

CHAPTER FOUR

THE EFFECT OF AID FOR TRADE FACILITATION ON SMUGGLING IN SUB-SAHARAN AFRICA⁸

Abstract: Smuggling is pervasive in Sub-Saharan Africa (SSA) but it is rarely examined in the context of the region. On the other hand, aid for trade facilitation is given paramount importance to improve economic development in the region through increasing trade. This chapter empirically examines and quantifies the impact of aid for trade facilitation on smuggling in SSA, which is defined as the illegal way of bringing legal goods to the country without complying with applicable customs laws. Using recent country-level and product-level mirror trade data with major trading partners and controlling for other key factors, the results show that aid for trade facilitation affects efficiency of customs procedures which in turn reduces smuggling activities in SSA. The findings indicate that aid for trade facilitation, which mainly aims at easing trade flows across borders, are also important to reduce smuggling in the region. Our result is robust to a series of checks using different samples, proxy variables, and specifications.

⁸ This chapter is based on: Worku, T., Mendoza, J. P., & Wielhouwer, J. L. (2017). *The Effect of Aid for Trade Facilitation on Smuggling in Sub-Saharan Africa*. Unpublished manuscript, Department of Accounting, Vrije Universiteit Amsterdam, the Netherlands. We thank the financial support provided by NUFFIC Netherlands.

4.1. Introduction

Smuggling, the illegal way of bringing legal goods into a country without declaring them or paying any legally required tariff, is one of the biggest challenges in Sub-Saharan Africa (SSA) affecting all countries in the region (Benjamin et al, 2012; Golub, 2012)⁹. The tariff revenue lost in South Africa in 2014 from smuggling of clothes from China could have covered the government's monthly child support program for nine million children and old-age grant payments for 2.1 million elders for one year (Dailymaverick, 2017). In Nigeria, 68 percent of the chickens consumed by the people are supplied by smugglers with the government losing around 2.75 billion dollars revenue annually from such imports (Sahara Reporter, 2015). In 2016 the Kenyan government, the United Kingdom, Interpol, and other regional partners have joined forces to combat smuggling of vehicles from Europe to East Africa through the Kenyan port of Mombasa (The Star, 2016). In SSA all sorts of items from cements to electrical machinery from whiskey to peanuts and toothpaste are brought from all over the world, smuggled into the region, and traded openly (Deardorff & Stolper, 1990). Despite its pervasiveness, smuggling in the region is a rarely studied subject (Golub, 2012) and in this chapter we study the effect of aid for trade facilitation on smuggling. We hypothesize that aid for trade facilitation improves the efficiency of customs procedures which in turn reduces smuggling.

The main motive behind smuggling is to gain an economic advantage by escaping trade barriers at the border. However, smuggling affects the formal economic environment and exposes the public to social, economic, and security risks resulting in negative welfare effects (Bhagwati,

⁹ The term smuggling is also used in relation to human trafficking and importing of illegal goods like narcotic drugs (Golub, 2015; Buehn & Eichler, 2009). This chapter focuses on smuggling of "legal goods", i.e., goods allowed to be imported into the country but brought in without complying with customs laws and regulations.

1981). Empirical studies mainly focus on examining the effect of tariff on import smuggling (Fisman & Wei, 2004; Mishra et al., 2008). However, the incentive to resort to this illegal activity may also come from unnecessary and time-taking government regulations and formalities imposed on traders at the border. Indeed, the cost of cumbersome customs procedures to the traders may be higher than the actual tariff payable on goods (World Bank, 2013c; Hummels et al, 2007; Isakova et al, 2016). But public revenues of SSA countries heavily rely on border tax and therefore the performance of customs is very important for governments to raise revenue (UNCTAD, 2016).

Following the conclusion of WTO's Uruguay Round and dramatic reductions of tariff rates through successive multilateral, regional and bilateral trade liberalization reforms (mainly in developed countries), tariffs have become less of an issue and considerable attention is given to the importance of trade facilitation which cover all actions taken to facilitate the smooth flow of trade across borders and includes addressing all forms of non-tariff barriers (OECD, 2005; WTO, 2015a). As trade is viewed as an engine for economic development, donor countries and multilateral development partners provide aids to improve trade facilitation in developing countries. The ratification of the Trade Facilitation Agreement by the WTO further demonstrates the importance attached to trade facilitation by the global trade communities (WTO, 2015b).

In SSA delays at the border due to inefficient operations and unnecessary customs requirements are widespread (Benjamin et al, 2012; Golub, 2012). At the same time smuggling is a main trade challenge in the region affecting public revenues, fair competitions in the private sector, public safety, and informed trade policy formulations and implementation (OECD, 2005). Such settings in the region offer an interesting and relevant case to examine how aid for trade facilitation reduces smuggling in the region.

In this chapter, therefore, we address this issue by hypothesizing that aid for trade facilitation reduces smuggling in SSA through improved efficiency of customs procedures. We refer to customs procedures as formalities undertaken by the customs office and/or the importer to formally bring the goods into the country. The main procedures include import valuation, goods classification, rules of origin determination, technical and sanitary standards checking, physical inspections, port handling, customs warehousing, documentations and other similar formalities. Apart from high tariffs, cumbersome customs procedures may provide an incentive for smuggling. To test our hypothesis we use mirror trade data to measure smuggling in the region (Fisman & Wei, 2004; Mishra et al., 2008). This approach involves the comparison of official import data as recorded by SSA and official export data as recorded by its trading partner countries. We rely on imports by SSA from its major trading partners outside the continent, namely, OECD and BRIC countries for the period 2008-2014. Contrary to Chapters 2 and 3, we now include products that are reported by the exporting country, but not by the importing country, as these products may be smuggled into the region. While smuggling is also widespread on intra-regional trade, we excluded the intra-Africa trade data because such trade is highly informal and largely unrecorded. As per some estimates informal cross-border trade in the region could reach as high as 80 percent of the official trade (Golub, 2015; Hoffmann and Melly, 2015; Azam, 2007).

Our dataset contains nearly one million product-level observations. The results show that, controlling for other key factors, aid for trade facilitation positively affects the level of efficiency of customs procedures and this in turn leads to reduced smuggling in SSA. Our findings are robust to a number of tests.

This chapter has two main empirical contributions to the existing literature on international trade and aid for trade facilitation. First, existing literature mainly focuses on how aid for trade facilitation increases trade flows and promotes export trade. By controlling for the effects of other key variables, using a large number of observations over the years, and conducting a series of robustness checks our chapter shows that by improving efficiency of customs procedures, aid for trade facilitation also reduces smuggling. Second, we show a structural relationship between the customs efficiency and the trade gap, formally demonstrating that indeed bureaucracy and time-consuming border procedures make importers resort to smuggling. The findings also have a policy implication with respect to ongoing international trade facilitation supports to SSA in the light of the WTO's Trade Facilitation Agreement. This agreement, which aims at modernizing and simplifying customs operations while safeguarding legitimate regulatory objectives, should be viewed as an important intervention not only to promote easy flow of cross-border trades but also to reduce smuggling in the region. This may, apart from increasing public revenues through import taxes, contribute to fair competition and public safety and thus result in an indirect benefit for SSA countries.

The rest of the chapter is organized as follows. The next section describes smuggling and trade facilitation in SSA. In Section 3 literature on aid for trade facilitation and customs procedures in relation to smuggling is reviewed and the hypothesis is developed. Section 4 discusses the data source, variable measurement, and baseline model specifications. Section 5 presents the results and robustness tests. The final section concludes.

4.2. Smuggling and trade facilitation in SSA

4.2.1. Smuggling in SSA

Smuggling is pervasive in SSA (Golub & Hansen-Lewis, 2012; Chen, 2005). Cumbersome and less transparent customs procedures coupled with corruption and high tariff rates offer economic incentives to engage in smuggling activities in the region (Barka, 2012; De Melo et al, 1992). In SSA, procedures at customs offices are time-taking and less automated. There is also poor coordination among customs offices and other border-related government agencies such as standard agencies and the border control police which makes importers to be subject to multiple and sometimes overlapping compliance requirements (Montagnat-Rentier & Parent, 2012; Zake, 2011). Even though around 90% of SSA's total import volume is transported by sea, its ports along its 32,000 km coastline have cumbersome regulatory requirements and bureaucratic clearance procedures creating high congestion to load and unload (AfDB, 2010; Mundy & Penfold, 2008). On average cargos in SSA ports stay for around 20 days before clearance; the international standard is 3 to 4 days (Raballand et al, 2012). The port mismanagement and the prevalence of corruption promote non-compliance and tariff evasion. An importer is expected to pay a bribe of around 6% of the tariff obligation to customs officials and port operators to smuggle the goods (Sequeira & Djankov, 2008).

Smuggling activities in the region is facilitated by a complex form of informal networks which involve money changers, goods storage service providers, transporters, brokers, credit suppliers, and other intermediaries who facilitate the smooth functioning of the smuggling business (Flynn, 1997; Golub & Hansen-Lewis, 2012). There are also people who work for both the customs office and smugglers at the same time (Deardorff & Stolper, 1990). Indeed, it is also common for

customs officials to collaborate with smugglers if they are paid for facilitation. A rice importer in Nigeria once described corruption at the customs to a local newspaper as follows: “custom officials collect between N2000 and N4000 as bribe, for a bag of rice. People, who can afford it, don't have any problem as they are allowed to go with their goods. But those who cannot afford it or try to play smart game with them are often arrested and paraded before the press as smugglers”(All Africa, 2016). Corruption is such a challenge in its customs offices that the Zimbabwe government has required border customs officials to take lie detector tests (polygraph tests) to identify corrupt officers (Sunday News, 2016).

In SSA smuggling results in substantial losses of revenue and restrains governments' ability to finance development projects (Barka, 2012; De Melo et al, 1992). Annually Uganda is, for example, estimated to lose up to 30 per cent and Zimbabwe up to 50 percent of their respective tax revenues due to smuggling at the border (The East African, 2011; Sunday News, 2016).

Smuggling also limits the effectiveness of governments in the region to protect the safety of the public from imports of dangerous and sub-standard products. Fake and counterfeited goods, including drugs for medications, are widely smuggled into the region and traded at relatively cheaper prices exposing the general public to various safety and environmental risks (Bloomberg, 2015; Sambira, 2013). According to the World Health Organization, in Africa 30% of the medicines in circulation are estimated to be fake and a report by the BBC shows that more than 120,000 people a year die in the continent as a result of fake anti-malarial drugs (WTO, 2006; BBC, 2016). Indeed, even though sanitary and phytosanitary measures applied in the region are meant to protect human, animal and plant life or health by imposing requirements on the import of agriculture, livestock, and food products, in many instances due to their ineffective

implementation they turn out to be a barrier to trade encouraging smuggling (Cadot & Gourdon, 2014).

Golub (2015) indicates that smuggling may benefit consumers by increasing the availability of goods at cheaper prices while Koroma et al. (2017), MacCulloch (2001) and Muhammad (2011) argue that the inability of governments in the region to prevent illegal imports exposes the domestic industries to unfair competition leading to erosion of market shares, closure of formal trading shops and factories, and job losses.

Governments across the region have been taking various measures unilaterally and in collaboration with neighboring countries to curb smuggling. These measures may increase the expected cost of smuggling by increasing the probability of being caught and penalized, but they also increase the benefits as customs and other customs-related procedures and regulations in the region may become more cumbersome and costly to comply with. For example, governments in the region use roadblocks, customs checkpoints, physical escorts, and weighbridges to prevent smuggling. However, such traditional on-road customs control measures in many cases act as counterproductive increasing import delays and pushing traders further in to smuggling activities (Barka, 2012; Hamilton, 2010; Arvis et al, 2007). For instance, an importer in Rwanda faces 47 roadblocks and weighs stations to transport goods from the Mombasa port in Kenya to the capital Kigali which increases the transport cost by 20 percent (The Economist, 2008). Likewise, an importer in landlocked Zimbabwe has to waste 36 hours at the border to cross the Zimbabwe-South Africa border post.

4.2.2. Trade facilitation in SSA

Over the years SSA countries have been receiving aid for trade facilitation in order to reduce trade costs and improve global competitiveness of the region (Barka, 2012). These supports have aimed at simplifying paperwork, automating customs operations, modernizing procedures, capacitating officials, and harmonizing customs requirements with regional and international trading partners. According to the World Bank, SSA made the biggest reductions in the time to trade across borders in the past years (World Bank, 2014). However, as compared to other regions of the world, in SSA bureaucratic delays at the border are still viewed as a key factor affecting the speed, cost, and predictability of the movement of goods across the border. In the region, the import of one standard container takes on average 37 days as compared to 10 days in OECD countries (World Bank, 2014). These constraints have limited the region's benefit from global trade and also make smuggling activities an attractive alternative option to escape excessive delays and cumbersome administrative requirements at the border.

To address the trade barriers in SSA, the importance of taking additional trade facilitation measures in the region have been given further attention. As SSA countries have limited resource capacity to implement trade facilitation reforms by their own, international and intergovernmental organizations keep on providing additional technical and financial support to reduce trade costs and promote economic development through trade by expediting the movement, release and clearance of goods. SSA is the biggest recipient of aid for trade support in the world (WTO, 2015a). Facilitation supports help SSA countries to automate customs operations, introduce single window systems, apply authorized economic operator schemes, improve coordination among various border agencies and custom offices of other countries, create web-based platforms to exchange trade

information among custom offices, and apply online declaration and payment systems, and implement risk-based inspection systems.

The ratification of the Trade Facilitation Agreement (TFA) by the WTO on February 2017 brings important global development related to trade facilitation which expects all member countries (developed and developing alike) to take specific trade facilitation actions in order to improve cross-border trades.¹⁰ The TFA is dubbed as “the biggest reform of global trade this century” (WTO, 2017). While SSA is expected to benefit from trade facilitation actions by diversifying their economy and saving resource from unnecessary procedures, in the region concerns are high that there is a capacity limitation to properly implement more complex and costly facilitation measures as required in the agreement without adequate support from donor countries and multilateral development organizations (WTO, 2015b). Noticeably, even if the Agreement was officially opened to the member countries for acceptance on November 2014, at the time when it was ratified by the WTO on February 2017, due to doubt about the potential impact of trade facilitation measures, less than half of SSA member countries officially notified the WTO of their acceptance of the agreement.¹¹

¹⁰ The WTO TFA includes twelve major trade facilitation measures which are publication and availability of information; opportunity to comment, information before entry into force; advance rulings; procedures for appeal or review and consultations; other measures to enhance impartiality, non-discrimination and transparency; disciplines on fees and charges imposed on or in connection with importation and exportation and penalties; release and clearance of goods; border agency cooperation; movement of goods intended for import under customs control; formalities connected with importation, exportation and transit; freedom of transit; and customs cooperation.

¹¹ As per the ratification rules of WTO, the agreement was ratified after getting the official acceptance of two-thirds of its member countries (110 out of its total 164 member countries). Those who don't ratify it are also bound to be governed by it.

This slow reaction by SSA countries to embrace this global trade facilitation initiative highlights the importance of providing trade facilitation support to SSA so that they benefit from global trade. Existing literature on trade facilitation mainly focuses on the effects of aid for trade in reducing trade costs, increasing trade flows, improving export performances, and increasing the opportunity to participate in the global value chains (WTO, 2015a; Cali & Te Velde, 2011; OECD, 2005). This chapter takes a different perspective and investigates how aid for trade facilitation affects the efficiency of customs procedures and through this reduces smuggling activities in the region.

4.3. Theory and hypothesis development

4.3.1. Effects of aid for trade facilitation

While trade plays an important role in achieving sustainable economic development and poverty reduction, high trade costs impede the smooth flow of international trade and limit its contribution to national economic development (WTO, 2015b; Arvis et al, 2013). In developing countries, trade costs represent equivalent to a tariff rate of 219 percent. As trade costs are partly caused by administration requirements at the border of the importing country, aid for trade facilitation to developing countries have gained growing attention by academics, trade policy makers, and international development partners to reduce trade costs (Cali & Te Velde, 2011). Globally, aid for trade facilitation has supported trade reforms in developing countries to simplify, harmonize, standardize and modernize customs operations thereby reducing trade costs in relation to getting customs clearance, effecting payments, securing insurance coverage, obtaining standards and conformance authorizations, and transporting and storing goods (WTO, 2015b; Arvis et al, 2013). Such improvements improve compliance with customs laws.

Literature shows that improvements in trade facilitation help countries integrate into a global trade system and contribute to the expansion of world trade (WTO, 2015b; OECD, 2005). Trade facilitation increase welfare gain more than the gain to be obtained from removing all tariffs (The Economist, 2017). The WTO estimated that trade facilitation measures reduce global trade costs by an average of 14.3% and the average import time by 47%. It has also estimated that such measures increase national GDP by 0.5% to 0.9% a year (WTO, 2015b).

A customs environment that allows goods to flow smoothly across border and without delay attracts more foreign direct investments (Duval & Utoktham, 2014; Büthe & Milner, 2008). For the government, trade facilitation help avoid loss of public resources in unnecessary customs administration, improve transparency, reduce red-tape and free public resources for other public purposes. By reducing the compliance costs, aid for trade facilitation help small businesses compete in the global markets, grow, create more jobs, and thrive (WTO, 2015a). Aid for trade facilitation related to imports can also have an indirect effect on the export sector as the domestic manufacturing sector that relies on imported inputs would be able to reduce production costs which in turn would enhance its competitiveness in the export market.

More importantly, aid for trade facilitation help reduce the complexity of trade procedures, make the procedures predictable, shorten the compliance time, harmonize logistical and administrative systems, reduce tariffs, and ensure transparency on customs formalities, technical regulations and sanitary standards. These improvements allow traders to move goods across borders less costly and without undue delay avoiding the need for holding excessive stocks or the risk of losing business. This benefits consumers by making goods relatively cheaper and readily available. The improvement in facilitation at all functional areas of the customs operations and the

resulting reductions in trade cost reduce importers' incentive to engage in goods smuggling activities to escape delays and unpredictable measures of customs officials at the border (WTO, 2015a).

4.3.2. Customs procedures and smuggling

Customs procedures aim at ensuring proper implementation of national trade policies and regulations applicable on goods crossing borders. However, these procedures would become a barrier to trade if they are cumbersome and their applications are not simple, clear, transparent, consistent, predictable, and non-discriminatory (OECD, 2003). In developing countries, import costs related to unnecessary and cumbersome customs procedures for documentation, inland transport and handling, customs clearance and inspections, and port and terminal handling are significant (World Bank, 2014; Ndikumana, 2016). Some estimates put it as much as 15% of the value of the imported goods (OECD, 2003).

Customs processes not equipped with modernized and harmonized procedures lead to delays to complete formalities and get the goods out of the customs control resulting in higher additional costs to the importers in the form of lost business opportunities. In current business environments where timeliness and predictability of delivery times are required to maintain customers and boost sales, the cost of such excessive delays caused by unnecessary customs requirements could be more significant for the importers than the tariff rates themselves (World Bank, 2013c; Hummels et al, 2007; Isakova et al, 2016).

Traders who face lengthy and unnecessary customs procedures at the border could resort to smuggling to avoid the hurdle and minimize import costs. Such actions not only affect government revenue but expose the public to health risks and unfair competition in the market.

4.3.3. Hypothesis

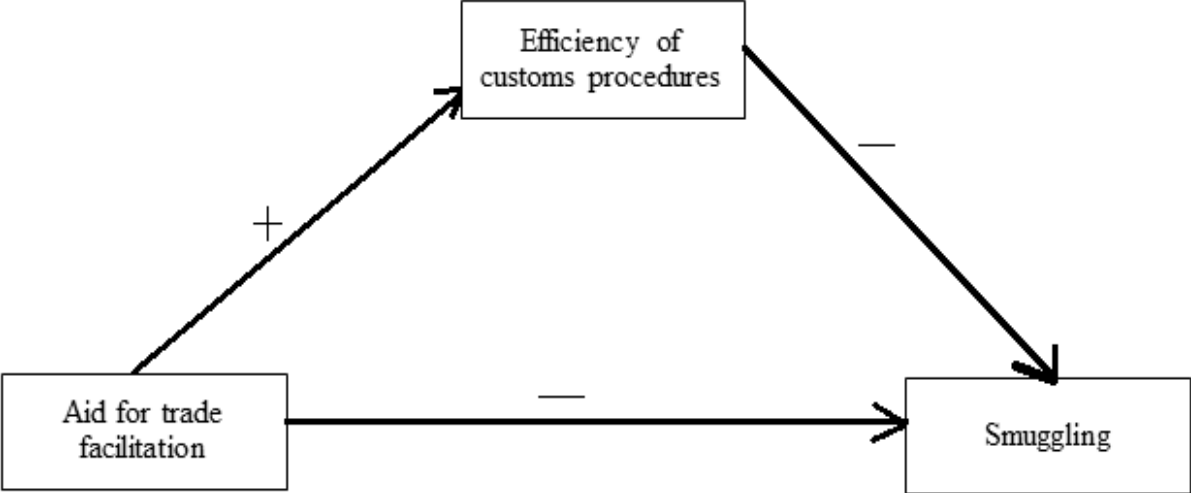
The main aim of aid for trade facilitation is to reduce the difficulty and cost of moving goods across borders by improving efficiency at each stage of the international trade chain. Aid for trade facilitation thus reduces trade barriers which hinder the smooth flow of goods across borders (OECD, 2005; Cali & Te Velde, 2011). This is achieved by improving the efficiency of customs procedures, streamlining logistics, reducing the burden of licensing requirements, simplifying insurance and payment requirements, reducing tariffs, and, in general terms, reducing the cost of doing business (OECD, 2005; Engman, 2005).

We expect that importers who are required to pass through complex, time-taking, and non-transparent customs procedures would resort to smuggling to escape these inefficient procedures, as these inefficient procedures may be very costly.

Taken together, we expect that, in a customs environment where the burden of customs procedures is excessive and traders turn to smuggling to bring the goods defeating the formal customs procedures, aid for trade facilitation becomes a critical intervention to reduce smuggling activities especially by improving the efficiency of customs procedures. Therefore, we hypothesize the following: *Aid for trade facilitation increases efficiency of customs procedures in the recipient country which in turn reduces smuggling in this recipient country.*

Our hypothesis is depicted in Figure 4.1. The figure acknowledges the possibility that aid for trade facilitation may, apart from the path through the efficiency of customs procedures, have a direct reducing effect on smuggling, as trade facilitation aids aim at improving the entire customs environment over and above improving efficiency of procedures.

Figure 4.1: Mediation Model



4.4. Methodology

4.4.1. Data Source

Our trade data source is the UN’s COMTRADE database which contains annual import and export trade data for large a number of countries in the world. In the database both the import and export values are stated in US dollar and quantities are stated using one of thirteen different units of measurement. We take imports by each SSA country from each OECD and BRIC country as reported by the SSA countries. Similarly we take export trade data as reported by each OECD and

BRIC country to each SSA country for the same period. To make sure that product coding and classifications are similar between trading partners and consistent over the years we use the 2007 edition of the Harmonized Commodity Description and Coding System. Both import and export data are at six-digit product level which is the lowest level of product disaggregation available in the database. We use trade data from 2008 to 2014. We focus on these periods because during this period the countries in our sample use the same version of goods classification nomenclature of the World Customs Organizations and data for all variables are available till 2014. Nearly 80 percent of the total non-oil imports to the region originate from OECD and BRIC countries (WITS, 2011).

Our tariff data is obtained from the TRAINS database of UNCTAD. The tariff rates are the most-favored-nation rates. However, when a SSA country offers preferential tariff rates those preferential rates are used. We obtain data on efficiency of customs procedures from various issues of World Economic Forums' World Competitiveness Reports. Our data sources for other variables are Transparency International, the Chinn-Ito index, World Bank's World Development Indicator, and CEPII.

4.4.2. Variable measurement

In our analysis our dependent variable is the trade gap which is used as a measure of smuggling and our main independent variables are aid for trade facilitation and efficiency of customs procedures. We also include control variables in our model to control for other factors which could affect smuggling. The control variables are tariff rate, corruption level, tax burden, capital control, access to the ocean, GDP per capita, and import-to-GDP ratio.

Trade gap: Our definition of smuggling combines both pure and technical smuggling (Bhagwati, 1981; Gillespie & McBride, 2013). Pure smuggling represents the case where goods are brought into the country through illegal border crossing without passing through the formal customs process. Technical smuggling represents the case where goods pass through the formal customs process but using fraudulent customs declaration (Bhagwati, 1981; Gillespie & McBride, 2013). We assume that export data without corresponding import data indicates pure smuggling. However, since COMTRADE trade data is not available at firm level (but at six-digit product level), the discrepancy in the matched trade data could be due to pure or technical smuggling and it is difficult to identify the type of smuggling involved.¹² As a result, our dataset contains both matched trade data and export data without corresponding import data. For the latter, import is considered zero. This measure of trade gap is thus different compared to the trade gap measured in Chapters 2 and 3. In addition, from our dataset we exclude products like nuclear reactors (HS84), railway or tramway locomotives (HS 86), aircraft and spacecraft (HS88), ships (HS89), and arms (HS93) as they are hard to smuggle.

We calculate the import-export trade gap in three ways: in value, in quantity, and in net weight at six-digit product level for each year and each importing country-exporting country pair. We calculate the value gap as follows (Fisman & Wei, 2004; Mishra et al, 2008):

$$vgap_{ptmx} = \log(1 + expv_{ptmx}) - \log(1 + impv_{ptmx}) \quad (4.1)$$

¹² For instance, suppose that a firm in Germany exports ballpoint pens (HS 960810) to two different importers in Kenya and one of the importers smuggle it and the other passes through the legal process by under-declaring the value using fraudulent documents. In the COMTRADE we get these trade data reported by both countries but it is hard to identify which portion of the difference is due to pure smuggling or under-invoicing.

where $expv_{ptmx}$ represents the value of product p that country x indicates to have exported to importing country m at year t , $impv_{ptmx}$ represents the value of product p that country m indicates to have imported from exporting country x at year t , so that $vgap_{ptmx}$ represents the value trade gap of product p imported by country m from exporting country x at year t . Unlike the previous chapters, in the calculation of the trade gap in Equation (1) we add 1 because we now include cases in which the corresponding trade entries are zero and therefore the addition of 1 to the trade data will make the natural log to be zero.

Similarly, the trade gaps in terms of quantity and net weight are calculated as follows:

$$qgap_{ptmx} = \log(1 + expq_{ptmx}) - \log(1 + impq_{ptmx}) \quad (4.2)$$

$$wgap_{ptmx} = \log(1 + expw_{ptmx}) - \log(1 + impw_{ptmx}) \quad (4.3)$$

where $expq_{ptmx}$ ($expw_{ptmx}$) represents the quantity (net weight) of product p exported by country x to importing country m at year t , $impq_{ptmx}$ ($impw_{ptmx}$) represents quantity (net weight) of product p imported by country m from exporting country x at year t , and $qgap_{ptmx}$ ($wgap_{ptmx}$) thus represents the quantity (net weight) trade gap of product p imported by country m from exporting country x at year t

The three indicators of the trade gap are strongly correlated with a correlation coefficient of 0.80 ($p < 0.01$), 0.83 ($p < 0.01$), and 0.94 ($p < 0.01$) between value gap and quantity gap, value gap and net weight gap, and quantity gap and net weight gap, respectively (See Table 4.2).

We observe that in our dataset observations are not the same for all of the three trade gap measures. As a result, to ensure that our analysis is not affected by differences in sample size we

base our main analysis on those observations which are the same for all of the three trade gap measures. As a robustness check we make additional analyses using all available observations for each of the three gap measures.

Aid for trade facilitation: The size of aid for trade facilitation is proxied by the amount of money disbursed by OECD and international multilateral development organizations to improve trade facilitation in SSA. We obtain the annual data for each recipient SSA country from the OECD's Credit Reporting System database. This database covers around 90% of global official development assistances (ODA) and uses codes to identify the purpose of the assistance. In the database trade facilitation has purpose code 33120. The amount is stated in million USD but in our analysis we use its natural logarithm. Since disbursements aiming at trade facilitation measure would take time to bring effects in the recipient country, we use trade facilitation disbursement which is lagged 1 year and 2 years and both are included in our baseline specification denoted as ATF_{t-1} and ATF_{t-2} .

Efficiency of customs procedure: This variable measures the extent of efficiency of customs procedures in each importing country. We use the annual "Burden of Customs Procedure" score from the World Economic Forum's (WEF) Global Competitiveness Reports as a measure of efficiency of customs procedures in each SSA country. In the annual report, WEF calculates the score as the average of current and last year performance. WEF gathers the data by employing an executive opinion survey. The survey question in the reports, which in some reports may slightly change in wording, is "How would you rate the level of efficiency of customs procedures (related to the entry and exit of merchandise) in your country?" The score ranges between 1 and 7 and a higher score indicates better efficiency. The variable is denoted as ECP_t and, as in the annual

reports of Global Competitiveness Report, the variable is the average of current and last year performance.

Control variables

Tariff rate: Because an increase in tariff rates is associated with an increase in smuggling activities (Bhagwati, 1981; Gillespie & McBride, 2013; Fisman & Wei, 2004; Mishra et al, 2008), we control for differences in tariff rates. We include tariff rates at six-digit product level as one of our independent variables. Botswana, Mauritius, Mozambique, Namibia, and South Africa have preferential tariff agreements with some of OECD and BRIC countries. For these countries we use their preferential tariff rates when applicable.¹³ Since the other SSA countries don't have such preferential trade agreements with any of OECD and BRIC countries, we use the most-favored-nation simple average tariff rates. The tariff is stated as the rate divided by 100.

Corruption: We control for the level of corruption in each country. When corruption at customs is rife, corrupt customs officials may actively involve in the illegal trade practices by facilitating smuggling (Ackello-Ogutu, 1996). Dutt (2009) also shows that corruption is higher in countries which pursue protectionist trade policies. Smuggling may be influenced by corruption as this affects the level of enforcement of customs laws (Worku et al, 2016). We control for the effect of corruption by including the corruption score of each SSA country as a control variable. Following Worku et al. (2016), we take the annual score from the Corruption Perception Index of

¹³ Botswana has entered into preferential tariff agreement with European Free Trade Association (EFTA) countries which are Iceland, Liechtenstein, Norway and Switzerland starting 2013. Mauritius has a preferential tariff agreement with India, Turkey and EU countries during 2009-2014. Mozambique has a preferential tariff agreement with EU countries since 2014. Namibia has a preferential tariff agreement with EFTA countries during 2008-2014. South Africa has preferential tariff agreement with EU and EFTA countries during 2008-2014.

Transparency International and reverse-code it. The score ranges between 1 and 10 and the higher the score the higher the corruption level of the importing country.

Financial Openness: We further control for the level of capital control in the country. More restrictions on foreign exchange make it hard to get foreign currency to pay for imports which may promote smuggling by those who can pay for imports from other sources such as foreign exchange purchased from the domestic black market or underinvoicing or smuggling of exports.¹⁴ When imports are to be paid in foreign currency, which is the case in SSA, the restriction on ease of access and use of foreign exchange in the importing country affects smuggling activities (Deardorff & Stolper, 1990; Bhagwati, 1978). A restrictive foreign exchange regime to access foreign exchange may force importers to smuggle imports paid through illegal means (Deardorff & Stolper, 1990). The data for this variable is obtained from the Chinn-Ito index which measures a country's degree of capital account openness (Chinn & Ito, 2008).¹⁵ We use the annual normalized score of each SSA country. The score ranges between zero and one and a higher score means less restrictions.

Tax burden: We include this variable to control for its effect on smuggling. When domestic taxes are high, firms may engage in smuggling activities to hide their actual imports from their financial reports for tax purposes (Schneider & Enste, 2000). This variable measures the amount of taxes and mandatory contributions payable by businesses in a country after accounting for allowable deductions and exemptions. It is the total tax rate as percentage of business profits. The

¹⁴ Payment for smuggled imports is one form of illicit financial outflow (Boyce & Ndikumana, 2012). In some SSA countries like Ethiopia payments for imports from outside sources require permission from the central bank as the source of finance may be foreign exchange purchased from the domestic black market or from underinvoicing or smuggling of exports.

¹⁵ The data is accessed from http://web.pdx.edu/~ito/Chinn-Ito_website.htm

total tax is the sum of profit tax, social contributions and labor taxes paid by the business, turnover taxes, and other non-refundable small taxes. Taxes collected and remitted to tax authorities (such as value added taxes) are excluded in the determination of the total tax. We get the data from World Bank's World Development Indicator database.

Landlocked: In addition, geographical location affects cross-border trade (Arvis et al, 2007). As landlocked countries face relatively higher trade costs than coastal countries, other factors fixed, the incentive to smuggle may be higher in the former as compared to the latter (Rodrigue et al, 2014). Recent estimates show that landlocked countries in SSA have a relatively higher import costs than coastal countries (129% higher than the global average; Rodrigue et al, 2014). Since the trading partners in our dataset are OECD and BRIC countries (regions outside the African continent) goods imported by landlocked countries from these partners are subject to border checking twice (first by the custom officials at the port of entry and later by its own customs officials at the border of entry to the importing country). The motive for cost saving may encourage importers in landlocked countries to engage in smuggling relatively more often. Thus, smuggling is likely to be higher in landlocked than in coastal countries. The variable is a dummy which takes a value of 1 if the importing country is landlocked and takes 0 if it is a coastal country. In our dataset, 12 countries are landlocked. Our data is obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) database (CEPII, 2017).

GDP per capita: To control for the effect of economic development on smuggling we use GDP per capita as a proxy measure. Countries with a relatively higher level of development have a higher public spending capacity to strengthen and monitor public institutions like customs offices which in turn could reduce smuggling (Buehn & Farzanegan, 2012). Also, more aid goes to

countries which are in higher need of aid as measured by a low level of economic development (Neumayer, 2003). We get the annual data from World Bank's World Development Indicators and take the natural logarithm.

Import-to GDP ratio: Openness to trade can affect smuggling in either way. Smuggling may be less in a country with less restrictive trade policies as there may be no incentive to engage in such activities. However, high trade flows due to increased openness to trade may also increase the pressure on customs officials to properly enforce some trade policies and regulations at the border. Large volume of legal trade can make it easy to hide smuggled goods from customs officials and it can increase smuggling (Buehn & Farzanegan, 2012; Neumayer, 2003; Pitt, 1981). We therefore use import-to-GDP ratio as a measure to control for the effect of greater import flows on smuggling. The data is obtained from World Bank's World Development Indicators.

Summary statistics and Pearson correlations of these variables are presented in Table 4.1 and Table 4.2, respectively.

Table 4.1: Summary statistics

| Variable | N | Mean | Std. Dev. | Min | Max |
|---------------------|---------|------|-----------|--------|-------|
| Value gap | 889,322 | 0.87 | 2.06 | -12.53 | 14.42 |
| Quantity gap | 889,322 | 1.97 | 3.95 | -20.19 | 27.76 |
| Net weight gap | 889,322 | 2.09 | 4.03 | -16.40 | 21.33 |
| ECP | 889,322 | 3.88 | 0.54 | 2.66 | 5.59 |
| ATF _{t-1} | 889,322 | 0.85 | 0.92 | 0.00 | 3.43 |
| ATF _{t-2} | 889,322 | 0.62 | 0.78 | 0.00 | 3.00 |
| Tariff rate | 889,322 | 0.12 | 0.10 | 0.00 | 5.17 |
| Corruption | 889,322 | 6.35 | 0.92 | 3.60 | 8.00 |
| Tax burden | 889,322 | 0.36 | 0.10 | 0.14 | 0.71 |
| Financial openness | 889,322 | 0.30 | 0.28 | 0.00 | 1.00 |
| Landlocked | 889,322 | 0.21 | 0.41 | 0 | 1 |
| GDP per capita(ln) | 889,322 | 7.56 | 1.04 | 5.82 | 9.14 |
| Import to GDP ratio | 889,322 | 0.32 | 0.10 | 0.11 | 0.61 |

Note: ECP represents efficiency of customs procedure. ATF represents natural logarithm of disbursement of aid for trade facilitation with one year (t-1) and two-year (t-2) lag.

Table 4.2: Pearson correlation of some variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|-------|
| 1. Value gap | 1.000 | | | | | | | | | | | | |
| 2. Quantity gap | .800 (.000) | 1.000 | | | | | | | | | | | |
| 3. Net weight gap | .827 (.000) | .938 (.000) | 1.000 | | | | | | | | | | |
| 4. ECP | -.085 (.000) | -.089 (.000) | -.091 (.000) | 1.000 | | | | | | | | | |
| 5. ATF _{t-1} | -.024 (.000) | -.037 (.000) | -.041 (.000) | .063 (.000) | 1.000 | | | | | | | | |
| 6. ATF _{t-2} | -.036 (.000) | -.041 (.000) | -.044 (.000) | .071 (.000) | .600 (.000) | 1.000 | | | | | | | |
| 7. Tariff rate | .038 (.000) | .068 (.000) | .050 (.000) | -.186 (.000) | .007 (.000) | .023 (.000) | 1.000 | | | | | | |
| 8. Corruption | .080 (.000) | .096 (.000) | .101 (.000) | -.631 (.000) | -.008 (.000) | -.032 (.000) | .260 (.000) | 1.000 | | | | | |
| 9. Tax burden | .055 (.000) | .080 (.000) | .081 (.000) | -.341 (.000) | .094 (.000) | .153 (.000) | .150 (.000) | .436 (.000) | 1.000 | | | | |
| 10. Financial openness | -.005 (.000) | -.008 (.000) | -.012 (.000) | .192 (.000) | -.085 (.000) | -.050 (.000) | .023 (.000) | .023 (.000) | -.368 (.000) | 1.000 | | | |
| 11. Landlocked | -.017 (.000) | .010 (.000) | .011 (.000) | .114 (.000) | -.057 (.000) | .062 (.000) | .159 (.000) | .159 (.000) | -.171 (.000) | .464 (.000) | 1.000 | | |
| 12. GDP per capita(ln) | -.052 (.000) | -.085 (.000) | -.084 (.000) | .406 (.000) | .015 (.000) | -.085 (.000) | -.305 (.000) | -.636 (.000) | -.487 (.000) | -.075 (.000) | -.461 (.000) | 1.000 | |
| 13. Import to GDP ratio | -.020 (.000) | -.011 (.000) | -.019 (.000) | .303 (.000) | -.109 (.000) | -.061 (.000) | -.085 (.000) | -.434 (.000) | .049 (.000) | -.043 (.000) | -.097 (.000) | .018 (.000) | 1.000 |

Note: P-values are in parentheses

4.4.3. Model specification

As we apply a mediation model, we have two baseline models: one to estimate the effect of trade facilitation measures on efficiency of customs procedures and another to estimate the indirect effect of aid for trade facilitation on smuggling which is carried by the efficiency of customs procedures. Our baseline specifications are as follows:

$$\begin{aligned}
 \text{Model 1: } ECP_{mt} = & \beta_0 + \beta_1 ATF_{t-1,m} + \beta_2 ATF_{t-2,m} + \beta_3 TR_{ptmx} \\
 & + \beta_4 CR_{mt} + \beta_5 TB_{mt} + \beta_6 CC_{mt} + \beta_7 L_m + \beta_8 GDPPC_{mt} \\
 & + \beta_9 IGR_{mt} + D_t + D_p + D_{mx} + \varepsilon_{ptmx}, \tag{4.4}
 \end{aligned}$$

$$\begin{aligned}
 \text{Model 2: } vgap_{ptmx} = & \beta_0 + \beta_1 (ATF_{t-1})_m + \beta_2 (ATF_{t-2})_m + \beta_3 ECP_{mt} + \beta_4 TR_{ptmx} \\
 & + \beta_5 CR_{mt} + \beta_6 TB_{mt} + \beta_7 CC_{mt} + \beta_8 L_m + \beta_9 GDPPC_{mt} \\
 & + \beta_{10} IGR_{mt} + D_t + D_p + D_{mx} + \varepsilon_{ptmx}, \tag{4.5}
 \end{aligned}$$

where, ECP_{mt} refers to the efficiency of customs procedure score of importing country m at time t . $ATF_{t-i,m}$ indicates the natural logarithm of aid for trade facilitation disbursement to importing country m at time $t-i$ (i.e., lagged i year). TR_{ptmx} refers to the tariff rate applicable on product p at time t when imported by country m from exporting country x . CR_{tm} , TB_{tm} , and CC_{tm} refer, respectively, to the corruption, tax burden, and capital control level of importing country m at time t . L_m is a dummy which takes a value of 1 if the importing country is landlocked or 0 if coastal. $GDPPC_{mt}$ refers to the GDP per capita of importing country m at time t and IGR_{mt} indicates the import-to-GDP ratio of importing country m at time t . The specification also includes year, product, and importing country-exporting country pair fixed effects represented in the specification by D_t , D_p , and D_{mx} , respectively. In Model 1 our parameters of interest are β_1

and β_2 which capture the effect of aid for trade facilitation on the efficiency of customs procedures. We expect these two parameters to be positive and statistically significant.

In Model 2, the dependent variable is the trade gap. In addition to $vgap_{ptmx}$, we use $qgap_{ptmx}$, and $wgap_{ptmx}$ as an alternative dependent variable. In this model our parameter of interest are β_1 , β_2 and β_3 . β_3 captures the effect of the efficiency of customs procedures on smuggling. We expect this parameter to be negative and statistically significant. The combination with a significant association in Model 1 indicates the expected mediation effect. We perform the Sobel test to test the statistical significance of this indirect effect of aid for trade facilitation on smuggling through efficiency of customs procedures. We note that, if in addition to β_3 both β_1 and β_2 are significant, this implies that the mediation with regard to aid for trade facilitation is partial but if these parameters are insignificant the effect of aid for trade facilitation is fully mediated by our mediator variable.

4.5. Results

4.5.1. Main Result

The first four columns of Table 4.3 present the regression results of our baseline specifications. In all regressions we include year, product and partnership (i.e., importing country-exporting country pair) fixed effects with robust standard errors clustered at product level. Regression 1 shows the association between the aid for trade facilitation measures (independent variable) and efficiency of customs procedures (the mediator variable).

Table 4.3: Regression results of the baseline model with ECP as mediator variable and Trade facilitation as independent variable

| Regression | (1) | (2a) | (2b) | (2c) | (2d) |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------------|
| Dependent variable | ECP | Value gap | Quantity gap | Net weight gap | Complete smuggling dummy |
| ECP | | -.074*** (.012) | -.096*** (.021) | -.157*** (.022) | -.210*** (.008) |
| ATF _{t-1} | .078*** (.000) | -.032*** (.003) | -.074*** (.007) | -.077*** (.007) | -.036*** (.003) |
| ATF _{t-2} | .017*** (.001) | -.057*** (.004) | -.115*** (.007) | -.102*** (.007) | -.088*** (.004) |
| Tariff rate | -.066*** (.012) | .585*** (.102) | 1.004*** (.222) | 1.398*** (.286) | .997*** (.190) |
| Corruption | -.199*** (.002) | .024** (.008) | -.005 (.015) | -.007 (.015) | .064*** (.006) |
| Tax burden | .386*** (.012) | .899*** (.065) | 2.504*** (.123) | 2.413*** (.133) | 1.831*** (.047) |
| Financial openness | .387*** (.004) | -.068** (.023) | -.458*** (.044) | -.627*** (.047) | .358*** (.016) |
| Landlocked | .284*** (.003) | .224*** (.020) | .684*** (.036) | .780*** (.037) | .258*** (.012) |
| GDP per capita(ln) | .151*** (.002) | -.002 (.010) | -.105*** (.018) | -.095*** (.018) | -.084*** (.008) |
| Import to GDP ratio | 1.001*** (.013) | .134 (.074) | 1.273*** (.143) | 1.637*** (.145) | .387*** (.043) |
| N | 889,274 | 889,274 | 889,274 | 889,274 | 889,322 |
| F-test | 13,733 | 94 | 170 | 174 | 5,741 |
| Sig | .000 | .000 | .000 | .000 | .000 |
| R ² | .847 | .160 | .208 | .222 | |
| R ² (Adj) | .846 | .155 | .204 | .218 | |
| Pseudo R ² | | | | | .0284 |
| Sobel statistics | | | | | |
| ATF _{t-1} | | -6.17*** | -4.57*** | -7.14*** | -26.25*** |
| ATF _{t-2} | | -5.80*** | -4.41*** | -6.58*** | -14.27*** |

Note: The first four regressions include year, product and partnership fixed effects. The last regression is based on linear probability model. Robust standard errors, clustered by six-digit product, are in parentheses. For last column the figure in F-test row represents Wald chi2. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As expected the aid for trade facilitation has a positive and statistically significant effect on the (future) efficiency of customs procedures ($\beta=.08$; $p<0.001$ for ATF_{t-1} and $\beta=.02$; $p<0.001$ for ATF_{t-2}). For Regression 2, we use the three different measures of smuggling as dependent

variable (i.e., value gap in Regression 2a, quantity gap in Regression 2b, and net weight gap in Regression 2c). The results of all of these three regressions indicate that both aid for trade facilitation in the past two years and the efficiency of customs procedures are negatively associated with smuggling. The level of efficiency of customs procedures carries an indirect association between aid for trade facilitation measures and smuggling.

We use the Sobel test to check the statistical significance of the indirect effect (i.e., the effect of aid for trade facilitation on smuggling which is channeled through improvement in efficiency of customs procedures). As our sample size is large (around one million), the Sobel test works well for our case (Sobel, 1986; Preacher & Hayes, 2008). As reported in Table 4.3, in all of the three alternative estimates of Regression 2, the Sobel test is statistically significant ($p < 0.001$) supporting our hypothesis that aid for trade facilitation improves efficiency of customs procedures which in turn reduces smuggling. In Regression 2 aid for trade facilitation variables remain significant which implies that efficiency of customs procedures partially mediates the association between aid for trade facilitation measures and smuggling. There is thus also a direct effect of aid for trade facilitation on smuggling. This can be explained by the fact that trade facilitation supports aim at improving the entire customs environment over and above improving efficiency of procedures. These results show that aid for trade facilitation measures are important interventions to reduce smuggling activities in SSA through improving the efficiency of customs procedures and also of other custom operations such as payments processing, insurance arrangements, goods standards and conformance authorizations, and logistics related to transportation and storage of goods.

Noticeably, the estimates for the five control variables are consistent with our expectation and are statistically significant. Tariff rates, corruption and domestic tax burdens have a positive effect on smuggling. Countries with a high level of financial openness face a lower level of smuggling, *ceteris paribus*, and smuggling in landlocked countries of SSA is 12% -40% higher than in coastal countries.

4.5.2. Robustness checks

We perform a number of robustness checks to ensure that our results are consistent under different settings. First, since our measure of smuggling is based on a combination of matched trade data and the unmatched export data we check how export data without corresponding import data change with changes in aid for trade facilitation and improvements in customs procedures. Following Mishra et al, (2008) we formulate a linear probability model where the dependent variable takes a value of 1 if the export data at six-digit product level does not have corresponding import data (we call this complete smuggling) and 0 otherwise.¹⁶ The estimation of this model tells us how the probability that the import will be “*completely smuggled*” depends on the independent and mediator variables. The results reported in the last column of Table 4.3 (Regression 2d) indicate that aid for trade facilitation and efficiency of customs procedures reduce the probability of complete smuggling validating our claim that imports missed from official records could be smuggled.

¹⁶ It is important to note that since our dataset is based on product level trade data, rather than at the product and firm level, there is still a possibility of complete smuggling within matched trade data. Therefore, our estimation here should be read with caution.

Table 4.4: Robustness check: Winsorizing and dropping outlier observations of trade gap

| | Coefficients | | | Sobel Statistics | |
|-----------------------|--------------|--------------------|--------------------|--------------------|--------------------|
| | ECP | ATF _{t-1} | ATF _{t-2} | ATF _{t-1} | ATF _{t-2} |
| Winsorized at (1 99) | | | | | |
| Value gap | -0.072*** | -0.032*** | -0.054*** | -6.55*** | -6.11*** |
| Quantity gap | -0.096*** | -0.075*** | -0.111*** | -4.57*** | -4.41*** |
| Net weight gap | -0.156*** | -0.078*** | -0.100*** | -7.09*** | -6.54*** |
| Trimmed at (1 99) | | | | | |
| Value gap | -0.064*** | -0.032*** | -0.043*** | -5.82*** | -5.04*** |
| Quantity gap | -0.091*** | -0.081*** | -0.095*** | -4.55*** | -4.40*** |
| Net weight gap | -0.150*** | -0.084*** | -0.090*** | -7.14*** | -6.59*** |
| Winsorized at (5 95) | | | | | |
| Value gap | -0.065*** | -0.030*** | -0.048*** | -6.50*** | -6.07*** |
| Quantity gap | -0.100*** | -0.074*** | -0.100*** | -5.00*** | -4.80*** |
| Net weight gap | -0.159*** | -0.078*** | -0.093*** | -7.57*** | -6.91*** |
| Trimmed at (5 95) | | | | | |
| Value gap | -0.046*** | -0.025*** | -0.031*** | -5.11*** | -4.89*** |
| Quantity gap | -0.101*** | -0.071*** | -0.070*** | -5.61*** | -5.33*** |
| Net weight gap | -0.155*** | -0.078*** | -0.067*** | -8.16*** | -7.35*** |
| Winsorized at (10 90) | | | | | |
| Value gap | -0.055*** | -0.027*** | -0.041*** | -6.11*** | -5.75*** |
| Quantity gap | -0.095*** | -0.069*** | -0.086*** | -5.28*** | -5.04*** |
| Net weight gap | -0.154*** | -0.074*** | -0.084*** | -8.11*** | -7.32*** |
| Trimmed at (10 90) | | | | | |
| Value gap | -0.030*** | -0.018*** | -0.022*** | -4.29*** | -4.16*** |
| Quantity gap | -0.084*** | -0.056*** | -0.045*** | -5.60*** | -5.32*** |
| Net weight gap | -0.127*** | -0.068*** | -0.047*** | -7.47*** | -6.84*** |

Note: All regressions include year, product and partnership fixed effects and the control variables of Table 4.3. Robust standard errors, clustered by six-digit product, are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Second, to ensure that our result is not affected by outliers, we estimate our baseline specification after winsorizing, and alternatively trimming, the trade gap at the 1th and 99th percentiles, 5th and 95th percentiles and 10th and 90th percentiles. The coefficient estimates for the mediator variable and Sobel tests are reported in Table 4.4. The tests of all regressions indicate that the indirect effect of trade facilitation on smuggling is statistically significant and not influenced by outlier observations.

Third, instead of aid for trade facilitation disbursements we use in the main analysis, we use the total aid disbursement for the purpose of “Trade Policies & Regulations” as an alternative but broader measure of aid for trade facilitation.

We get the data from the OECD Credit Reporting System database (purpose code of 331). The expenditure is used to support trade policy and regulations activities in the recipient country and in the database it is stated in million USD. In the database the purpose of expenditure under this code has six sub-components: trade policy and administration management; trade facilitation, regional trade agreements, multilateral trade negotiations, trade-related adjustment, and trade education/training. Between 2002 and 2014 the disbursements of international donors in SSA under “Trade Policies & Regulations” category has grown by nearly eleven folds. We use our baseline specification to estimate the effect of aid for “Trade Policies & Regulations” on smuggling. The results are presented in Table 4.5.

Table 4.5: Robustness Check: Using “Trade policy and regulation” disbursement rather than “Trade facilitation” disbursement as Independent variable.

| Regression | (1) | (2a) | (2b) | (2c) |
|----------------------|--------------------|--------------------|--------------------|--------------------|
| Dependent variable | ECP | Value gap | Quantity gap | Net weight gap |
| ECP | | -.075*** (.012) | -.056* (.022) | -.117*** (.023) |
| ATPR _{t-1} | .090*** (.001) | -.036*** (.004) | -.146*** (.008) | -.143*** (.008) |
| ATPR _{t-2} | .029*** (.001) | -.082*** (.004) | -.207*** (.008) | -.208*** (.008) |
| Tariff rate | -.081*** (.016) | .602*** (.105) | 1.056*** (.231) | 1.450*** (.295) |
| Corruption | -.217*** (.002) | .024** (.008) | .015 (.015) | .010 (.016) |
| Tax burden | .491*** (.013) | .757*** (.065) | 2.028*** (.124) | 1.954*** (.133) |
| Financial openness | .397*** (.004) | -.072** (.023) | -.493*** (.045) | -.660*** (.047) |
| Landlocked | .283*** (.003) | .214*** (.020) | .643*** (.036) | .741*** (.037) |
| GDP per capita(ln) | .135*** (.002) | .007 (.010) | -.090*** (.018) | -.082*** (.018) |
| Import to GDP ratio | 1.211*** (.013) | -.118 (.078) | .311* (.150) | .654*** (.151) |
| N | 889,274 | 889,274 | 889,274 | 889,274 |
| F-test | 11,633 | 100 | 221 | 227 |
| Sig | .000 | .000 | .000 | .000 |
| R ² | .847 | .160 | .209 | .223 |
| R ² (Adj) | .846 | .155 | .205 | .219 |
| Sobel statistics | | | | |
| ATPR _{t-1} | | -6.23*** | -2.54** | -5.08*** |
| ATPR _{t-2} | | -6.11*** | -2.54** | -5.01*** |

Note: ATPR stands for natural logarithm of aid for “Trade policy and regulation” disbursement with one year (t-1) and two-year (t-2) lag. The regressions include year, product and partnership fixed effects. Robust standard errors, clustered by six-digit product, are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In line with the results of our main analysis, Regression 1 indicates that such broad measure of aid for trade facilitation (we denote it here as ATPR) has a positive and statistically significant effect on the mediator variable (i.e., efficiency of customs procedures). The point estimates show

$\beta=.09$ ($p<0.001$) for $ATPR_{t-1}$ and $\beta=.03$ ($p<0.001$ for $ATPR_{t-2}$). The results for Regression 2 also support the same pattern of results observed in our main analysis.

As a fourth robustness test we use a different measure of efficiency of customs procedures. We use the “time to import” scores in the ‘trading across border’ - component of the World Bank’s Doing Business indicators. Our correlation test using our dataset shows that “time to import” is negatively correlated with *efficiency of customs procedure* with a correlation coefficient of 0.41 ($p<0.001$). The “time to import” measures the time it takes to comply with all procedures required by the importing country to import goods. It is stated in calendar days. The World Bank publishes the scores of each country annually. We note that in the Doing Business annual report, the scores are determined based on data collected in the previous two years (i.e., for example, the scores in the 2013 report are based on data collected in the first half of 2012 and the second half of 2011).

Table 4.6: Robustness Check: Time to import as mediator variable

| Regression Dependent variable | 1 Days to import | 2(a) Value gap | 2(b) Quantity gap | 2(c) Net weight gap |
|----------------------------------|------------------------|--------------------|----------------------|---------------------------|
| Days to import | | .006*** (.001) | .014*** (.001) | .017*** (.001) |
| ATF _{t-2} | -.175*** (.016) | -.070*** (.004) | -.142*** (.007) | -.132*** (.007) |
| Tariff rate | 4.611*** (1.002) | .561*** (.098) | .941*** (.211) | 1.325*** (.272) |
| Corruption | .443*** (.072) | .033*** (.008) | .001 (.014) | .009 (.014) |
| Tax burden | 3.122*** (.305) | .914*** (.065) | 2.559*** (.124) | 2.448*** (.134) |
| Financial openness | -9.215*** (.101) | -.036 (.024) | -.350*** (.045) | -.512*** (.047) |
| Landlocked | 17.987*** (.093) | .106*** (.023) | .419*** (.039) | .441*** (.041) |
| GDP per capita(ln) | 1.315*** (.044) | -.018 (.010) | -.133*** (.018) | -.135*** (.018) |
| Import to GDP ratio | -14.865*** (.284) | .202** (.074) | 1.511*** (.144) | 1.872*** (.144) |
| N | 889,274 | 889,274 | 889,274 | 889,274 |
| F-test | 12,976 | 97 | 189 | 195 |
| Sig | .000 | .000 | .000 | .000 |
| R ² | .835 | .160 | .208 | .222 |
| R ² (Adj) | .834 | .155 | .204 | .218 |
| Sobel statistics | | -5.26*** | -8.62*** | -9.20*** |

Note: All regressions include year, product and partnership fixed effects. Robust standard errors, clustered by six-digit product, are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.7: Robustness check: Using all observations for each of the trade gap measures

| | Coefficients | | | Sobel Statistics | |
|-----------------------|--------------|--------------------|--------------------|--------------------|--------------------|
| | ECP | ATF _{t-1} | ATF _{t-2} | ATF _{t-1} | ATF _{t-2} |
| All observations | | | | | |
| Value gap | -.08*** | -.03*** | -.04*** | -6.91*** | -6.49*** |
| Quantity gap | -.07** | -.08*** | -.12*** | -3.05*** | -3.01*** |
| Net weight gap | -.19*** | -.06*** | -.08*** | -9.24*** | -8.31*** |
| Winsorized at (1 99) | | | | | |
| Value gap | -.08*** | -.03*** | -.04*** | -7.27*** | -6.79*** |
| Quantity gap | -.07** | -.08*** | -.11*** | -3.33*** | -3.28*** |
| Net weight gap | -.19*** | -.06*** | -.08*** | -9.05*** | -8.17*** |
| Trimmed at (1 99) | | | | | |
| Value gap | -.07*** | -.03*** | -.03*** | -7.00*** | -6.57*** |
| Quantity gap | -.06** | -.09*** | -.10*** | -2.86*** | -2.83*** |
| Net weight gap | -.19*** | -.06*** | -.07*** | -9.50*** | -8.50*** |
| Winsorized at (5 95) | | | | | |
| Value gap | -.07*** | -.03*** | -.03*** | -7.00*** | -6.57*** |
| Quantity gap | -.07*** | -.08*** | -.10*** | -3.50*** | -3.44*** |
| Net weight gap | -.19*** | -.06*** | -.07*** | -10.53*** | -8.85*** |
| Trimmed at (5 95) | | | | | |
| Value gap | -.06*** | -.02*** | -.02*** | -6.00*** | -5.72*** |
| Quantity gap | -.08*** | -.07*** | -.07*** | -4.00*** | -3.91*** |
| Net weight gap | -.18*** | -.06*** | -.05*** | -9.00*** | -8.13*** |
| Winsorized at (10 90) | | | | | |
| Value gap | -.06*** | -.02*** | -.03*** | -6.00*** | -5.72*** |
| Quantity gap | -.07*** | -.08*** | -.09*** | -3.5*** | -3.44*** |
| Net weight gap | -.19*** | -.06*** | -.06*** | -9.50*** | -8.50*** |
| Trimmed at (10 90) | | | | | |
| Value gap | -.04*** | -.02*** | -.02*** | -4.00*** | -3.91*** |
| Quantity gap | -.06*** | -.06*** | -.04*** | -3.50*** | -3.44*** |
| Net weight gap | -.15*** | -.05*** | -.03*** | -7.50*** | -7.00*** |

Note: All regressions include year, product and partnership fixed effects and the control variables of Table 4.3. Robust standard errors, clustered by six-digit product, are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Accordingly, since trade facilitation expenditure in one year can't improve customs efficiency in the previous year, in our estimation we use trade facilitation disbursement lagged 2 years for this test. The results, reported in Table 4.6, show that aid for trade facilitation reduces the time to import (Regression 1: $\beta = .18$; $p < 0.001$). The Sobel test also confirms that aid for trade facilitation

statistically significantly reduces smuggling by reducing the time to import (Regression 2a-2c). These results are consistent with our main results and provide further support to our hypothesis that aid for trade facilitation reduces smuggling and this effect is indirectly transmitted through improvement in the efficiency of customs procedures.

Finally, instead of basing our analysis on observations which are the same for all of the three trade gap measures, we use the available observations for each of the trade gap and re-estimate our baseline specifications. This increases our sample size from 889,274 to 989,738 for value gap, to 912,224 for quantity gap and to 948,739 for net weight gap. The results of our estimations, which are reported in Table 4.7 for the whole sample as well as after winsorizing and trimming outliers, are in line with the pattern of results of our main analysis.

Although only control variables, it may be argued that the Import/GDP ratio and the corruption variable may be endogenously related to the trade gap. We therefore finally note that excluding these control variables does not change our results.

4.6. Discussion and conclusion

Smuggling, which we define as the illegal way of importing legally permitted goods without complying with applicable customs laws, is one of the major problems that characterize cross-border trade in Sub-Saharan African countries. Goods imported from outside the continent are smuggled by traders to escape higher tariff rates and lengthy and excessively inefficient customs procedures. These illegal activities reduce governments' revenue and spending capacity, expose the public to health and security risks, hamper the growth of domestic industries due to unfair

competition with cheap imports, and limit governments' ability to formulate and implement appropriate trade policies and strategies.

Undoubtedly, the successive trade reforms undertaken in SSA countries over the last three decades have brought about a number of positive changes in the region including reduction of tariff rates, improvements of customs structure and operation, promotion of intra-regional integration, and growth in the flow of cross-border trade and investment. Despite all these measures, however, the trade performance of Sub-Saharan Africa lags behind other regions indicating the importance of taking additional measures to improve the contribution of trade to economic progress.

To minimize the effect of customs procedures in global trade, aid for trade facilitation is given special attention. GATT and WTO agreements include various provisions to simplify and harmonize international trade procedures in relation to the collection, presentation, communication and processing of trade data and to expedite the movement, release and clearance of goods so that goods can cross borders without delay (WTO, 2015a). These measures play an important role in reducing smuggling activities and enhancing formal trade flows (Engman, 2005).

In this chapter we examine how aid for trade facilitation affects the efficiency of customs procedures which in turn affects smuggling in the region. Using a large number of product-level observations and controlling for other key factors, the results show that aid for trade facilitation supports to SSA by international and intergovernmental organizations improve the efficiency of customs procedures which in turn leads to reduced smuggling in SSA. Our results are robust to a series of tests. We argue that there is a causal effect because we include time-lags between the aid for trade facilitation provided, the efficiency of the customs procedures, and the trade gap.

Furthermore, we include fixed effects to reduce the probability that unobserved factors affect the coefficients of interest. This makes it unlikely that unobserved factors explain the path identified in this chapter.

This chapter is a new empirical contribution to the existing literature on the effect of aid for trade facilitation in SSA countries. It indicates that aid for trade facilitation should not be viewed only as a solution to reduce trade costs, improve SSA export to the world market, attract foreign direct investment, and improve SSA participation in the global trade chains. It shows that by improving the efficiency of customs procedures and streamlining the flow of goods across borders, such aids also reduce smuggling activities thereby promoting formal trading in SSA, increasing public revenues, enhancing fair competition in the domestic market, and safeguarding the general public from health-threatening and sub-standard imported goods. Increase in public revenues due to reduction in smuggling could also increase SSA countries' funds and provide opportunities to lower tariffs to further foster trade and economic development.

The policy implication of our result is that SSA countries should embrace the initiatives incorporated in the recently ratified Trade Facilitation Agreement (TFA) of WTO and work towards its effective implementations in the region as trade facilitation are more than improving trade flows. Undoubtedly, SSA countries need technical assistance and capacity building supports to develop and implement effective trade facilitation reform initiatives and to benefit from the global trade. As a result, it is important for development partners to discharge their responsibility as stipulated in multiple provisions in TFA and Annex D of the Doha Work Programme (the July Package) and offer targeted support to improve trade facilitation measures in SSA.

