CHAPTER 14

Government Analytics Using Customs Data

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SUMMARY

Many government agencies have multidimensional missions, in which achieving one objective can reduce the attainment of another organizational objective. This presents particular challenges to government analytics. Incomplete measurement of objectives risks encouraging the attainment of the 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 ensuring the security and safety of the goods entering or exiting the country. Attaining one objective (for example, the greater safety of traded goods) can come at the expense of another (for example, facilitating trade). This puts a premium on the 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 trade facilitation (for example, the costs of the process—in particular, time delays), revenue collection (for example, trade volume and revenue collected based on the assessed value), and safety (for example, the number of goods in infraction seized). The chapter also underscores how a wider use of the customs database itself could help measure performance, by combining it with other data collection methods, such as the World Customs Organization (WCO) Time Release Study (TRS) and exciting developments in GPS tracking data.

ANALYTICS IN PRACTICE

- Government organizations with multidimensional missions—such as customs—typically need to integrate multiple data sources to ensure they measure performance holistically and avoid measuring and focusing on some goals but not others. In customs, the efficiency of the border-crossing process, and the customs agents and other agencies involved in it, should be evaluated with both traditional tools—the World Customs Organization (WCO) Time Release Study Plus (TRS+) and monitoring and evaluation metrics—and new or underused data sources—such as GPS data—to provide a way to reduce

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the cost and increase the frequency of the 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. Measurement validation and triangulation are important components in analyzing customs data. It is thus important to invest in understanding the data routinely collected and to analyze them 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 the revenue collected. This requires understanding the full customs process and ensuring entries are not duplicated or incomplete, as might be the case if customs declarations for a shipment can be resubmitted under a different regime (for example, when the importer wants the goods to leave the warehouse and be released).
- Data should be standardized and rendered into reports for easy and fast consumption. Standardization of the extraction process, indicators, questions, and data treatment helps reproduce reports at a high frequency. From user surveys, information on the performance of the customs agent can also be collected.
- Valuation of goods in customs 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 of origin to their destination may assist in identifying the true value of goods. While valuation is a difficult process, and the World Trade Organization (WTO) rules describe how individual items' values 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, the duties and excises collected, and the 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 the relevant checkpoints along the customs process against which it is measured must be defined (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 Automated System for Customs Data (ASYCUDA) data is the time between assessment and clearance excluding the payment of taxes and duties. This exclusion is important because payment issues can be the cause of a lot of the delays, and such findings would have different policy implications.

INTRODUCTION

Many government agencies have multidimensional missions, in which achieving one objective can reduce the 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 multidimensional missions with conflicting goals present particular challenges to government analytics. Incomplete measurement of objectives risks encouraging the attainment of the 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 multidimensional mission attainment holistically, the chapter complements other chapters in *The Government Analytics Handbook* that detail the use of one particular form of data—such as case data in chapter 15 or task data in chapter 17.

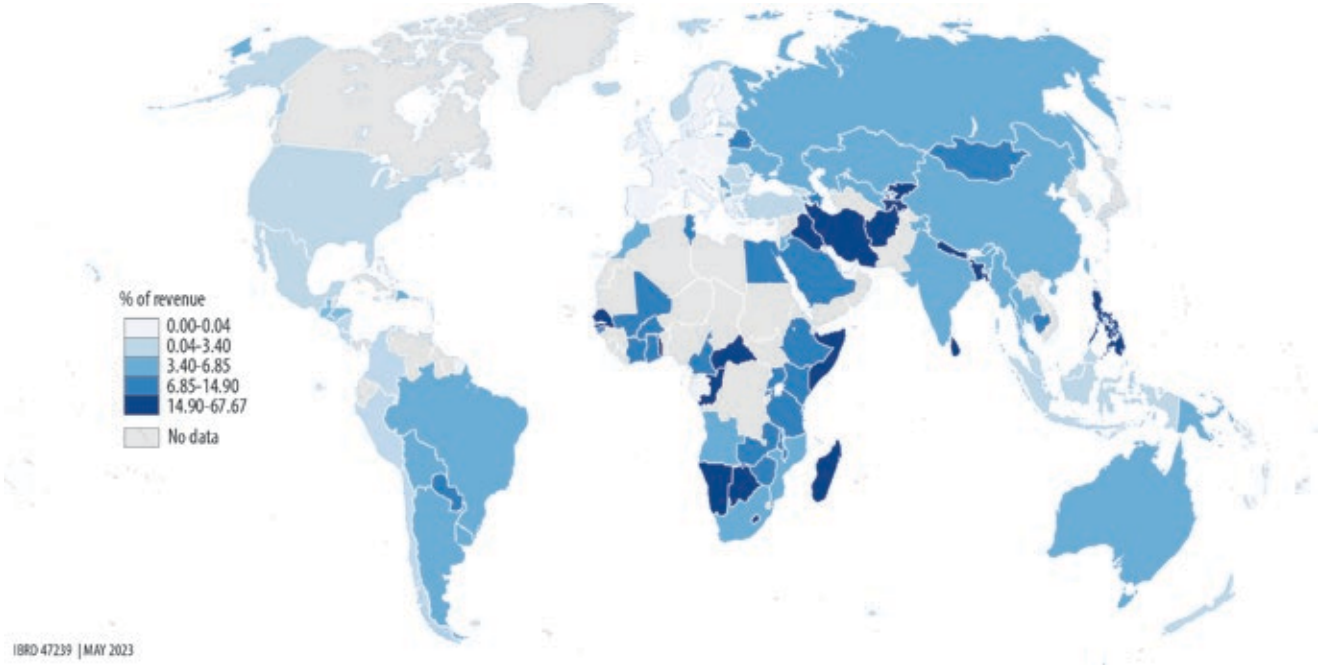
Among agencies tasked with multidimensional missions, customs is arguably a key one. Customs operations are located within the international borders of a country and are responsible for the processing of export and import goods. This includes several steps, from reviewing goods declarations to risk assessments,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

In high-income countries, customs and other import duties represent, on average, 3.8 percent of state revenue, but, as illustrated in map 14.1, this value rises for countries with lower average incomes. For upper-middle-income countries, it stands at 8.9 percent, for lower-middle-income countries, at 11 percent, and for low-income countries, at 20 percent. For some countries in Sub-Saharan Africa, South Asia, and the Pacific islands, customs and import duties provide over one-third of all tax revenue. In addition to its key role in revenue collection, customs ensures borders' integrity and is the point of entry for goods coming into or going out of the country. For these reasons, the 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: the facilitation of trade across borders, the collection of revenue, and the protection of the safety of people and the security of goods coming through the borders. Working toward these three missions simultaneously involves trade-offs: making progress toward one goal can undermine the 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 fewer 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 toward those three key objectives, as well as some associated challenges, are illustrated in box 14.1 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 for. With this in mind, this chapter provides an empirical guide to assessing customs performance across these three objectives, as well as

MAP 14.1 Customs and Other Import Duties as a Percentage of Tax Revenue



Source: World Development Indicators (latest available values).

BOX 14.1 Interactions with Other Agencies: The Case of Malawi

The Republic of Malawi is a landlocked country in southeastern Africa (see map B14.1.1). In Malawi, 14 agencies are present at the border. The agencies perform the inspections related to their missions: for instance, the Malawi Bureau of Standards ensures that the foodstuff coming in to the country respects Malawian standards. Together, these agencies strive to improve performance as related to the three principal objectives of customs operations below:

Trade facilitation: Malawian customs agents strive to improve the flow of goods and services across the border. One example of their efforts in this sphere is upgrading to the Automated System for Customs Data (ASYCUDA) World system in 2018. The new system facilitates trading across the border by, among other things, allowing web access for businesses, enabling the round-the-clock submission of customs declarations, and providing customized data extraction features.

MAP B14.1.1 Location of Malawi

Source: World Bank.

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

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

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BOX 14.1 Interactions with Other Agencies: The Case of Malawi *(continued)*

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

outlining the diverse data necessary to perform these 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 resources constraints they face when developing them. Because modifications in how customs operates affect other policy areas—trade policy and fiscal revenue—any change in how data are ingested and consumed should be coordinated with other government agencies.

The chapter is structured as follows. First, it provides institutional context on how customs operates and the international policy framework governing customs data collection and trade policy. Section 3 reviews the academic literature on customs, emphasizing its role in 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, and the final section concludes.

INSTITUTIONAL CONTEXT

Customs Process Overview

The customs process follows a linear structure, from the formal declaration of goods to the 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 14.1). This can be done remotely or at the border, depending on the country. The goods declaration usually lists a description of the items, with the classification, weight or quantities, origin, and value of the items in the shipments. Supporting documents, such as an invoice and bill of landing, are submitted along with the declaration. In addition, the customs declaration contains the declarant's assessment of the taxes and duties to be paid.

The next step is risk assessment. This step can take place before the submission is made or when it 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, in which the color indicates whether the documents or the goods have to be inspected, sends flags for potential fraud or discrepancies in the declaration, and, potentially, sends 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 the declarant and the diagnostics provided by the risk department, the inspector can overrule the clearance channel 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 with 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

FIGURE 14.1 Diagram of Customs Process

Source: Original figure for this publication.

accumulated, the inspector produces a report on the declaration. The report lists any adjustments to the classification of the goods, the origin, product 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 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.

International Trade Policy Framework

While work to efficiently regulate customs operations is done on the domestic front by customs authorities, international organizations play a significant role as well. Since trade is, by nature, the 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), 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 WTO trade facilitation agreement (TFA) reached at the 2013 Bali Ministerial Conference includes provisions related to customs operations. Intended 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 area of everyday customs work. In particular, the TFA, which 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 (TFAF). It was the first time in WTO history that the obligation to implement an agreement was linked to the capacity of the country to do so.

The mission of the WTO and other international organizations, such as the WCO, is broad. The 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 cooperation is the WTO's Agreement on Customs Valuation, which established the Technical Committee on Customs Valuation under the rule of the WCO. In the area of technical assistance, according to the WTO, the main focus remains on negotiations surrounding technical assistance. Another example is the Harmonized Commodity Description and Coding System, or "Harmonized System," a classification of goods under the lead of the WCO, which the WTO thoroughly follows. Established by the Tokyo Round agreement, the WCO's Technical Committee on Customs Valuation and the General Agreement on Tariffs and Trade (GATT) and WTO Committee on Customs Valuation provide 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 was 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 growing pressure from the international trading community to minimize the intervention of the government in commercial transactions (Widdowson 2007). WTO rules on customs valuation highlight the discretionary autonomy that customs authorities must retain to fulfill their duties in promoting food safety and security and fighting illegal practices.

Measurement of time as a critical component for efficient customs operations has been dictated by the WCO Time Release Study (TRS) as well. The 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 Mechanism (PMM) thoroughly monitored by WCO. Aimed at data-driven decision-making, the TRS helps customs agencies see opportunities for further improvement of the processes involved in realizing and accepting cargo.

THE MULTIDIMENSIONAL MISSION OF CUSTOMS AGENCIES

The mission of customs agencies typically translates into three core objectives: trade facilitation, fiscal revenue, and security and food safety. In outlining these objectives, this chapter presents evidence from research exploring how these goals can be pursued, as well as a detailed discussion of their analytical approach. The first cluster of research studies examines the role of customs and nontechnical barriers in trade facilitation. The second subsection provides an extensive discussion of customs as a source of fiscal revenue, with its associated challenges in fighting fraud and illegal practices, such as corruption. The last subsection presents studies that improve our understanding of how customs can promote product safety and ensure security.

Objective One: The Role of Customs in Trade Facilitation

Scholarly interest in customs research stems from its potential to serve as a tool for trade facilitation. What follows is an overview of the evidence to date. For example, Fernandes, Hillberry, and Alćantara (2021) evaluate Albanian reforms 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 reforms gave rise to evasive behaviors. Similarly, for exports, Martincus, Carballo, and Graziano (2015) focus on time as a critical barrier to trade. Using a unique data set that consists of the universe of Uruguay's export transactions over the period 2002–11, 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 by Djankov, Freund, and Pham (2010). The authors examine how time delays affect export volumes. To measure time, the total export delay is considered. This means that the time delay does not include the time spent in a home country, on procedures, or in transit. It consists of the time spent when a container is 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 transit times abroad is likely negligible. Nevertheless, Djankov, Freund, and Pham (2010) estimate a difference gravity equation showing that each additional day a product is delayed prior to being shipped reduces trade by more than 1 percent. 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 operations can facilitate trade.

Objective Two: 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), Dutt and Traca (2010) show that in most cases, corrupt bureaucrats tax trade through either *extortion* or *evasion*. The former refers to a bureaucrat's demanding bribes from exporters for doing his duties, while the latter refers to a situation in which an exporter pays off a public servant to receive preferential treatment, like a lower tariff rate or the lowering of regulatory standards. Evasion may be trade-enhancing in an environment with high tariffs because it allows an exporter 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 the rigorous implementation of customs rules, to be able to finance their development policies.

In seeking to increase tax revenues while reducing corruption, researchers and policy makers have been conducting experiments to identify optimal policies (Cantens, Raballand, and 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 (WCO 2015). This approach is often limited by difficulties in obtaining detailed customs data. When implemented in Madagascar by Chalendard, Raballand, and Rakotoarisoa (2019), this method helped to identify the probability of fraud in the context of customs operations reforms.

Technology can help customs improve its 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 six log points in the firm's value, with consequences for employment and tax collection. However, Chalendard et al. (2021) show that, through manipulation of the IT system, some customs inspectors and IT specialists were able to manipulate the assignment of import declarations. This was identified by measuring deviations from random assignments prescribed by official rules. Deviant declarations are found to be at greater risk of tax evasion, less likely to be deemed fraudulent, and cleared faster.

Another experiment analyzing policies to curb fraud was conducted in Madagascar (Chalendard et al. 2020). The 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 they do not necessarily detect more fraud. Relatedly, Khan, Khwaja, and Olken (2019) propose a mechanism to improve the performance of public servants in collecting tax revenue, 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 Three: Security and Food Safety

Customs authorities play 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, the WCO established an ad hoc working group to find ways for customs authorities to quickly react to such emergencies. The WTO, in turn, supports food security practices through the work of its Agriculture Committee and an Agricultural

Market Information System (AMIS) by a recommendation of the UN 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: consumers do not always judge food security properly, and there are substantial differences between countries in terms of the regulation of food safety. The notion of trade security differs considerably in developed countries and developing ones (Diaz-Bonilla et al. 2000). Additionally, there are substantial risks of contamination due to trade. Ercsey-Ravasz et al. (2012) provide evidence that given the international agro-food trade network, the speed of potential contamination is extremely high because 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 the illegal trade of products. The academic literature has documented how illegal trade in goods operates. In the European Union, Świerczyń ska (2016) provides a list of legal solutions implemented to sustain the 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 the Islamic Republic of Iran, Farzanegan (2009) estimates that a penalty rate on smuggling contributed to reducing illegal trade, using historical data from 1970 to 2002.

DATA REQUIREMENTS

Data Sources

Before delving into the definition of customs performance indicators, it is useful to explain 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 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 declarations, 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 14.2 illustrates the basics of the ASYCUDA's structure.

However, ASYCUDA data are rarely used outside of aggregate statistics of revenue collection. Most of the time, studies of time delays are based on a TRS. A 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. A TRS is conducted over a predefined period of time, during which several declarations are followed by the surveyor at some border posts. The surveyor observes all steps until release and makes note of the time spent and the associated costs. As noted by the WCO, the tool is useful to produce a pre-reform benchmark and needs to be repeated often to follow the evolution at a particular border post. However, intercountry comparisons are limited given differences in capacity and infrastructure (WCO 2018).

The information coming from the country databases is usually shared at an aggregated annual level with the UN Statistical Division. This information is treated and aggregated by the Harmonized System, typically using eight- or six-digit codes. The Harmonized System is a standardized classification of traded products based on numerical categories. The system is managed by the WCO and is regularly updated. Each product is described using eight digits.[1] 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 14.2. It provides an overview of the total value of imports, classified according to 22 sections of the Harmonized System, across the 50 largest ports of entry in the United States.

BOX 14.2 ASYCUDA Data Structure

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

A typical extract from ASYCUDA data thus contains information on the entry point for a specific declaration, the number of items declared, the agent and importer name, the year, and the registration date (see figure B14.2.1). ASYCUDA data also register *free on board* value—value outside insurance claims and ownership rights on the shipment—and value-added taxes (VAT), 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 B14.2.2).

FIGURE B14.2.1 Example of an 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	83	12345678	IMPORTER 1	2020	1	RED	Green	IM4	62034300
3	BIR	DED	CA26775	MALAWI AGENT 2	01.02.2022	84	12345679	IMPORTER 2	2021	1	RED	Red	IM4	62053010
4	SWE	DED	CA26776	MALAWI AGENT 3	02.02.2022	85	12345680	IMPORTER 3	2022	1	BLUE	Green	IM4	73261990
5	BIR	BIR	CA26777	MALAWI AGENT 4	03.02.2022	86	12345681	IMPORTER 4	2022	1	YELLOW	Yellow	IM4	61103000
6	MUL	DED	CA26778	MALAWI AGENT 5	04.02.2022	87	12345691	IMPORTER 5	2022	1	YELLOW	Green	IM4	62171010
7	MWA	BIR	CA26779	MALAWI AGENT 6	05.02.2022	88	12345692	IMPORTER 6	2022	1	RED	Green	IM4	87033311

Source: Automated System for Customs Data (ASYCUDA), United Nations Conference on Trade and Development.

FIGURE B14.2.2 Example of an ASYCUDA Extract: Duty, Excise, and Value-Added Taxes 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

Source: Automated System for Customs Data (ASYCUDA), United Nations Conference on Trade and Development.

The typical time stamp data are associated with a particular action—such as a change in lane selectivity or in payments due, among others. Linking all the tables, one can extract tailored reports, as in figure B14.2.3, to create indicators of time delays between different actions depending on lane selectivity or type of declaration.

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BOX 14.2 ASYCUDA Data Structure *(continued)*

FIGURE B14.2.3 Example of an 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_REL	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_nikname
3	BIR	02.01.2022	C679	IM4	RED	Green	1234	HIGH VALUE	GFR908433	2	Request PRN	03.01.2022 16:04	user1_nikname
4	BIR	02.01.2022	C680	IM4	RED	Green	1234	HIGH VALUE	GFR908434	3	Payment	04.01.2022 16:04	user1_nikname
5	BIR	02.01.2022	C681	IM4	RED	Green	1234	HIGH VALUE	GFR908435	4	Release Order (selectivity)	05.01.2022 16:04	user1_nikname
6	BIR	02.01.2022	C682	IM4	RED	Green	1234	HIGH VALUE	GFR908436	5	Control Results	06.01.2022 16:04	user22_nickname
7	BIR	02.01.2022	C683	IM4	RED	Green	1234	HIGH VALUE	GFR908437	6	Control Results	07.01.2022 16:04	user22_nickname
8	BIR	02.01.2022	C684	IM4	RED	Green	1234	HIGH VALUE	GFR908438	7	Control Results	08.01.2022 16:04	user22_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

Source: Automated System for Customs Data (ASYCUDA), United Nations Conference on Trade and Development.

Another source of data is trader perception surveys. The focus of this type of survey 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 costs 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 clearance-associated costs is usually not represented either. The issue with these surveys is how to harmonize perception questions across countries to make sure they cover the same issues: 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 captures the time spent on the road. These data can be used to observe the time spent at the border. Used in conjunction with time stamps, they show what share of time delays is attributable to customs operations as opposed to, for instance, difficulties linked to parking infrastructure. While these data are usually privately collected by firms providing transponders or insurers, some transport corridor authorities or public databases collect and provide these tracking data. One example of such a resource in Southern and Eastern Africa is administered by the World Bank's corridor team.[2]

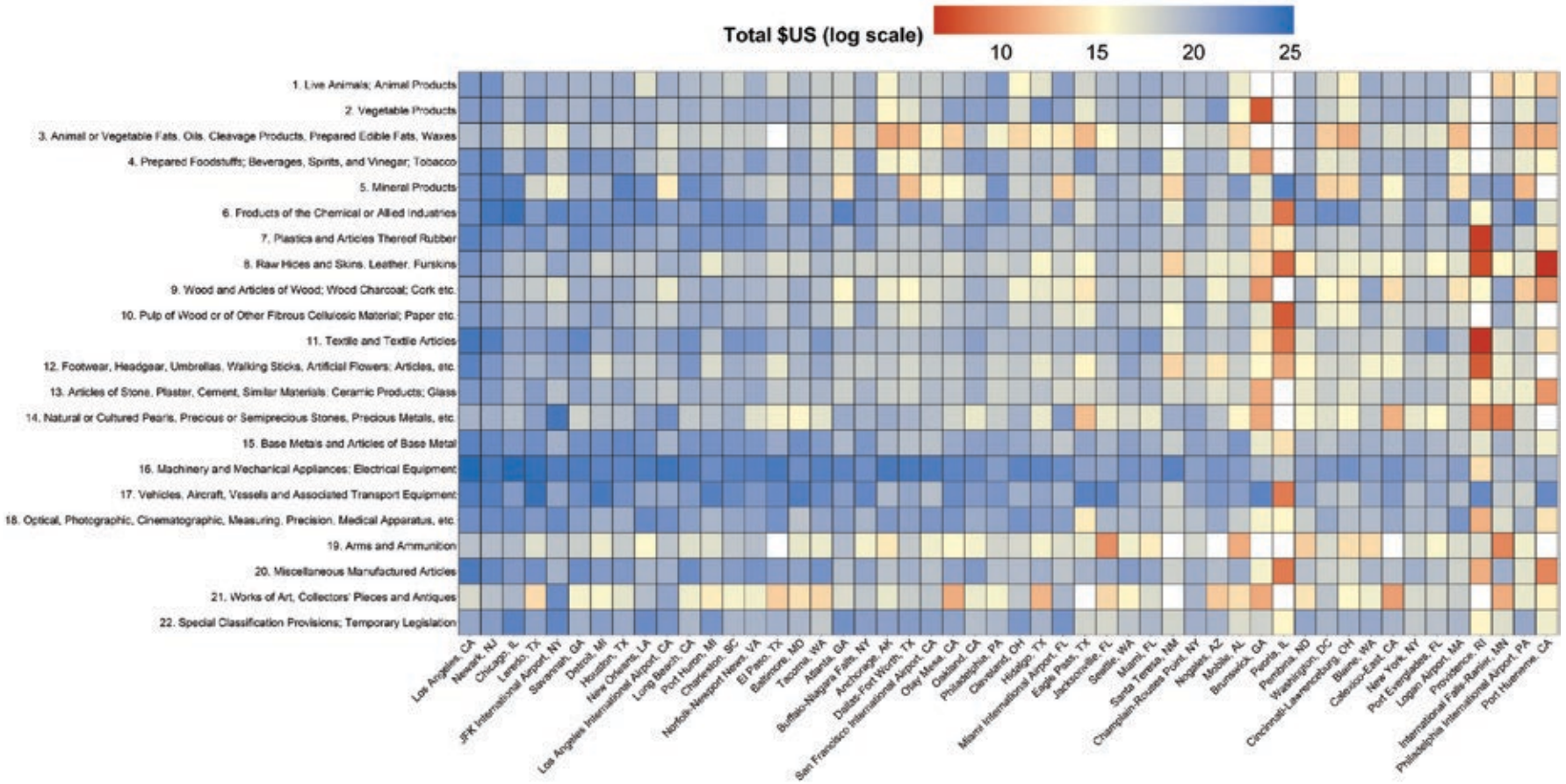
PERFORMANCE INDICATORS

While previous sections have 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 objectives of the multidimensional mission of customs: trade facilitation, revenue collection, and food safety and security.

Indicators for Trade Facilitation

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

FIGURE 14.2 Value of Different Product Categories Imported to the United States for 50 Largest Ports of Entry, as Appraised by US Customs and Border Protection



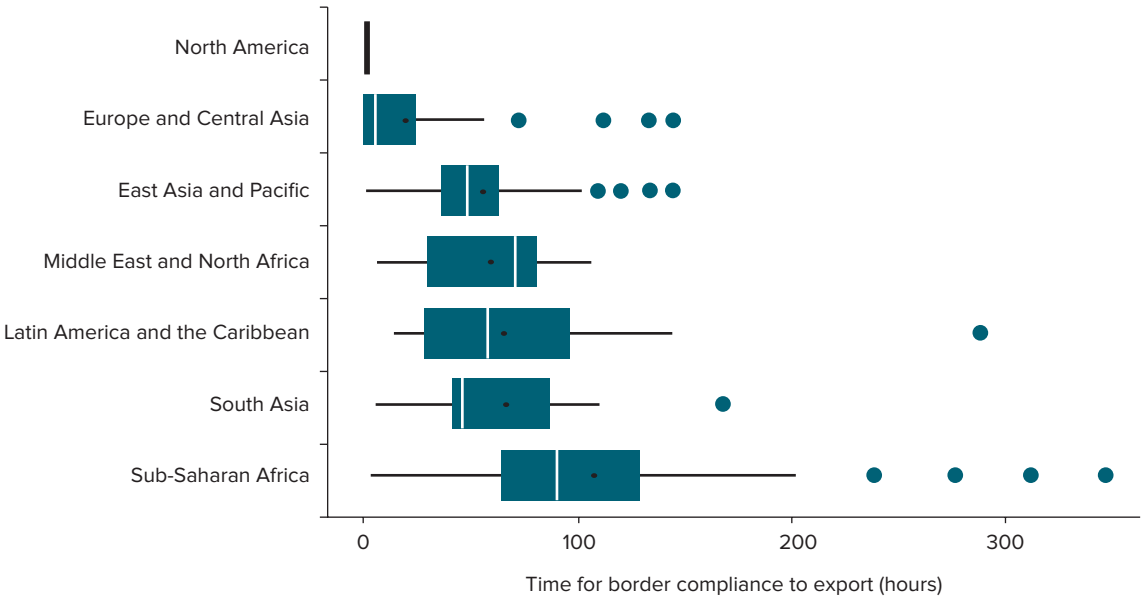
Source: USA Trade Online, US Census Bureau: Economic Indicators Division.
Note: Goods on the *y* axis are grouped according to the 22 sections of the Harmonized System. Some section labels are shortened due to space considerations. The *x* axis displays the 50 largest ports of entry in the United States by the total value of all goods imported, in decreasing order.

Figure 14.3 presents an example of a TRS indicator in the form of cross-country and regional disaggregation of border compliance times. Exporters across countries face vastly different times to process through customs. They are close to zero in the Northern American trade involving the United States and Canada, as well as in 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 African exporters, where the mean border compliance time is 107 hours, and over 200 hours for several countries in Central Africa.

Not only are these processing times intrinsically heterogeneous, but the data used to measure them also paint a different picture of the customs process. The routinely collected time stamps from the customs database, the ASYCUDA or another, will show the date of the first submission and clearance. However, if the submission is made far in advance—for example, when arriving at the port, while the country itself is still far off—the time will be artificially long. In addition, as 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.

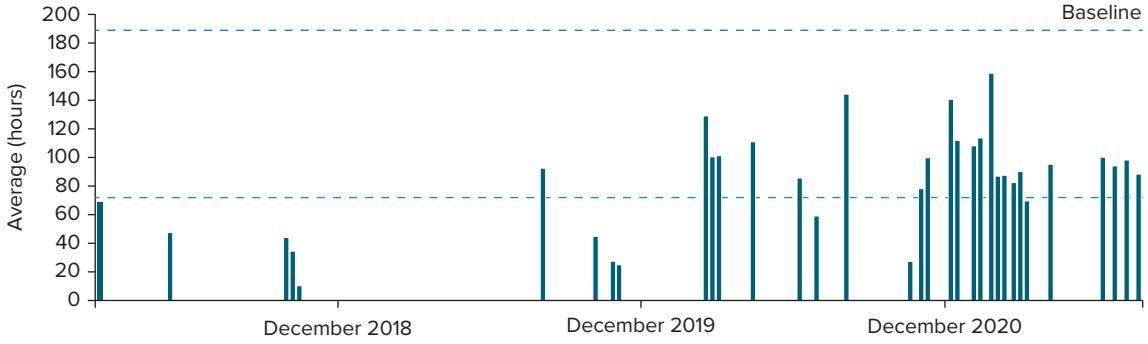
One possibility is, therefore, to look at the time necessary between the moment the frontline inspector is assigned to the declaration and the moment they clear it. While some agencies may delay the process by requesting additional inspection and clearances, this is less likely to be the case. In the ASYCUDA or other databases, this would correspond to the time difference between the time for assessment and the time at release. An example of such an indicator used for monitoring this time is depicted in figure 14.4. This figure displays the average time between the issuance of a release order and the issuance of a certificate of export at Malaba, on the Northern Corridor between Kenya and Uganda. The TRS follows 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 elements related to noncustoms delays can be isolated.

FIGURE 14.3 Border Compliance Times in Cross-Country and Regional View



Source: Doing Business database, World Bank.
Note: 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—that is, the distance between the 25th and 75th percentiles in the distribution of respective values. The lines in the middle of the box represent the medians, whereas the dots represent means. The time is calculated in hours. The 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.

FIGURE 14.4 Example of Indicators to Measure Performance: Transit Time on the Northern Corridor



Source: Original figure for this publication.

Finally, the same indicators can be based on surveys of traders to recover their perception of the delays, using a question to estimate how many days it takes between the moment a 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. Early results show a reported average of two to three days once traders get notified their shipment is at the border.

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 14.3 on the problem of valuation—and, therefore, constructing the theoretical revenue that could have been collected requires considerable effort. Hence, this is something that the customs administration rarely does, 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 the revenue that could have been collected if the items followed a similar price for other goods of the same class and origin. This is considered one of the acceptable valuation methods by the WTO. 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 set of prices but a comparison with similar goods' prices.

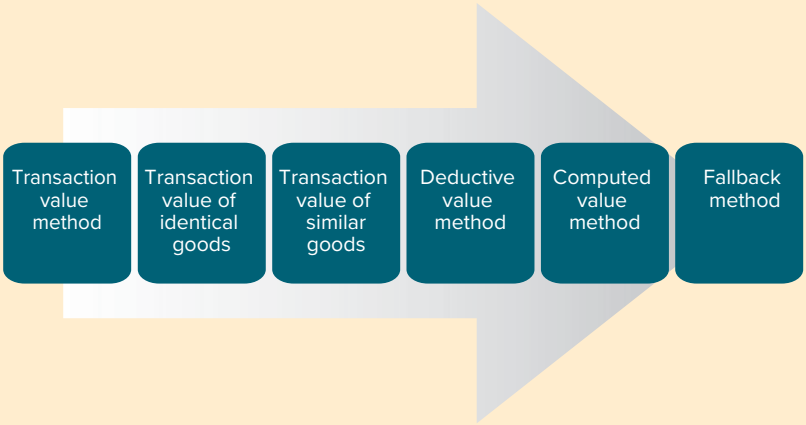
Evaluating the value of an item is intrinsically hard, as the inspector doesn't have precise information on the goods outside of what is listed on the declaration. The WTO agreement establishes rules for the valuation of imported goods that must be applied by all member countries. The WTO mandates using the transaction value supported by invoices and 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. The second method 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 B14.3.1. Customs is prohibited from using the same goods produced nationally as a comparison point, and from using arbitrary or fictitious values, such as minimal values or thresholds.

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. For an example of the use of such data for customs reform, see box 14.4. 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 an artifact of the data. Another possibility is to reconcile the data at the

BOX 14.3 The Problem of Valuation

Evaluating the value of an item is intrinsically hard, as the inspector does not have precise information on the goods 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 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. The second method 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 B14.3.1. Customs is prohibited from using the same goods produced nationally as a comparison point, and from using arbitrary or fictitious values, such as minimal values or thresholds.

FIGURE B14.3.1 World Trade Organization Valuation Methods, Arranged Sequentially



Source: Based on WTO Agreement on Customs Valuation (ACV) of 1994.

individual level, linking exporters' declarations from a country to another country's importers' declarations. This level of analysis can highlight value discrepancies and the potential mistakes or omissions of customs frontline agents.

Indicators for Food Safety and Security

There is relatively less work on safety because the data are harder to come by. The seized goods could indicate either an increase in customs activity or criminal activity. The TRS and ASYCUDA data can provide a good indication of risk management operations, both in terms of value recovery and physical inspection for safety. In Brazil, for example, the rate of physical inspections performed by customs was found to be around 2 percent during the most recent TRS (Receita Federal do Brasil 2020). However, 12 other government agencies were often involved in the process, granting licenses or permissions necessary for import. Around 60 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 need for other agencies' licenses and inspections. Another example is that, for goods under the jurisdiction of health authorities, around one-quarter to a third of the time is actually due to delays in paying the licensing fee.

BOX 14.4 Information and Customs Performance: The Case of Madagascar

The Republic of Madagascar is an island country lying off the southeastern coast of Africa (see map B14.4.1). In an experiment conducted in Madagascar, Chalendard et al. (2020) measure customs indicators and how they change when customs agents are given additional information. Madagascar is among the countries that rely heavily on customs and other import duties—16.9 percent 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 because each inspector is responsible for a considerable value of import revenues. In the sample of Chalendard et al. (2020), every inspector handles around US$10 million in import revenues per year. Therefore, ensuring the good performance of its customs officials is a vital interest of the Malagasy authorities.

MAP B14.4.1 Location of Madagascar

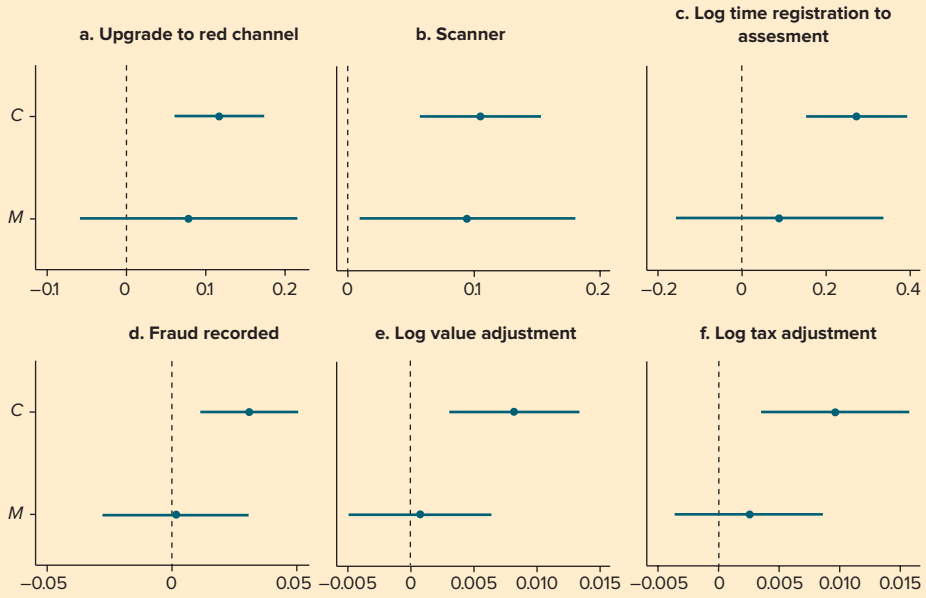
Source: World Bank.

(continues on next page)

BOX 14.4 Information and Customs Performance: The Case of Madagascar *(continued)*

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 labeled with *C* in figure B14.4.1). Officials in another group were told they would be more intensively monitored throughout a period of study (this group is labeled with *M* in the figure). Figure B14.4.1 shows that monitoring has an impact only on the increased frequency of customs officials' scanning containerized goods. In contrast, additional comments about high-risk declarations also lead the officials to more frequently upgrade inspections to the red channel and declare more cases of fraud detection and larger value adjustment. However, this also increases screening times and leads to only small improvements in tax collection, especially for declarations supposed to yield large tax revenues.

FIGURE B14.4.1 Changes in Malagasy Customs Officials' Performance



Source: Original figure for this publication.
Note: The label *C* on the *y* axis indicates the group of inspectors who were provided with comments; the label *M* indicates the group of inspectors who were told they would be monitored. *X*-axis units are regression coefficients.

CONCLUSION

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

First, an initial diagnosis through the TRS can provide a broad overview of the customs process. This can be done either at the beginning of a project or by using baseline data from past exercises. The TRS can provide useful indicators on what part of the clearance process suffers from a bottleneck. This is commonly done by the revenue administration before an overhaul of its process. This can be extended with a trader survey, which asks traders about the most sensitive aspects of the process, which are unlikely to be captured

during the TRS. For example, the issues of speed money—or bribes to speed up the process—or other issues with any of the agencies involved might not be seen by the TRS surveyors but nevertheless influence traders' decisions to import or export.

Second, protocols to ensure data confidentiality while providing external access should be set in place. The anonymity of taxpayers is an important governmental concern, and some administrations are prevented from sharing taxpayer information with third parties. If protocols are set in place, these 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 the deidentification of data whenever possible, such that researchers have access to deidentified tables only. This can be done via the 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 server. If necessary, the data can be deidentified by the client team based on a hashing code provided by the researcher, a procedure described on the World Bank's Development Impact Evaluation (DIME) Wiki.[3]

Third, stakeholders may resist additional measurement efforts. Some stakeholders may be reticent to use anything other 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 of the sources of delays, ASYCUDA data offer an often harsher view of the clearance process, as they also include steps that depend on the taxpayer—such as paying taxes. Because the ASYCUDA aggregates so much data, it can incorporate more outliers and influence the mean. This contrasts with the TRS, which is often done in a week, with the inspectors being aware of it. Researchers 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 first investing in 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 with the TRS, if available, or with trader surveys. Further refinement of the indicators could include more precise measures of delays to distinguish tax compliance and the actions of customs, but these should be done once the more foundational indicators are measured and set in place. Of course, as outlined in the introduction, when measuring only select indicators of an organization with a multidimensional mission—such as customs—analysts need to remain cognizant of risks of effort substitution toward measurable indicators and to devise strategies to expand measurement to all core objectives of customs over time.

NOTES

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1. An example of an eight-digit description is 08051000, which corresponds to fresh oranges. Each product belongs, at the broadest level, to one of 22 Harmonized System sections. These are, however, not marked in the product code. Instead, each section is composed of one or more chapters, and the first two digits of the code refer to a specific chapter: in this case, chapter 08: "Edible Fruit and Nuts; Peel of Citrus Fruit or Melons." The next two digits stand for a heading within that chapter: heading 05: "Citrus fruit, fresh or dried." The following two digits stand for subheading 10: "Guavas, mangoes and mangosteens: Oranges." The last two digits can further specify more fine-grain divisions of product category if these exist. In this case, no further specification is indicated by 00.
2. Their website is accessible at https://www.corridorperformancemonitoringsystem.com/geozone-route-catalogue.
3. See DIME Wiki, s.v. "De-identification," last modified November 17, 2020, 20:10, https://dimewiki.worldbank.org/De-identification.

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