of customs agencies. By showcasing the integration of different data sources to measure multi-dimensional mission attainment holistically, the chapter complements other chapters in this Handbook which detail the use of one particular form of data - such as case data as in Best et al. (2023) or task data as in Rasul et al. (2023).

Among agencies tasked with multi-dimensional missions, customs are arguably a key one. Customs operations are located in the international borders of a country, responsible for the processing of export and import goods. This includes several steps, from reviewing goods declarations, risk assessments, inspections, clearance and risk collection. Revenue collection from customs is particularly important in low and middle income countries. Frequently, they represent a substantial share of state revenue and at times are also used for collecting fees requested by other government agencies.

In high income countries, customs and other import duties represent on average 3.8% of state revenue, but as illustrated in Figure 2, this value goes above for countries with lower average incomes. For upper middle income countries it stands at 8.9%, for lower middle income countries at 11.0% and for low income countries at 20.0%. For some countries in Sub-Saharan Africa, South Asia and Pacific island customs and import duties provide over one-third of all tax revenue. In addition to their key role in revenue collection, customs ensure border integrity and are the point of entry for goods coming in or coming out of the country.

For these reasons, performance of customs operations has substantial implications on the fiscal sustainability and trade engagement of countries. The challenge of improving customs performance can thus be viewed from the vantage point of the following three distinct missions: a) facilitation of trade across border, b) collection of revenue and c) protection of the safety of people and security of goods coming through the borders. Working towards these three missions simultaneously involves trade-offs: making progress towards one goal can undermine achievement of another. For example, facilitating trade means improving the customs process to reduce its total duration, including inspection and screening times. If the frontline agents were to perform less inspections, this would lead to a faster border crossing. However, this would likely have revenue implications, as proper product classification and tax collection would be more prone to errors. Examples of initiatives

Figure 1: Customs and other import duties (% of tax revenue)



Source: World Bank Development Indicators. Latest available values shown.

undertaken towards those three key objectives, as well as some associated challenges are illustrated in Box 1 on the case of Malawi.

This puts a premium on measuring the performance of agencies with multi-dimensional missions – such as customs – holistically to ensure these trade-offs are accounted. With this in mind, this chapter provides an empirical guide to assessing customs performance across these three objectives, as well as outlining the diverse data requirements necessary to perform those assessments. There are multiple choices available for practitioners when building both performance indicators and customs databases. Practitioners should prioritize indicators that enable them to accomplish a particular policy objective, while considering the data and human resource constraints they face when developing them. Because modifications in how customs operates affect other policy areas - trade policy, fiscal revenue - any change in how data is ingested and consumed should be coordinated with other government agencies.

The chapter is structured as follows. First, we provide institutional context on how customs operate and the international policy framework governing customs data collection and trade policy. Section 3 reviews academic literature on customs, emphasizing its role for trade facilitation and fiscal revenue. Section 4 outlines the data infrastructure requirements for analyzing customs performance and generating indicators. Section 5 presents different types of indicators used to measure customs performance. Finally, we conclude.

Box 1. Interactions with other agencies: the case of Malawi

In Malawi, fourteen agencies are present at the border. The agencies perform the inspections related to their missions: agriculture check the contents of the agricultural products, the Malawi Bureau of Standards ensure that the foodstuff coming in respects Malawian standards. Together, those agencies strive to improve performance as related to the three principal objectives of customs operations outlined in the main text:

1) Trade facilitation: Malawian customs agents strive to improve the flow of goods and services across the borders. One example of their efforts in this sphere is updating to the ASYCUDA World system in 2018. The new system facilitates trading across the border by, among others, allowing web access for businesses, enabling round-the-clock submission of customs declaration, and providing customized data extraction features.

2) Revenue collection: Customs and other revenue duties collected in Malawi were equal to 88.3 billion MWK in 2019, which represented 8.9% of all state tax revenue.

3) Protection of the safety of people and security of goods coming through the borders: Malawi Revenue Authority restricts the import of certain classes of goods by requiring import licenses. Those include goods such military uniforms, ammunition and guns, fertilizers, pharmaceuticals, gold and several types of foodstuff. In addition all animals and animal product need to be certified as disease-free. Importation of most types of meat products further requires a prior written permission from the Minister of Industry and Trade.

In the future, the agencies will be connected to the customs database, and customs will perform joint inspections. While the reduction of the number of agencies at the border is likely to reduce the burden on the drivers or transporters, the customs will also have more responsibilities, and measuring their performance after the reform against the pre-intervention situation might be complicated. It is thus necessary to create indicators that will reflect the scope of the mission as well as being easy to be implement with the existing data.

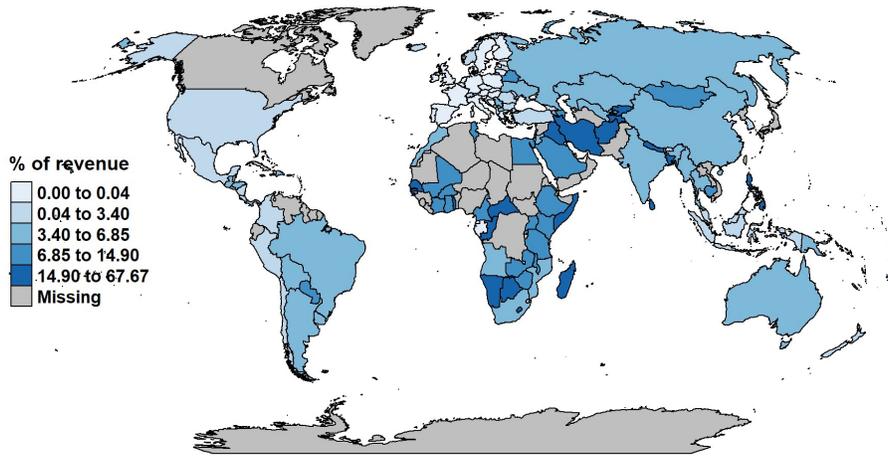
Source: Malawi Revenue Authority (2022); World Bank Development Indicators (2022)



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Figure 2: Customs and other import duties (% of tax revenue)



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process to reduce its total duration, including inspection and screening times. If the frontline agents were to perform less inspections, this would lead to a faster border crossing. However, this would likely have revenue implications, as proper product classification and tax collection would be more prone to errors. Examples of initiatives undertaken towards those three key objectives, as well as some associated challenges are illustrated in Box 1 on the case of Malawi.

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Source: Malawi Revenue Authority (2022); World Bank Development Indicators (2022)



2 Institutional Context

2.1 Customs Process Overview

The customs process follows a linear structure, starting at the formal declaration of goods, to the final step of payment of taxes and exit. The process starts with the submission of a goods declaration to the customs administration by the importer or exporter or by a broker acting on behalf of the importer or exporter (Figure 3). This can be done remotely or at the border depending on the customs of the country. The goods declaration usually lists a description of the items, with classification, weight or quantities, origin and value of the items in the shipments. Supporting documents are submitted along with the declaration, such as invoice, bill of landing, among others. In addition, the customs declaration contains the declarant's assessment of the taxes and duties to be paid.

Figure 3: Diagram of customs process



The next step is risk assessment. It can take place before or when the submission is made, as soon as the goods arrive at customs. An initial screening is conducted through a customs database risk model, analyzing the risk level of a declaration and issuing recommendations at the product level. The risk department usually issues a color-coded clearance channel where the color indicates whether the documents or the goods have to be inspected, send flags for potential fraud or discrepancies in the declaration and, potentially, comments to help the inspector assess the correct valuation of the shipment.

The customs process then moves to the assessment of the declaration by an inspector. Based on the documentation submitted by declarant and the diagnostics provided by the risk department, the inspector can overrule the clearance chan-

nel recommendations. If the green channel is recommended, nothing happens and the shipment goes through customs uninspected. If the yellow channel is recommended, the documents submitted along the goods' declaration are reviewed. If the red channel is recommended, the goods are inspected - either by scanning the container or opening the cargo. Based on the information accumulated, the inspector produces a report on the declaration. The report lists any adjustments to the classification of the goods, the origin, products characteristics or quantity, and, importantly, the value assessed as well as the taxes and duties to be paid. It can also include penalties to be paid in case of fraud.

In the last two stages, the goods are cleared and the duties taxes and duties are paid. The goods are released upon proof of payment. The term "clearance" means the accomplishment of all formalities necessary to allow goods to enter home use or to be exported. "Release" means that the goods are physically placed at the disposal of the transporter or importer.

2.2 International Trade Policy Framework

While work to efficiently regulate customs operations is done on a domestic front by customs authorities, international organizations play a significant role as well. Trade being by nature an international flow of goods, multiple international trade policy frameworks have been designed to regulate it and provide guidance for domestic customs authorities. These frameworks have been built and advocated for by a set of international organizations, including the World Trade Organization (WTO) with its rules on Customs Valuation, the World Customs Organization (WCO) being the voice of the international Customs community, and the United Nations Conference on Trade and Development (UNCTAD). This section provides practitioners with an overview of these different international trade policy frameworks and agreements.

The World Trade Organization (WTO) trade facilitation agreement (TFA) reached at the 2013 Bali Ministerial Conference includes provisions related to customs operations. Intending to expedite the movement, release, and clearance of goods, the agreement sets up procedures for effective communication between customs authorities and other entities directly involved in customs compliance issues. As a result, all WTO members can benefit from technical assistance and capacity building related to any areas of customs everyday work. In particular, the TFA that finally entered into force in February 2017, after being ratified by two-thirds of WTO members, was followed in July 2014 by the launch of another important tool - the Trade Facilitation Agreement Facility. It was the first time in WTO history when the obligation to implement an agreement was linked to the capacity of the country to do so.

The mission of WTO and other international organizations, such as WCO, is broad. WTO and WCO cooperate on a number of initiatives: customs valuation, market access, rules of origin, information technology agreement, and trade facilitation. Among numerous examples of such a cooperation is the WTO's Agreement on Customs Valuation that established the Technical Committee under the rule of

WCO. In the areas of technical assistance, according to WTO, the main focus remains on the negotiations surrounding technical assistance. Another example is the Harmonized System classification of goods under the lead of WCO that WTO thoroughly follows. Established by the Tokyo round agreement, the WCO's Technical Committee on Customs Valuation and the GATT/WTO Committee on Customs Valuation provides advice and case studies on customs valuation. These international efforts provide a legal framework to regulate customs operations so that each member state determines the value of goods in a *neutral* and *uniform* way.

Historically, general principles for an international system of valuation were established under the GATT Article VII. The agreement sets the actual value of a good, the price at which merchandise is sold under competitive conditions. It is the first agreement for customs valuation that highlighted the importance of competitive conditions for the determination of the sale price and stated that the price under established rules should be related to either comparable quantities or quantities not less favorable. At the same time, the need to simplify and harmonize international trade procedures coexists with the growing pressure from the international trading community to minimize the intervention of the government in commercial transactions widdowson2007changing. WTO rules on customs valuation highlight the discretionary autonomy that Customs Authorities must retain to fulfill their duties in promoting food safety and security, fighting illegal practices.

Measurement of time as a critical component for efficient customs operation has been dictated by the WCO Time Release Study (TRS) as well. The WCO TRS is a methodology to measure, using data-driven approaches, the time that it usually takes to release cargo. It is a part of the Performance Measurement (PM) tool thoroughly monitored by WCO. Aiming at data-driven decision-making, TRS helps customs agencies to see opportunities for further improvement of the processes involved in realizing and accepting cargos.

3 Policy Objectives for Customs

This section presents three policy objectives for customs: (a) trade facilitation, (b) fiscal revenue and (c) security and food safety. In outlining these goals, we present evidence from research exploring how these goals can be pursued as well as a detailed discussion on their analytical approach. The first cluster of research studies examines the role of customs and non-technical barriers in trade facilitation. The second subsection provides an extensive discussion on customs as a source of fiscal revenue, with its associated challenges in fighting fraud and illegal practices such as corruption. Lastly, we present studies that improve our understanding of how customs can promote product safety and ensuring security.

Objective 1: The role of customs in trade facilitation

Scholarly interest in customs research stems from their potential to serve as a tool of trade facilitation. We provide an overview of the evidence to date. For example, Fernandes, Hillberry, and Alcántara (2021) evaluate Albanian reform that sharply decreased the number of physical inspections of import shipments. There are clear indications that reduced inspections increase imports substantially. And there is no compelling evidence that the reform gave rise to evasive behaviors. Similarly, for exports Martincus et al. (2015) focuses on time as a critical barrier to trade. Using a unique dataset that consists of the universe of Uruguay’s export transactions over the period 2002–2011, they demonstrate that delays have a substantial negative impact on firms’ exports. Furthermore, this effect is more pronounced for newcomers.

A seminal research paper that looks at the measurement of time as an instrumental component for the efficient functioning of customs is Djankov et al. (2010). Authors examine how time delays affect export volumes. To measure time, the total export delay is considered. This means that time delay does not include time spent at a home country, neither on procedures nor in transit. It can consist of time spent when container at the border, transportation from the border to the post, and getting to the ship. The logic is that trade volumes can impact home country trade times; the effect on the transit times abroad is likely negligible. Nevertheless, Djankov et al. estimating a difference gravity equation shows that each additional day a product is delayed prior to being shipped reduces trade by more than 1%. Delays have a relatively more significant impact on exports of time-sensitive goods, such as perishable agricultural products. Hence it is important to measure and study how changes in customs operation can facilitate trade.

Objective 2: Customs as a source of fiscal revenue

Another key policy objective for customs offices is increasing fiscal revenue. Several studies discuss interventions and propose mechanisms to improve local tax collection practices or incentivize inspectors posted in a given tax collection location. This is not surprising since there is evidence that trade tax revenues collected at the border constitute a large part of GDP, particularly for developing, low-income countries. Baunsgaard and Keen (2010) show, using a panel of 117 countries, that the inability to find alternative sources of revenue may hinder trade liberalization. Results suggest that high-income countries recovered from the revenue they lost during the past wave of trade liberalization, but the same does not apply to emerging markets, where recovery from trade liberalization is weaker.

Another major issue is the presence of tax evasion and corruption in customs administrations. Defining corruption following Bardhan (2006), a paper by Dutt and Traca (2010) shows that in most cases, corrupt bureaucrats tax trade through either extortion or evasion. The former refers to the act of a bureaucrat demanding bribes from the exporters for doing his duties, while evasion is a situation when an exporter pays off a bureaucrat to receive preferential treatment, like lower tariff

rate or lowering of regulatory standards. Evasion may be trade-enhancing in an environment with high tariffs because it allows to effectively reduce the tariff rate by paying a bribe. However, in order to develop in a sustainable fashion, countries need to combat corruption more efficiently. In particular, developing economies are often in dire need of increasing state fiscal revenue via rigorous implementation of customs rules, to be able to finance their development policies.

In seeking to increase tax revenues while reducing corruption, researchers and policymakers have been conducting experiments to identify optimal policies (Cantens, Raballand, & Bilangna, 2019). One method that is relatively straightforward is mirror analysis, which compares the exports for a given country with the imports for its export client, or vice versa.¹ This approach is often limited by difficulties to obtain detailed customs data. When implemented in Madagascar by Chalendard, Raballand, and Rakotoarisoa (2019), this method has helped to identify the probability of fraud in the context of customs operations reforms.

Technology can help customs improve on their mission while reducing fraud. In a natural experiment in Columbia, Laajaj, Eslava, and Kinda (2019) find that the computerization of imports led to an increase of 6 log points in the firms' value with consequences for employment and tax collection. However, Chalendard, Fernandes, Raballand, and Rijkers (2021) shows that, through a manipulation of the IT system, some customs inspectors and IT specialists were able to manipulate the assignment of import declaration. This is identified by measuring deviations from random assignment prescribed by official rules. Deviant declarations are found to be more at risk of tax evasion, less likely to be deemed fraudulent, and to be cleared faster.

Another experiment analyzing policies to curb fraud was conducted in Madagascar Chalendard et al. (2020). Authors investigated whether providing better information to customs inspectors and monitoring their actions could affect tax revenue and fraud detection. Results from the experiment show that monitoring incentivizes agents to scan more shipments but does not necessarily detect more fraud. Relatedly, Khan, Khwaja, and Olken propose a mechanism to improve the performance of bureaucrats in collecting tax revenues, given their significance in enforcing and determining tax liabilities. Evaluating a two-year field experiment with 525 property tax inspectors in Pakistan, the authors stress the potential of periodic merit-based postings in enhancing bureaucratic performance.

Objective 3: Security and food safety

Customs authorities serve an essential role as regulators of food safety and security. Although disruptions in total trade volume due to food safety are relatively rare (Buzby, 2003), international organizations such as the WCO assist customs in the event of natural disasters and food crises. In June 2010, WCO established the Ad Hoc Working Group to find ways for Customs Authorities to quickly react to such

¹For additional details, see <https://www.wcoesarocb.org/wp-content/uploads/2017/03/11-Mirror-analysis-guide-FINAL-EN.pdf>.

emergencies. WTO in its turn supports food security practices through the work of its Agriculture Committee and an Agricultural Market Information System (AMIS) by a recommendation of the United Nations High-Level Task Force on the Global Food Security Crisis.

The role of customs authorities and their food security practices revolves around two fundamental issues: (1) consumers do not always judge food security properly, and (2) there are substantial differences between countries in terms of regulation of food safety. The notion of trade security differs considerably in developed countries and developing ones (Diaz-Bonilla, Thomas, Robinson, & Cattaneo, 2000). Additionally, there are substantial risks of contamination due to trade. Ercsey-Ravasz, Toroczka, Lakner, and Baranyi (2012) provide evidence that given the international agro-food trade network, the speed of potential contamination is extremely high since it is not possible to track the country of origin of different food products.

Safety is another key concern for customs authorities, and is often associated with operations to reduce illegal trade of products. Academic literature has documented how illegal trade in goods operates. In the EU, (Świerczyńska, 2016) provides a list of legal solutions implemented to sustain a twofold goal of customs authorities to combat the illegal trade in goods and, at the same time, decrease control measures that increase the cost of trade. In Iran, Farzanegan (2009) estimate that a penalty rate on smuggling contributed to reducing illegal trade, using historical data from 1970 to 2002.

4 Data Requirements

4.1 Data sources

Before delving into the definition of customs performance indicators, it is useful to explain what are the data requirements for measuring them. The first and fundamental source of data is the customs database. The most common system in low and middle income countries is the Automated System for Customs Data, usually abbreviated to ASYCUDA. It is used by 100 countries and territories around the globe. This is a system designed by the United Nations Conference on Trade and Development (UNCTAD). Its purpose is to compile information pertaining to: customs declaration, with customs office or border post information, frontline inspectors assigned to the case, potential changes in the clearance channel, irregularities, and final value assessments. In addition, this database lists goods by their characteristics, as well as the taxes and duties due. It was also designed with the goal of generating broad ranging data for statistical and economic analysis of trade and customs performance. Box 2 illustrates the basics of the ASYCUDA's structure.

Box 2. ASYCUDA data structure

The ASYCUDA database is composed of a series of modules. Each module corresponds to a set of users. The customs brokers modules gives secure access to the broker to the system to fill in a declaration. The customs office module covers declaration processing and is accessible to customs offices agents. The accounting module is accessible for auditors only. The operations - registration of the declaration, assignment to an inspector, inspection results, change in value, clearance, release-all have a time stamp associated with them, but merging all this information in one report can be complicated, as they are stored in different tables of the relational database.

The typical extract from ASYCUDA data thus contains information on the entry point for specific declaration, the number of items declared, agent and importer name, year, and registration date (see Figure 4). ASYCUDA data also registers “free on board” value - indicating value outside insurance claims and ownership rights on the shipment- and value added taxes, duties and excise values for a chosen declaration as well as exchange rate information and the currency with which payment for goods has been made (see Figure 5).

Figure 4: Example of ASYCUDA extract: basic variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	OFFICE	ENTRY	DEC_CODE	AGENT NAME	REGDATE	REGNO	TPIN	IMPORTER NAME	YEAR	ITEMNO	Lane At Selec	Current Lane	REGIME	HSCODE
2	BIR	DED	CA26775	MALAWI AGENT 1	31.01.2022	B3	12345678	IMPORTER 1	2020	1	RED	Green	IM4	62034300
3	BIR	DED	CA26775	MALAWI AGENT 2	01.02.2022	B4	12345679	IMPORTER 2	2021	1	RED	Red	IM4	62053010
4	SWE	DED	CA26776	MALAWI AGENT 3	02.02.2022	B5	12345680	IMPORTER 3	2022	1	BLUE	Green	IM4	73261990
5	BIR	BIR	CA26777	MALAWI AGENT 4	03.02.2022	B6	12345681	IMPORTER 4	2022	1	YELLOW	Yellow	IM4	61103000
6	MUL	DED	CA26778	MALAWI AGENT 5	04.02.2022	B7	12345691	IMPORTER 5	2022	1	YELLOW	Green	IM4	62171010
7	MWA	BIR	CA26779	MALAWI AGENT 6	05.02.2022	B8	12345692	IMPORTER 6	2022	1	RED	Green	IM4	87033311

Figure 5: Example of ASYCUDA extract: excise, duties and vat variables

33	34	35	36	37	38	39
FOB FCY	CURRENCY	EXCRATE	VDP AMOUN	DUTY	EXCISE	VAT
1000	MWK	1	43718945	435345	0	468396
45000	MWK	1	12843921	435345	0	6849306
134144,85	USD	12,999	2401842	3452	483964	48963
8405	USD	12,999	3234398240	574575	45903	6439634
8405	MWK	1	840399234	8769769	65	84963
8405	GBP	13,888	4820384	769769	872	684396

The typical time stamps data is associated with a particular action - changes in lane selectivity, in payments due, among others. Linking all the tables, one can extracts tailored reports as in Figure 6 to create the indicators of time delays between different actions depending on lane selectivity or type of declaration.

Figure 6: Example of ASYCUDA extract: time stamps

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	OFFICE	REGDATE	REGNO	REGIME	Lane At Sele	Current Lane	VEHICLE_REC VALUE_OF_DECLARATION	CONTAINER_NUMBER	DOCUMENT	OPERATION	OPERATION_TIME	USERNAME	
2	BIR	02.01.2022	C678	IM4	RED	Green	1234 HIGH VALUE	GFR908432		1 Validate and assess	02.01.2022 16:04	user1_nickname	
3	BIR	02.01.2022	C679	IM4	RED	Green	1234 HIGH VALUE	GFR908433		2 Request PRN	03.01.2022 16:04	user1_nickname	
4	BIR	02.01.2022	C680	IM4	RED	Green	1234 HIGH VALUE	GFR908434		3 Payment	04.01.2022 16:04	user1_nickname	
5	BIR	02.01.2022	C681	IM4	RED	Green	1234 HIGH VALUE	GFR908435		4 Release Order (selectivity)	05.01.2022 16:04	user1_nickname	
6	BIR	02.01.2022	C682	IM4	RED	Green	1234 HIGH VALUE	GFR908436		5 Control Results	06.01.2022 16:04	user2_nickname	
7	BIR	02.01.2022	C683	IM4	RED	Green	1234 HIGH VALUE	GFR908437		6 Control Results	07.01.2022 16:04	user2_nickname	
8	BIR	02.01.2022	C684	IM4	RED	Green	1234 HIGH VALUE	GFR908438		7 Control Results	08.01.2022 16:04	user2_nickname	
9	BIR	02.01.2022	C685	IM4	RED	Green	1234 HIGH VALUE	GFR908439		8 Clear declaration	09.01.2022 16:04	user1_nickname	
10	BIR	02.01.2022	C686	IM4	RED	Green	1234 HIGH VALUE	GFR908440		9 System re-route to green	10.01.2022 16:04	user2_nickname	
11	BIR	02.01.2022	C687	IM4	RED	Green	1234 HIGH VALUE	GFR908441		10 Print Release Order	11.01.2022 16:04	user1_nickname	
12	BLA	04.04.2022	C234567	IM4	BLUE	Blue	4321 LOW VALUE			1 Validate and assess	04.04.2022 17:18	user2_nickname	
13	BLA	04.04.2022	C234568	IM4	BLUE	Blue	4321 LOW VALUE			2 Request PRN	05.04.2022 17:18	user1_nickname	
14	BLA	04.04.2022	C234569	IM4	BLUE	Blue	4321 LOW VALUE			3 Add Scanned Docs	05.04.2022 17:45	user2_nickname	
15	BLA	04.04.2022	C234570	IM4	BLUE	Blue	4321 LOW VALUE			4 Post-Entry	08.04.2022 17:00	user1_nickname	
16	BLA	04.04.2022	C234571	IM4	BLUE	Blue	4321 LOW VALUE			6 Request PRN	08.04.2022 17:18	user2_nickname	

However, ASYCUDA data is rarely used outside of aggregates statistics of revenue collection. Most of the time, studies of time delays are based on a time release study (TRS). The TRS measures the time required for the release and/or clearance of goods, from the time of arrival at the border until the physical release of cargo. TRS are conducted over a pre-defined period of time, during which several declarations are followed by the surveyor at some border posts. The surveyor observe all steps till release and take note of the time spent and costs associated. As noted by the World Customs Organization, the tool is useful to produce a benchmark pre- reform, and needs to be repeated often to follow the evolution at a particular border post. However, inter-countries comparisons are limited given differences in capacity and infrastructure. (World Customs Organization, 2018).

The information coming from the countries databases is usually shared at an aggregated annual level with the United Nations Statistical Division. This information is treated and aggregated at the harmonized standardized classification, typically using 8- or 6- digits codes. The Harmonized System is a standardized classification of traded products based on numerical categories. The system is managed by the World Customs Organization and is regularly updated. Each product is described using 8 digits.² It is used by customs authorities around the world to identify products when assessing duties and taxes and for gathering statistics. The vast range of product categories that customs agents regularly handle is illustrated by Figure 7. It provides an overview of the total value of imports, classified according to 22 section of the Harmonized System, across the 50 largest ports of entry in the United States.

²An example of an 8-digit description is 08051000 corresponding to fresh oranges. Each product belongs, at the broadest level to one of 22 HS sections. Those are however not marked in the product code. Instead each section is composed of one or more chapters, and the first two digits (08) of the code refer to a specific chapter, in that case Chapter 08: Edible Fruit and Nuts; Peel of Citrus Fruit or Melons. The next two digits (05) stand for a heading within that chapter - Heading 05: Citrus fruit, fresh or dried. The following two digits (10) stand for Sub-heading 10: Guavas, mangoes and mangosteens: Oranges. The last two digits can further specify more fine-grained divisions of product category, if those exist. In this case, no further specification is indicated by 00.

Another source of data is traders perception's surveys. The focus of this type of surveys is, as the name suggests, traders, importers and exporters who directly engage in international trade. For example, traders might think that transport costs not related to border crossing are the most important cost faced when trading across borders, but these costs are unlikely to be shown in regular trade statistics. The burden of import or export certificates and clearances associated costs is usually not represented either. The issue with these surveys are how to harmonize perception questions across countries to make sure they cover the same issue: what is experienced as a delay might be business as usual in another country, or traders might be reluctant to answer truthfully.

Finally, an emerging source of data is based on GPS trackers. This data source provides an objective time measure for border crossing and also capture the time spent on the road. This data can be used to observe time spent at the border. Used in conjunction with time stamps, it shows what share of the time delays are attributable to customs operations as opposed to, for instance, difficulties linked to parking infrastructure. While this data is usually privately collected by firms providing transponders or insurers, some transport corridors authorities or public database collect and provide information on this tracking data. One example for such a resource in Southern and Eastern Africa is administered by the World Bank's corridor team.³

5 Performance Indicators

Having discussed the types of data sources that can be used to measure customs performance, this section describes how customs data can be developed into indicators to measure and further the three key policy objectives of customs operation: trade facilitation, revenue collection, and food safety and security.

5.1 Indicators for Trade Facilitation

Indicators related to trade facilitation usually focus on time spent at the border and for clearance. This is part of the standard assessment of the World Customs Organization, The African Customs Union, and of the TRS+ (time-release study) implemented by the World Bank. Of course, different border posts and different categories of goods will have different clearance times.

Figure 8 presents an example of TRS indicator in the form of cross-country and regional disaggregation of border compliance times. Exporters across countries face vastly different time to process through customs. They are close to 0 in the Northern American trade involving U.S. and Canada, as well as in the intra-EU trade. However, they increase more than threefold for Central Asian countries. On the other end of the spectrum, the largest delays are experienced by Sub-Saharan

³the website is accessible at <https://www.corridorperformancemonitoringsystem.com/geozone-route-catalogue>

African exporters, where the mean border compliance times is 107 hours and above 200 hours for several countries in Central Africa.

Not only are these processing times intrinsically heterogeneous, but the data used to measure it will also paint a different picture of the customs process. Taking the routinely collected time stamps from the customs database, ASYCUDA or other, will show the date of first submission and clearance. However, if the submission is made way in advance, for example when arriving at the port, while the country itself is still far, the time will be artificially long. In addition, as we mentioned, if other agencies have to clear the goods while under customs custody, the time stamps will reflect a longer process. Indicators should take into account this heterogeneity in measurement approaches.

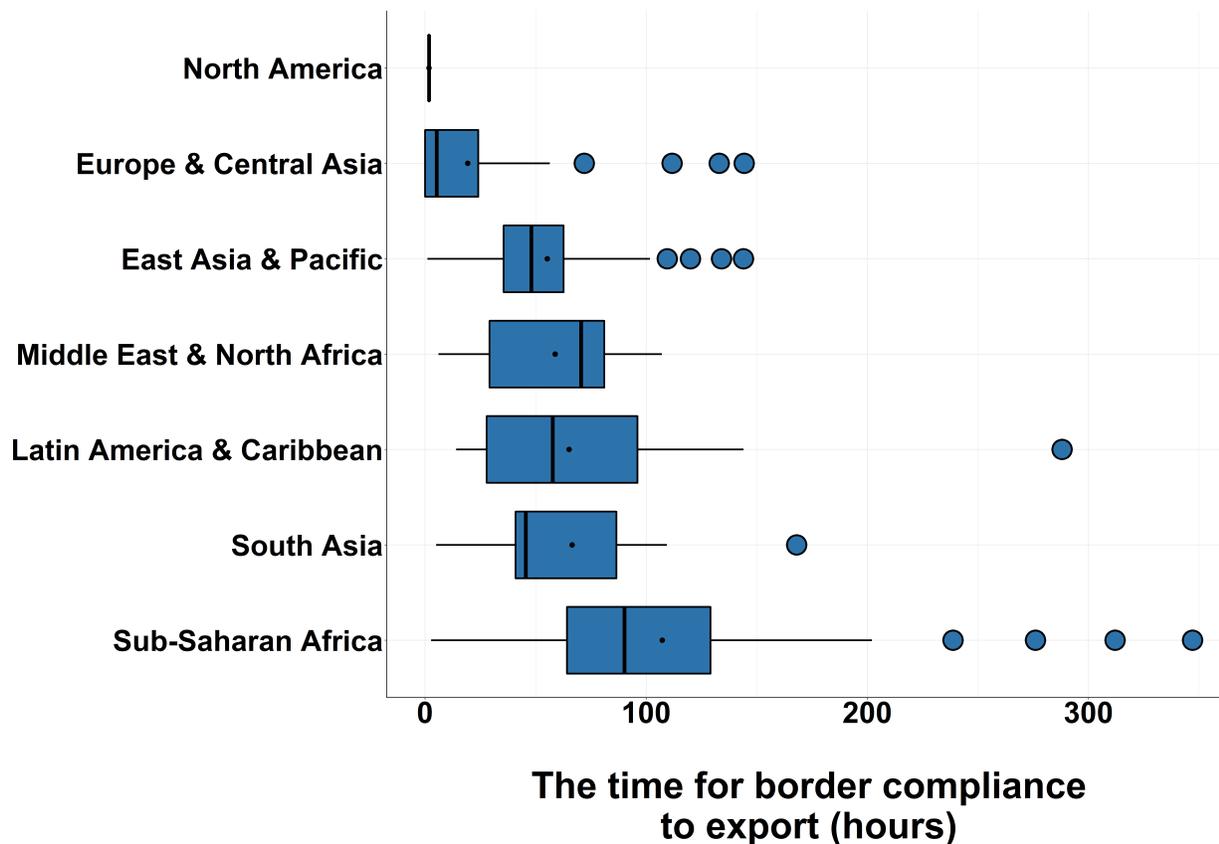
One possibility is therefore to look at the time necessary between the moment the frontline inspector is assigned the declaration, and the moment they clear it. While some agencies might delay the process by requesting additional inspection and clearances, it is less likely to be the case. Looking at ASYCUDA or other databases, this would correspond to the time difference between the the time for assessment and the time at release. An example of such an indicator used for monitoring this time is depicted in Figure 9. This displays the average time between issuance of release order and issuance of certificate of export at Malaba on the Northern corridor, between Kenya and Uganda. The time release studies follow a declaration at the border from when it is submitted to when the truck arrives and gives a snapshot of the border crossing process at a moment in time, such that the elements related to non-customs delays can be isolated.

Finally, the same indicators can be based on surveys of traders, to recover their perception of the delays. The question attempts to estimate how many days it takes between the moment the shipment reaches the border point and when it can be cleared from the border post. In Malawi, a survey is being conducted in this way. The early results show a reported average of two to three days once they get notified their shipment is at the border.

5.2 Indicators for Revenue Collection

The revenue collection objective focuses on how much revenue is collected at the border. This is intrinsically difficult to do – see box 3 on the problem of valuation – and therefore constructing theoretical revenue that could have been collected requires considerable effort. Hence, this is something that customs administration rarely do, unless misdeclaration or fraud is discovered. Otherwise, the declared value stays and the revenue collected is assumed to be the revenue that could have been collected by customs. However, not all misdeclaration or fraud is discovered. Hence, assuming that some of the incorrect declarations are missed, it is possible to look at what is the revenue that could have been collected if the items were following a similar price for other goods of the same class and same origin. This is considered as one of the acceptable valuation method by the World Trade Organization. While the scholarly literature usually calls this reference prices, this clashes with the meaning of the reference prices used by the WTO: it is not an artificial

Figure 8: Border compliance times in cross-country and regional view

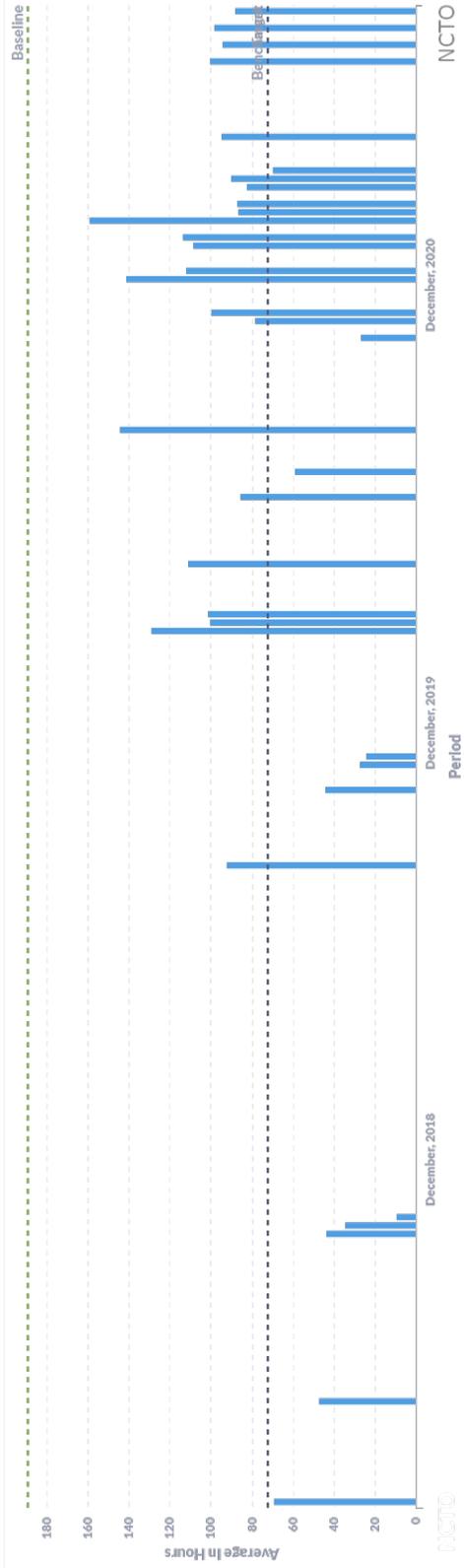


Notes: The component indicator is computed based on the methodology in the Doing Business 2016-20 studies. The boxes in the plot represent the interquartile range (IQR) of the variable, i.e. the distance between 25th and 75th percentile in the distribution of respective values. The lines in the middle of the box represent the medians, whereas the black dots represent means. The time is calculated in hours. Our measure includes time for customs clearance and inspection procedures conducted by other agencies. If all customs clearance and other inspections take place at the port or border at the same time, the time estimate for border compliance takes this simultaneity into account.

Source: World Bank. Doing Business Report Database

Figure 9: Example of indicators to measure performance: transit time on the Northern Corridor

Bar Graph - Transit time Existing through Malaba

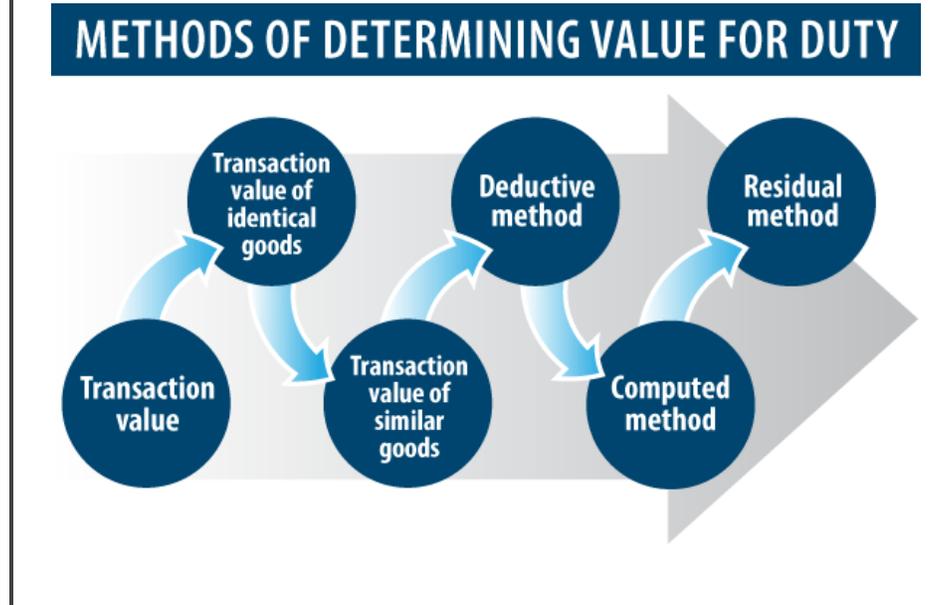


set of prices but a comparison with similar goods' prices.

Box 3. The problem of valuation

Evaluating the value of an item is intrinsically hard, as the inspector doesn't have precise information on the good outside of what is listed on the declaration. The World Trade Organization (WTO) agreement establishes rules for the valuation of imported goods that must be applied by all member countries. The WTO mandates using the transaction value supported by invoices and the relevant documentation, as the assessed value unless there is something missing or suspicion of fraud. In this case, the customs administration is authorized to use other valuation methods. The first method is using the transaction value of identical goods - same goods, same country of origin, same producer whenever possible. Second is using the transaction value of similar goods - same function or design, same country of origin, and whenever possible, same producer. Additional methods are outlined in Figure 10. Customs are prohibited to use the same goods produced nationally as a comparison point, or use arbitrary or fictitious values such as minimal values or thresholds.

Figure 10: WTO valuation methods, arranged sequentially.



To refine this analysis, it is possible to use it in conjunction with the mirror gap: given the quantities of similar goods declared by the exporting country, how many are missing from the importing country import declarations and vice versa? The quantities declared for import and export in the origin country should be the same. This can give a rough idea of what revenues should be collected - or are missing - on either end. However, as mentioned earlier, these trade data sets are not updated as frequently as the customs data themselves. Hence, some of these gaps might be artifact of the data. Alternatively, the point of entry if the customs declaration is needed only in one zone. Another possibility is to reconcile the data at the individual level, linking exporters declaration form a country to another country's importers' declaration. This level of analysis can highlight value discrepancies, ad the potential mistake or omission of customs frontline agents.

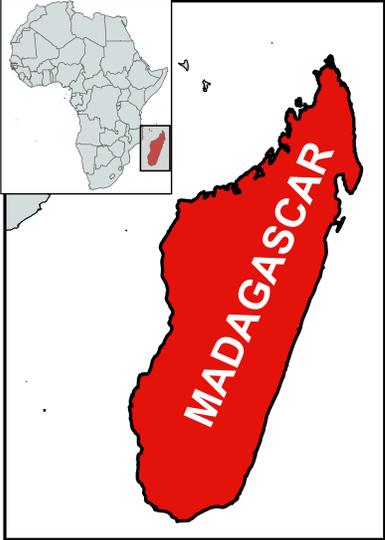
5.3 Indicators for Food Safety and Security

There is relatively less work on safety because the data is harder to come by. The seized goods could indicate either an increase in customs activity or in criminal activity. The TRS and ASYCUDA data can provide a good indication of how the risk management operations, both in terms of value recovery but also physical inspection for safety, are operated. In Brazil for example, the rate of physical inspections performed by customs was found to be of around two percent during the most recent TRS.⁴ However, twelve other government agencies were often involved in the process, granting licenses or permissions necessary for import. Around sixty percent of the declarations required involvement by another agency, whether or not the process required a physical inspection. The delays noted in the TRS process for Brazil thus reflect the needs for other agencies licenses and/or inspection. Another example: for goods under the jurisdiction of health authorities, around one quarter to a third of the time is actually due to delays in payment the licensing fee.

⁴Receita Federal, Time Release Study 2020, accessible at: <https://www.gov.br/receitafederal/pt-br/aceso-a-informacao/dados-abertos/resultados/aduana/estudos-e-analises/TRSReport.pdf>.

Box 4. Information and Customs Performance: the case of Madagascar (Chalendard et al. (2020))

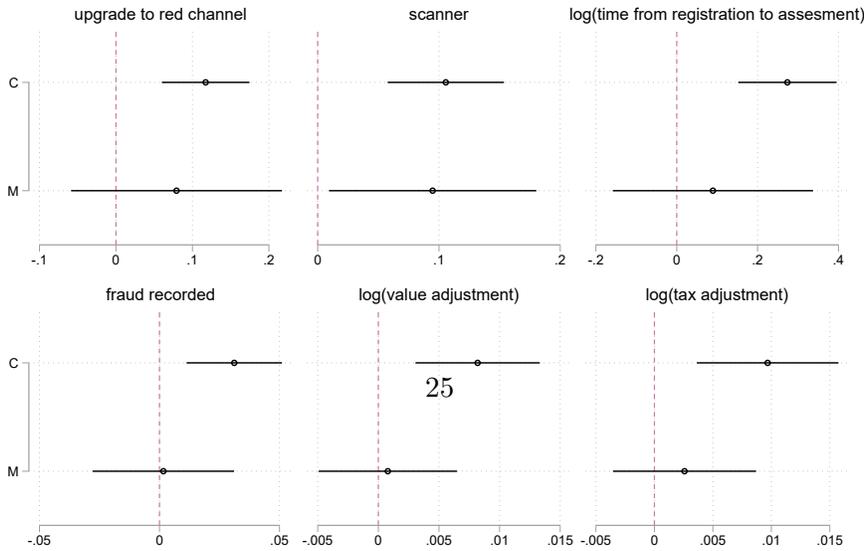
In an experiment conducted in Madagascar, (Chalendard et al., 2020) measure the indicators described above and how they change when customs agents are given additional information. Madagascar is among the countries that highly rely on customs and other import duties - 16.9% of the total tax revenue going to Antananarivo proceeds from this source. At the same time, the performance of particular customs inspectors in Madagascar can be highly impactful since each inspector is responsible for considerable value of import revenues. In the sample of Chalendard et al. (2020), every inspector handles around 10 million USD in import revenues per year. Therefore, ensuring good performance of its customs officials is in vital interest of the Malagasy authorities.



Chalendard et al. (2020) investigate the role of information provision and monitoring in a randomized setting. One group of officials in their study was provided with a set of detailed risk-analysis comments on high-risk customs declarations (this group is labelled with 'C' in the figure below). Officials in another group were told they would be more intensively monitored throughout a period of study (M). The figure below shows that monitoring had an impact only on increased frequency of customs officials scanning containerized goods. In contrast, additional comments about high-risk declarations also led the officials to perform more frequent upgrades of inspections to the red channel, declare more cases of fraud detection and larger value adjustment. However, this also increased screening times and led to only small improvements in tax collection, and especially so for declarations supposed to yield large tax revenues.

Source: Chalendard et al. (2020); World Bank Development Indicators

Figure 11: Malagasy customs officials - performance changes following a randomized intervention of providing comments (C) and monitoring (M)



6 Conclusion

What lessons for practice should be considered by the practitioner interested in exploring customs data for analytics?

First, an initial diagnosis through a TRS can provide a broad overview of the customs process. This can be done either at the beginning of a project or using baseline data from past exercises. TRS can provide useful indicators on what part of the clearance process suffers from bottleneck. This is commonly done by the revenue administration before an overhaul of their process. This can be extended with a trader survey, asking them about the most sensitive aspects, unlikely to be captured during the TRS survey. For example, the issues of speed money – or bribe to get the process faster – or other issues with any of the agencies involved, might not be seen by the TRS surveyors but influence the traders’ decision to import or export.

Second, protocols to ensure data confidentiality, while providing external access, should be set in place. The anonymity of tax payers is an important governmental concern, and some administrations are prevented from sharing them with third parties. If protocols are set in place, the data can be shared while respecting these anonymity concerns, allowing practitioners and outside researchers to build customs performance indicators and opening the door to further research. These protocols include de-identification of the data whenever possible, such that the researcher themselves have access to de-identified tables only. This can be done via hashing of the tables. Beyond security concerns, ASYCUDA tables might need to be merged and extracted, which can prove challenging in low-capacity settings. A useful solution is to support client engagement by requesting the data needed to build the basic indicators and assemble the data on a safe server⁵ If necessary, the data can be de-identified by the client team based on an hashing code provided by the researcher and described on the DIME Analytics wiki.⁶

Third, stakeholders may resist additional measurement efforts. Some stakeholders might be reticent to use anything else than the TRS, as it is new and requires more effort from the ASYCUDA team. On top of that, while the TRS provides a narrative with the sources of delays, ASYCUDA data offer an often harsher view of the clearance process, as it also includes steps that depend on the tax payer - such as paying the taxes. Because ASYCUDA aggregates so much data, it can incorporate more outliers and influence the mean. This contrasts with the TRS, which is often done in week and with the inspectors being aware of it. The researcher should thus expect discrepancies with the reported TRS, especially if the survey was done a while back. Thus, triangulating the different sources of data is important, as well as using the TRS results to comment on ASYCUDA-based indicators.

Finally, we suggest to first invest in the easy to produce indicators, such as revenue recovered and revenue recovered compared to similar products of the same type, as well as the easiest types of delays. These indicators should be triangulated

⁵ Available here with standard ASYCUDA fields.

⁶ Available here: <https://dimewiki.worldbank.org/De-identification>.

with the TRS if available, or traders surveys. Further refinement of the indicators could include more precise measure of delays to distinguish tax compliance and actions of customs, but these should be done once the more foundational indicators are measured and set in place.

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