Chapter 2

Estimating the magnitude of illicit financial flows related to extractive commodity exports from Africa

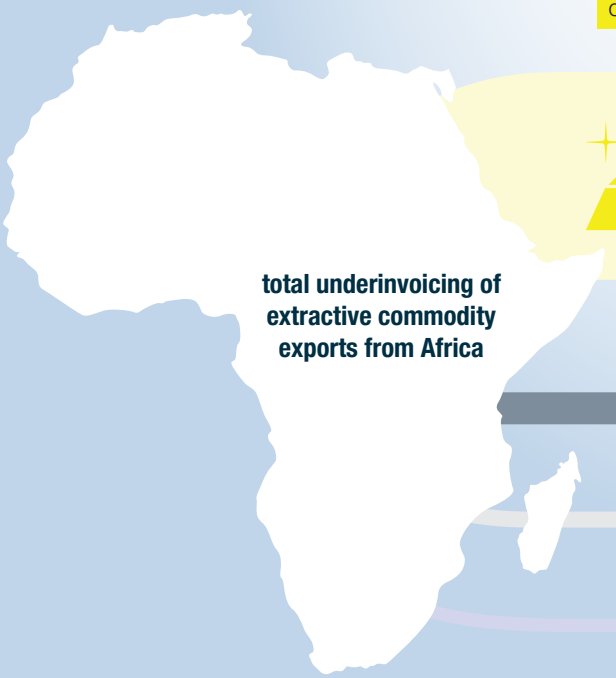
The measurement of trade-related IFFs in Africa is critical to combating them. While refining the methods of estimating and classifying trade-related IFFs to help policymakers establish their priorities and devise appropriate policy responses, this report considers but does not delve deeply into recent debates about methodology. Rather, it starts from the presumption that even under the most conservative estimates, extractive export-related IFFs from African countries are of an order of magnitude that gives rise to serious concerns. Reliable estimates are key to curbing IFFs and to creating sensible policies to tackle them. As highlighted in the conceptual framework of this report (see chapter 1), trade misinvoicing is a key channel for moving illicit value across borders.

IFFs OF AT LEAST
$40 billion

linked to
extractive commodities

HIGH-VALUE,
LOW-WEIGHT COMMODITIES

drive illicit trade outflows



total underinvoicing of extractive commodity exports from Africa

gold
77%

diamonds
12%

platinum
6%

other commodities
5%

This chapter adopts the partner-country trade gap method applied to official trade statistics for African countries and specific commodity groups to estimate the magnitude of trade misinvoicing. The chapter identifies and explores country-specific issues linked to statistical anomalies with regard to trade recording and extractive sectors that are at a high risk of illicit outflows. The estimates presented in this chapter show that export underinvoicing as a channel for illicit outflows is of critical importance for the continent. This chapter also reviews logistical and statistical reasons for the identified partner-country trade gaps and links them to current trade recording practices. It also presents case studies discussing the complex interrelationships between various illicit activities that contribute to trade-related illicit outflows. The chapter concludes that the partner-country trade gap method can be a potentially powerful tool to identify commodities that are at risk of trade-related illicit outflows and also alert countries to serious anomalies in the recording of trade statistics.

2.1 Counting the losses: Methodological issues in estimating illicit financial flows

The three main methods in the empirical literature focusing on the quantification of IFFs are: (a) the partner-country trade gap method;[14] (b) the balance of payment residual method; and (c) the price filter analysis method. The partner-country trade gap method, which is used in this chapter, compares the export value reported by country A to country B with the import value reported by country B from country A and after some adjustments tries to infer the magnitude of trade misinvoicing from the extent of the calculated trade gap. This method relies on mirror statistics, based on the principle of double accounting in international trade statistics and with a focus on discrepancies in the same trade flow recorded in two different countries at the commodity group level.

The balance of payments residual model, which is used to measure capital flight,[15] quantifies IFFs as unrecorded capital outflows and is measured as the missing residual in the balance of payments, after corrections for underreported external borrowing and the partner-country trade gap. The terms “capital flight” and “illicit financial flows” are sometimes used interchangeably, but they are distinctly different concepts. Capital flight can be illicit, depending on the definition, but not all IFFs are capital flight (for example,

[14] In this report the partner-country trade gap method, which is the same as the IMF DOTS method for trade misinvoicing, uses United Nations Comtrade data.

[15] Capital flight represents outflows of financial resources from a country in each period that are not recorded in official government statistics (Ndikumana and Boyce, 2018). The definition of capital flight used in this chapter is linked to the balance of payments residual method and is conceptually different than capital leaving a country due to a political or economic event.

smuggling). Capital flight may be illicit through illegal acquisition, transfer, holding abroad, or some combination of the three. Illicitly acquired capital is money obtained through embezzlement, bribes, extortion, tax evasion or criminal activities. Wealth acquired by these means is often transferred abroad clandestinely to evade legal scrutiny as to its origins. Conceptually, IFFs include not only capital flight but also payments for smuggled imports, transactions connected with illicit trade in drugs and other contraband and outflows of illicitly acquired funds that were domestically laundered before flowing abroad through recorded channels. These are illicit, but they are not capital flight, since these illicit funds are recorded in the balance of payments (Ndikumana et al., 2014).

The price-filter analysis, in comparison with the other two approaches, relies on transaction-level microdata and estimates the price range of a specific commodity over time to distinguish between normal and abnormal pricing (Carbonnier and Mehrotra, 2018; Ahene-Codjoe and Alu, 2019). The analysis either relies on the distribution of prices over time and its outliers (interquartile range price filter) or the comparison of transaction-level prices to free market prices ("arm's length price filter").

This chapter represents a systematic effort to apply the partner-country trade gap method to intra- and extracontinental African trade utilizing United Nations Comtrade data for eight extractive commodity groups.[16] Trade misinvoicing, the fraudulent issuing of an invoice to shift funds abroad, is estimated by exploring discrepancies in mirror trade statistics, which has a long-standing history in the detection of customs fraud (Morgenstern, 1963; Bhagwati, 1964, 1967). Mirror trade statistics compare the bilateral export flows of one country to the respective reported import flows of the partner country. Ideally, the value of the two trade statistics should only differ by the cost, insurance, freight (c.i.f.), but large discrepancies can arise due to valid logistical or statistical reasons as well as deliberate misinvoicing. A study by WCO (2018) highlights that mirror trade gaps[17] identified by the partner-country method do not distinguish between trade misinvoicing and random reporting errors. Although the statistical properties of trade misinvoicing and random errors can be assumed to be different, this is not the case for systematic errors generated by how international trade statistics are recorded. There are challenges in using the partner-country trade gap for the purpose of inferring illicitly motivated customs fraud ranging from differences in valuation, time lags in shipping, destination and product misclassification (section 2.3).

Table 1 provides an overview of four different trade gaps that can arise when comparing mirror trade statistics and their underlying motivation. Since this chapter focuses on

[16] Gold, platinum, diamonds, copper, iron, aluminium, manganese, petroleum oil and gas.

[17] The mirror trade gap is the discrepancy between mirror trade statistics, which is the same trade flow reported as export by country A and import by country B.

primary extractive commodities which account for over half of African exports (figure 3), only the export side is analysed. A positive partner-country trade gap arises when the value of exports is lower than the value of imports recorded by the partner country. This practice of export underinvoicing whereby the exporting firm understates the value of exports is used to conceal trade profits abroad (WCO, 2018). Thus, commodities leave the country, but the corresponding financial flows partly stay in foreign accounts. This deprives developing countries of much needed foreign exchange and erodes the tax base of economies already under pressure to mobilize domestic resources for the financing of the Sustainable Development Goals.

Table 1

Classification of the outcome of the partner-country trade gap

Positive gap	Export underinvoicing	→ Resource outflow in excess of the exchange that returns, e.g. tax evasion	Import overinvoicing	→ Exchange outflow in excess of true cost of imports, e.g. money-laundering
Negative gap ↓ Not IFFs in this context	Export overinvoicing	→ Benefit from export subsidies or domestic taxes (domestic crime)	Import underinvoicing	→ Avoid import tariffs

Source: UNCTAD secretariat.
Note: A positive gap in the partner-country trade gap can be used to infer illicit outflows and a negative gap can be used to infer illicit inflows depending on the country and commodity context in question.

On the import side, a positive gap can be associated with a practice called import overinvoicing, which is another way to disguise capital flight as a form of trade payment (WCO, 2018). Typically, an importer overstates the value of imports to allow the outflow of excess funds to foreign accounts instead of only paying for imports. Trade-related IFFs are generated by both practices and will lead to excessive funds or merchandise, greater than indicated in official records, leaving the country. This practice is also referred to as

technical smuggling in contrast to "pure" smuggling,[18] which will only be captured by the mirror trade gap if the merchandise is imported to the partner country legally. Additionally, if both trading partners collude in falsifying the value of an invoice, it will not be captured by the mirror trade gap since both trading partners will report the same value in their trade statistics. Reviewing a variety of motives for trade misinvoicing, Bhagwati (1967) concludes that underinvoicing of exports, rather than overinvoicing of imports, is used as a vehicle for capital flight, given that export controls are often less restrictive. There are also other reasons for trade misinvoicing such as export overinvoicing to benefit from subsidies or import underinvoicing to avoid tariffs (Nitsch, 2011). Although both are fraudulent and linked to illicit activities, they do not fit in the context analysed here, focusing on exports of primary extractive resources from the continent (Nitsch, 2011; UNECA, 2015; WCO, 2018). Thus, in the context of this analysis, export overinvoicing and import underinvoicing are not considered illicit financial inflows, which represents a major methodological difference between this report and approaches used by Global Financial Integrity (Global Financial Integrity, 2017, 2019) or capital flight measures (Ndikumana and Boyce, 2018).

This chapter contributes to the measurement of trade-related IFFs via the partner-country trade gap method by:

(a) Identifying the partner-country trade gap model of best fit for primary extractive commodities exports from Africa;

(b) Reflecting the first systematic mirror trade analysis for the continent with a focus on both intra-African and extracontinental African trade;

(c) Placing particular emphasis on primary commodities in Africa and their value chains (including increasingly centralized aspects of trading in Europe) and transit trade;

(d) Discussing country- and commodity-specific case studies in Madagascar and Zambia, and the gold trade in East Africa, South Africa and Switzerland;

(e) Providing an in-depth analysis of trade-recording practices and data quality uncertainties in African countries (that is, informal economy, porous borders, selection bias, non-reporting of data, and the like, which in turn impacts IFFs as both are linked to institutional quality).[19]

[18] Pure smuggling is when goods are exported clandestinely and then imported clandestinely to the next country. This practice is associated with trade in illicit goods such as drugs, in contrast to technical smuggling, which is a fraudulent statement about the value of merchandise trade through official channels and thus being partially recorded in trade statistics.

[19] A country's institutional capacity impacts its ability to enforce customs and border controls, which in turn impacts both the accuracy of its trade statistics and the probability of IFFs.

Trade-related illicit financial flows in the literature

The literature on trade-related IFFs has graduated from estimates based on total exports and imports to more country- and product-specific analyses, as the limitations of international merchandise trade statistics to accurately trace international trade have become clear.

The report of the High-level Panel on Illicit Financial Flows from Africa (UNECA, 2015) considers the whole continent and specific country–commodity pairs. It concludes that the largest shares of illicit outflows from Africa in precious metals, iron and steel, and ores are generated by the Southern African Customs Union; Zambia alone accounted for 65 per cent of trade misinvoicing in copper. The difficulties in using international trade statistics from Southern Africa are the subject of a more detailed discussion in section 2.3.

It has been estimated that as much as 50 per cent of illicit outflows from Africa are generated via trade mispricing and more than half of trade-related IFFs stem from the extractive sector (UNECA and African Minerals Development Centre, 2017). This and other studies have highlighted the importance of the extractive sector in generating IFFs and the role that the international community could play in combating them (UNCTAD, 2016). In the case of mining, MNEs increasingly centralize their trading operations, which raises the risk of trade mispricing. Singapore and Switzerland are among the most attractive places for centralizing trade operations due to tax incentives for multinational trading companies (UNECA and African Minerals Development Centre, 2017). Switzerland accounts for around a third of the global transit trade in key commodities such as oil, metals and agricultural goods (Lannen et al., 2016).

Table 2 provides a summary of country-level estimates of IFFs in Africa. For example, Ahene-Codjoe and Alu (2019) find evidence of a significant and abnormal undervaluation of commodity exports from Ghana. Using contemporaneous market reference prices and interquartile-range price filter methods, the authors find that abnormally undervalued export of gold (gold bullion and unwrought gold) equalled $3.8 billion or 11 per cent of the total export value ($35.6 billion) of gold between 2011 and 2017. Their estimates for cocoa beans and cocoa paste show that 2.7 per cent of the $12.6 billion worth of cocoa beans exported was undervalued and that 7.5 per cent of the total export of cocoa paste ($1.8 billion) was also undervalued. The authors argue that this corresponds to significant IFF risks due to the presence of many MNEs in the industry and corroborates existing literature that IFFs via commodity trading are a concern for Ghana. In another study, Nicolaou-Manias and Wu (2016) estimate the extent of trade mispricing for five African countries using the IMF DOTS methodology. These authors find declining trade

mispricing in South Africa and Zambia for the period 2013–2015 and in Nigeria for the period 2013–2014. However, Egypt and Morocco exhibited significant and increasing trade mispricing from 2013–2014.

Table 2

Summary of country estimates of illicit financial flows

	Study	Method and/or results
Angola	Ndikumana and Boyce (2018)	Capital flight of $60 billion during 1986–2015
Cote d'Ivoire	UNCTAD (2016)	Net cocoa export misinvoicing of $3.7 billion during 1995–2014
	Ndikumana and Boyce (2018)	Capital flight of $32 billion during 1970–2015
Democratic Republic of the Congo	Cathey et al. (2018)	Eurostat data and price filter analysis to detect undervalued European Union imports. Undervalued amount of European Union imports from the Democratic Republic of the Congo: €9.95 billion during 2000–2010
Egypt	Nicolaou-Manias and Wu (2016)	Gross excluding reversal (GER) method; $32.6 billion during 2013–2014
Ghana	Ahene-Codjoe and Alu (2019)	Micro-level data provided by the Ghana Revenue Authority (2011–2017): Abnormally undervalued export of gold was $3.8 billion and of cocoa, $12.6 billion
	Marur (2019)	Mirror trade data between Ghana, Switzerland and the United Kingdom during 2000–2017: Gold $6 billion; cocoa $4.3 billion
Kenya	Letete and Sarr (2017)	Uses Ndikumana estimate from the Political Economy Research Institute database and links it to institutions
Madagascar	Chalendard et al. (2016)	Import underinvoicing and mirror trade data to detect customs fraud. Customs fraud reduced non-oil customs revenue (duties and import value-added tax) by at least 30 per cent in 2014
Morocco	Nicolaou-Manias and Wu (2016)	GER method; $16.6 billion during 2013–2014
Nigeria	UNCTAD (2016)	Oil export misinvoicing at $44 billion and import misinvoicing at $45 billion during 1996–2014
	Nicolaou-Manias and Wu (2016)	GER method; $48 billion during 2013–2014
South Africa	UNCTAD (2016)	Net export misinvoicing during 2000–2014: Silver and platinum, $24 billion; iron, $57 billion
	Ndikumana and Boyce (2018)	Capital flight: $198 billion during 1970–2015
	Nicolaou-Manias and Wu (2016)	GER method; $67 billion during 2013–2015
Zambia	UNCTAD (2016)	Net export misinvoicing of copper: $14.5 billion during 1995–2014
	Nicolaou-Manias and Wu (2016)	GER method; $12.5 billion during 2013–2015

Source: UNCTAD secretariat.
Note: The GER method only considers positive gaps and sets negative trade gaps, resulting from the partner-country method, to zero.

The studies summarized in table 2 reflect a wide range of estimates of IFFs and capital flight, data and empirical approaches to measurement. This makes a comparison of estimators across studies impossible. At the time of writing, there are insufficient studies exploring the statistical reasons for bilateral trade asymmetries, especially in Africa (United Nations Statistics Division (UNSD), 2019). This chapter aims to address some of the criticisms raised in the literature by better controlling for c.i.f. and by providing an in-depth analysis of the recording of international trade statistics, while highlighting the idiosyncrasies of individual countries. The chapter also aims to provide an Africa-centred partner-country trade gap analysis by focusing on key commodities and their value chains that are of particular importance to the continent (in terms of total exports) and that have been highlighted as being prone to illicit outflows (UNECA, 2015; UNCTAD, 2016).

In this chapter, the analysis focuses on intra- and extracontinental African mirror trade gaps and considers the drivers of illicit outflows in this context. The lack of information on how intra-African trade statistics are recorded is a major obstacle to accurately assessing the status quo of regional and continental trade integration. The role of industry-specific features, such as the high degree of concentration in commodity trading, bonded warehouses for metals and petroleum exports via pipelines and how these features are reflected in international trade statistics is also highlighted.

2.2 Africa: Empirical analysis of the commodity-based partner-country trade gap

Rationale and sample selection

The importance of the mining and minerals sector led to the creation of the African Mining Vision (AMV), adopted by the first African Union Conference of African Ministers Responsible for Mineral Resources Development, held in Addis Ababa in 2008. The aim of AMV is to use the mineral wealth of Africa to eradicate poverty and achieve structural transformation and socioeconomic development. It is the most comprehensive continental framework governing mining and aims to integrate mining into national development policies, by ensuring that communities see real benefits, countries negotiate contracts that generate fair resource rents and that the mining industry becomes a strategic element of continental industrialization (UNECA, 2011).

The primary commodities included in the sample are those identified in previous studies as drivers of illicit outflows and extractive commodities that matter for the continent.

Most African economies are heavily dependent on the export of primary commodities (46 out of 54 are commodity dependent).[20] Eighteen countries are dependent on minerals, ores and metals exports, 17 on the export of agricultural products and 11 on fuel exports. There is also empirical evidence that the degree of trade misinvoicing varies over commodity groups and is linked to commodity-specific characteristics (UNCTAD, 2016). For example, high-value, low-weight commodities such as diamonds, gold and other precious metals appear to be more prone to smuggling and have been linked to IFFs, corruption and illicit arms trafficking (IMF, 2014; Berman et al., 2017). A feature of trade in primary extractive commodities that makes them vulnerable to trade misinvoicing is market concentration. As the large-scale extraction of natural resources is highly capital intensive, MNE market concentration is significant given their substantial financial and market power, enabling them to exert significant influence over government regulations together with the technical expertise to circumvent domestic laws (UNCTAD, 2016). Similarly, major agglomerates in extractive industries, which both mine and trade commodities, can exert considerable influence over prices and key elements of the value chain.

The distinction between intra- and extracontinental African trade for the calculation of the partner-country trade gap matters since trade patterns in terms of size and products are different. In addition, key players and motives for fraudulent customs invoicing differ. Furthermore, the quality of intra-African trade data is generally lower as trade recording at porous land borders is often more challenging than at ports. Therefore, the partner-country trade gap patterns are expected to differ for intra- and extracontinental African exports of extractive resources.

Countries need to
improve the recording
of intra-African trade statistics, especially over land borders

Figure 3 shows commodity exports by group as a share of total African exports. Primary extractive commodities constituted more than 50 per cent of total exports during 2000–2018, with oil and gas exports contributing around 40 per cent of total

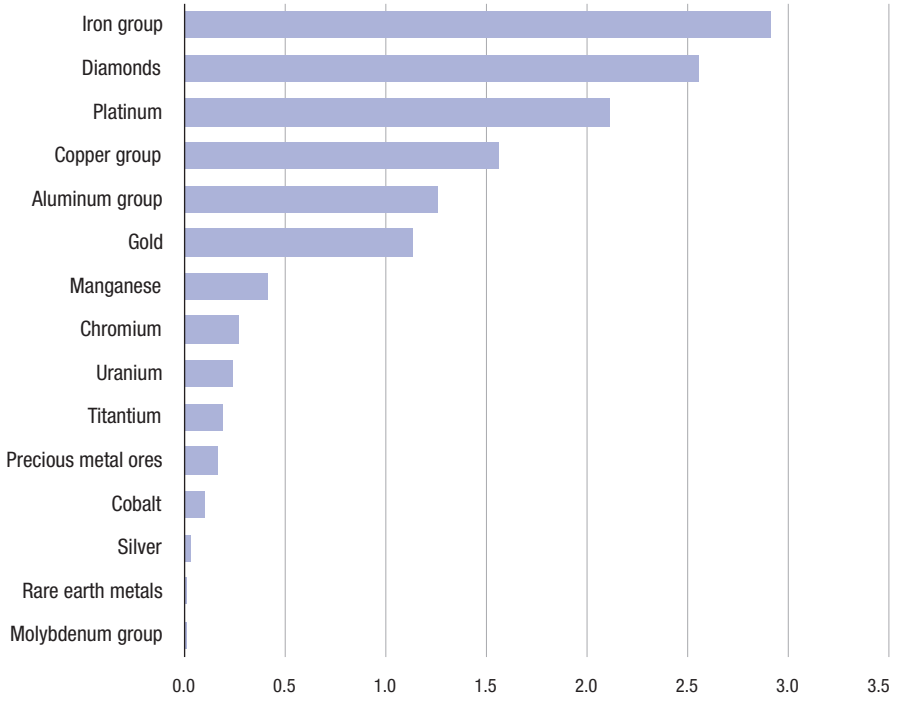
[20] A country is export commodity-dependent when more than 60 per cent of its total merchandise exports are composed of commodities. African countries that are not export commodity dependent include Cabo Verde, Egypt, Eswatini, Lesotho, Mauritius, Morocco, South Africa and Tunisia.

exports. Since many of the identified commodities only make up a small percentage of total African exports not all are included in the final analysis. Manganese is the last commodity included in the analysis because the share of total exports of the other listed commodities was too small at the time of writing.

Figure 3

Commodity exports by group, 2000–2018

(Percentage of total African exports, by value)



Source: UNCTAD calculations based on UN Comtrade.

The method

This section outlines the method used to estimate the extent of partner-country (mirror) trade gaps (*DX*) focusing on commodity exports from Africa and its mirror, that is, imports from Africa reported by the rest of the world. Building on Ndikumana and Boyce

(2018), the following equation denotes the difference between import (*M*) and export values (*X*) correcting for the c.i.f. (β):

$$DX_{i,t} = \sum_{j=1,k=1}^{JK} (M_{ji,t}^{k} - \beta X_{ij,t}^{k})$$

In this equation, *DX* captures statistical and logistical errors in mirror trade data, as well as intentional export misinvoicing. Given the limitations of international trade reporting, a positive value of *DX* in a given year may be an indication of export underinvoicing, whereas a negative value is more difficult to explain as to some extent this depends upon how a primary commodity is traded. A negative value of *DX* cannot be readily linked to IFFs for the following reasons: (a) illicit inflows in the context of extractive industries in Africa is counterintuitive; and (b) large negative trade gaps (where exports are larger than imports reported by the partner country) are likely to be linked to the characteristics of specific primary commodities and their trade patterns (for example, copper storage in bonded warehouses, or upstream transformation in industrial free zones). (β) is c.i.f., which is usually set at 1.1 following Ndikumana and Boyce (2018) and UNCTAD (2016). Therefore, it is assumed that c.i.f. is 10 per cent of the export value. In section 2.3, this procedure is compared with data in the OECD International Transport and Insurance Cost for Merchandise Trade database, which allows for a more accurate estimate of the mirror trade gap.

The focus of the analysis is export underinvoicing (that is, a positive trade gap) since this is the most relevant conduit for IFFs in the context of primary commodity exports from Africa. Trade underinvoicing is often motivated by exporting MNE incentives to shift foreign exchange abroad to settle foreign transactions, to pay for smuggled goods or to avoid foreign exchange controls (UNECA, 2015; UNCTAD, 2016).

Table 3 shows various partner-country trade gap estimates of trade-related IFFs. Significant differences in methodology exist and are reflected in the variation in size of the estimators. First, a negative partner-country trade gap is not considered an illicit inflow (as in Global Financial Integrity, 2019) or set to zero. Second, if the sum over all partner-country trade gaps is negative it will not be attributed to illicit inflows (as in Ndikumana and Boyce, 2018) but is explained by particularities in commodity-specific trade recording. Third, the level of data aggregation used in all the studies with the exception of UNECA (2015) and Global Financial Integrity (2019) is total trade, which does not allow for a commodity-driven analysis. Fourth, this chapter focuses on illicit outflows related to extractive industry exports, thus does not take the import side, agricultural or manufactured products, into account.

Table 3

Africa: Different estimates of trade-related illicit financial flows

(Billons of dollars)

	UNECA (2015): annual average 2000–2010	Global Financial Integrity (2019): 2015 estimate (DOTS)	Global Financial Integrity (2019): 2015 estimate (United Nations Comtrade)	Ndikuman and Boyce (2018): 2015	UNCTAD (2020): 2015 Estimate[a]
Positive export gap[b]		39	11		40
Positive import and export gap[c]		65	23	38	
Total	16[d]–29				

Note: The group of countries included and the time period are not consistent across studies.

[a] The present report. Focuses on extracontinental African exports and eight commodity groups; 80 per cent of the results are driven by South Africa and largely by gold. Other countries include Angola, Benin, Burundi, the Central African Republic, Egypt, Eswatini, the Gambia, Guinea, Lesotho, Madagascar, Malawi, Mauritius, Morocco, Mozambique, the Niger, Rwanda, Senegal, Togo, Uganda, the United Republic of Tanzania and Zimbabwe.

[b] A positive export gap signifies that a country's reported exports of a specific commodity are lower than imports reported by the partner country. This may be an indicator of systematic export underinvoicing, intended to conceal trade profits abroad, such as in tax havens. A firm interested in moving capital out of a country would underinvoice its exports, thus bringing reduced foreign exchange into the country.

[c] A positive import gap is an indicator of systematic import overinvoicing, intended to disguise capital flight as a form of trade payment. Both positive export and import gaps can be indicative of trade-related illicit outflows.

[d] The total from UNECA (2015) reflects the five top commodities.

Global Financial Integrity (2019) notes that globally, sub-Saharan Africa has the highest propensity for trade misinvoicing and is the only region in which outflows exceed inflows. In 2015, IFFs (as reported in United Nations Comtrade) are estimated at $45 billion and illicit outflows are equal to $23 billion (table 3). The present report's estimate of $40 billion in export underinvoicing is based on the net export gap and is the sum of all positive individual country estimates in 2015 (covering 21 African countries and the eight selected commodity groups). Despite significant differences in methodologies for trade-related illicit outflows from the continent, some convergence on findings exist; IFFs are large, have increased over time and trade in primary extractive commodities is a major contributor (UNECA, 2015; Östensson, 2018). Estimates based on total trade should only be considered as indicative, since calculating the mirror trade gap over the sum of all commodity groups can conceal large commodity-specific heterogeneities. Furthermore, due to significant differences in the data used (for example, level of aggregation, total, Harmonized System four- or six-digit level or Standard International Trade Classification) and how IFFs are defined, estimates are not comparable across studies.

An additional premise underlying mirror trade gap-based estimates of IFFs is that trade statistics reported by developed countries are generally more accurate and thus discrepancies in partner-country trade statistics are mainly driven by trade-related IFFs from developing countries. Therefore, the mirror trade gap is usually calculated vis-à-vis developed countries only and then scaled up by their share in total trade (see, for example, Ndikumana and Boyce, 2018; Global Financial Integrity, 2019). This does not allow for the analysis of intra-African discrepancies nor account for the fact that although primary commodities are still traded in Europe, the latter is no longer the largest consumer. Another concern is attributing partner-country trade gaps as being directly linked to illicit flows, which has been widely criticized in the literature for being too simplistic (De Wulf, 1981; Nitsch, 2011). Other sources of error being of a purely logistical nature have gained insufficient weight in recent discussions. For example, the analysis by Hong and Pak (2017) of the partner-country trade gap between Japan and the United States shows that even between developed countries, these gaps persist. Similarly, Bundhoo-Jouglah et al. (2005) analyse asymmetries in bilateral trade between Germany and the United Kingdom and ascribe the differences to accounting standards. Other statistical challenges are discussed in section 2.3.

Table 4 summarizes the descriptive statistics for global, extracontinental and intra-African trade derived from the partner-country trade gap model. There are no significance levels presented, as a regression model is not estimated, but rather an indicator for potential illicit outflows, which is used in the regression analyses presented in chapter 5. The global, intra- and extracontinental African trade for the period 2000–2018 summarized in table 4 covers eight commodities (as specified in table A.2) and highlights some interesting findings. For example, only one third of recorded trade is intra-African, which reflects the extracontinental export orientation in Africa for primary commodities. The average trade value, meaning the sum of all trade values divided by the number of observations, of extracontinental African trade is seven times as large as intra-African trade, $63 million versus $8.5 million. The maximum trade value for extracontinental African trade is seven times as large as for intra-African trade. Imports recorded by the rest of the world stemming from the continent are on average larger than exports recorded by African countries.

Table 4

Descriptive statistics: Global, extracontinental and intra-African trade and trade gaps, 2000–2018

		Number of observations	Average trade value (millions of dollars)	Standard deviation	Minimum	Maximum
Global trade	Import	80 571	44	501	0	36 990
	Export	74 302	43	476	0	34 384
	M-1.1*export	113 390	1	155	-10 416	14 881
Extracontinental	Import	50 814	64	626	0	36 990
	Export	46 361	62	596	0	34 384
	M-1.1*export	72 217	2	189	-10 416	14 881
Intra-Africa	Import	29 757	7	88	0	5 112
	Export	27 941	10	109	0	4 700
	M-1.1*export	39 501	-2	60	-4 751	1 006

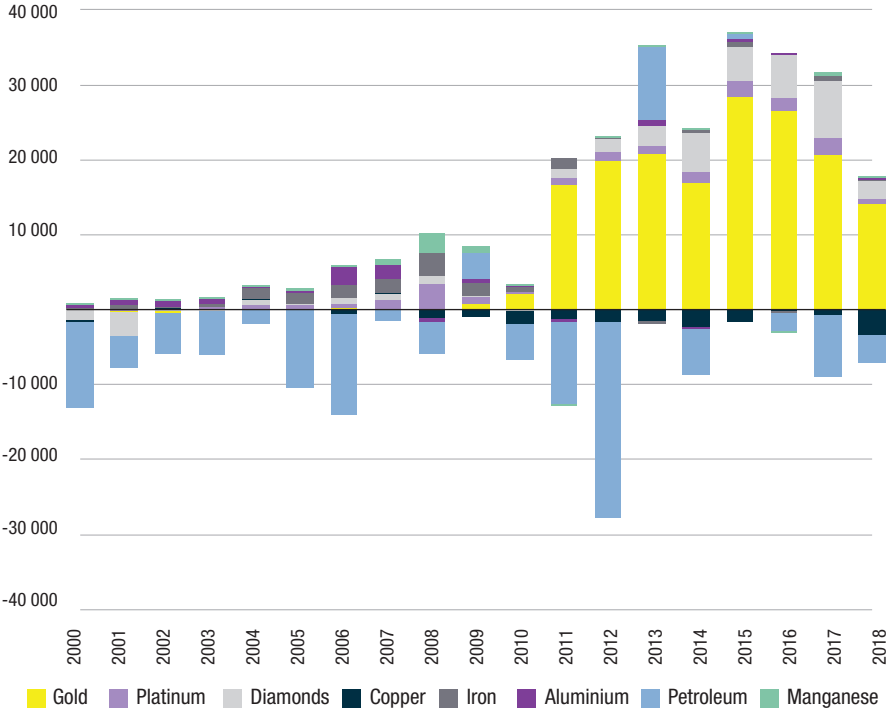
Source: UNCTAD calculations based on United Nations Comtrade.
Note: M-1.1*export denotes imports minus exports (including 10 per cent of export value proxy for c.i.f.).

Figure 4 shows the results of the partner-country trade gap clustered by the eight commodity groups. Some general trends emerge. First, the trade gap for gold from South Africa (since 2011) has a significant impact on the overall African trade gap. South Africa has a distinctive trade recording system, as illustrated by the observed gold trade reporting. Gold from South Africa, for historic reasons, had no trading partner country assigned before 2011. Since then, gold has been reported in United Nations Comtrade, and therefore included in this report, even though the reporting of this commodity remains special (Ndikumana and Boyce, 2019). Second, all high-value commodities, gold, platinum and diamonds (for example, from Eswatini, Lesotho, South Africa and the United Republic of Tanzania) tend to have a positive trade gap, whereas petroleum and copper exports tend to exhibit a negative one. In fact, all major petroleum exporting countries (Algeria, Angola, Nigeria and Tunisia) to some extent have large negative export trade gaps, with the exception of Egypt, which has a large positive gap. On average, iron, aluminium and manganese also have positive export gaps.

Figure 4

Sum of partner-country trade gaps by commodity group

(Millions of dollars)



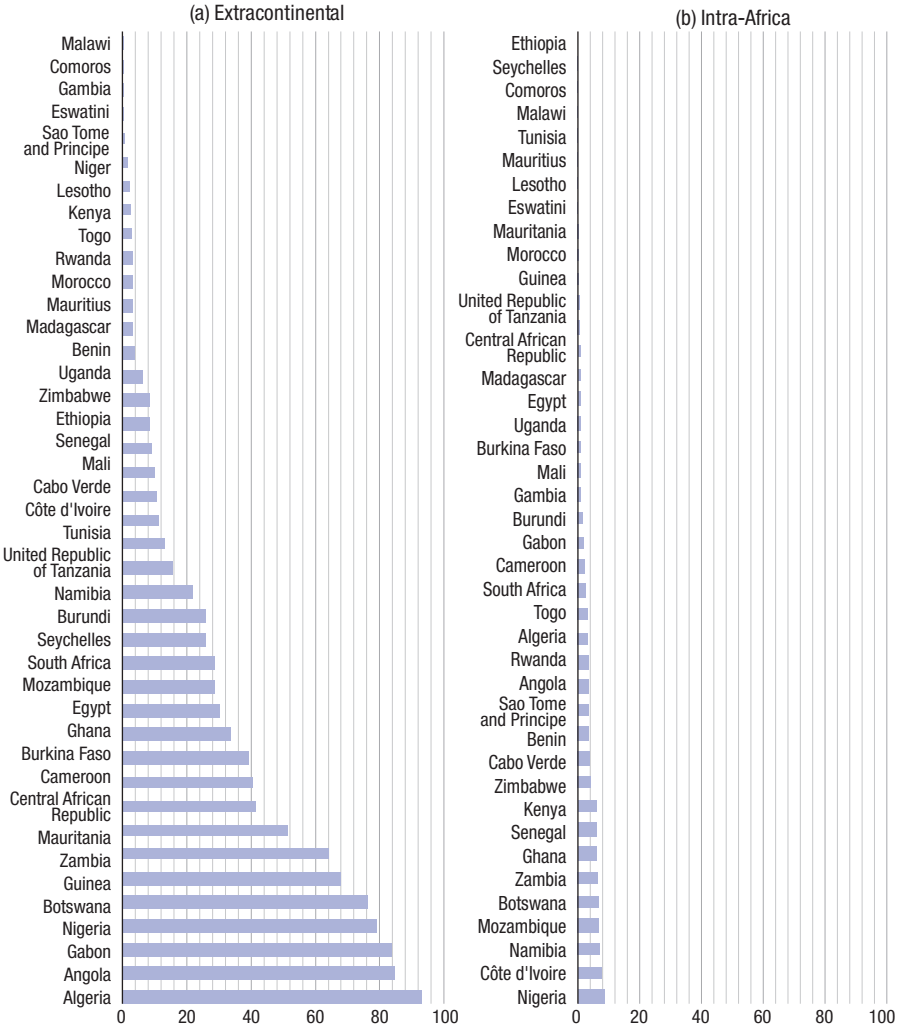
Source: UNCTAD calculations based on United Nations Comtrade.

The estimated partner-country trade gap consists of 109,451 observations; 40,803 are matched along the country commodity axis; 37,330 are orphan imports, meaning there are no commodity exports reported by the African State for the same year; and 31,318 are lost exports, meaning for the same year and commodity, the partner country did not report any imports. Figure 5 shows the amount of total exports covered in the sample. For many countries that primarily export mining commodities or petroleum, a large share of exports is included. For other countries, such as agricultural exporters or those with greater export diversification, a smaller share is covered.

Figure 5

Exports covered by the sample, 2000-2018

(Percentage of total exports)



Source: UNCTAD calculations based on United Nations Comtrade.

The findings show that during the period 2010–2014, there were eight countries[21] in which the partner-country trade gap was positive and increasing and that during the period 2015–2018, there were five countries[22]. This suggests that these countries are at increasing risk of trade-related illicit outflows via export underinvoicing. Three different countries during the periods 2010–2014[23] and 2015–2018[24] had a positive but decreasing trend in the size of the partner-country trade gap, implying that the risk of illicit outflows via export underinvoicing was decreasing over these periods for a subsample of countries. For the remaining countries, the partner-country trade gap is either stable over time or no time trend can be assigned due to too few observations for the years considered, or too much volatility to discern a clear trend. Although countries have up to two years to report data in United Nations Comtrade, not all countries provided data for 2018.

Intra-African asymmetries in bilateral trade data

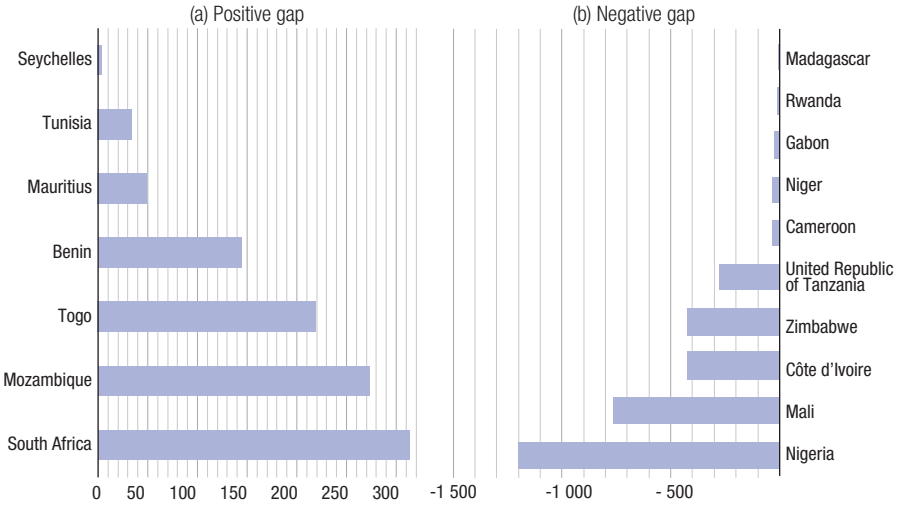
Generally, a positive net export gap can be an indicator of export underinvoicing, which is a channel through which value leaves the country illicitly. It is more difficult to link a negative trade gap to IFFs as this could simply reflect the underreporting of imports by the partner country. Figure 6 shows the annual average of the mirror trade gap for intra-African trade from 2000 to 2018. With regard to intra-African trade, the largest outliers are Ghana and Nigeria, with a negative average trade gap of more than $1 billion annually, which explains the negative average intra-African trade gap in table 4. This suggests that exports from Ghana and Nigeria are more rigorously recorded than imports by neighbouring countries. The largest positive outliers are Mozambique and South Africa, with an annual average of more than $250 million per year. Benin and Togo are the largest positive outliers when weighting the mirror trade gap by total exports (figure 7). According to the statistics of trading partners, both Benin and Togo export large amounts of gold, whereas both countries report exporting only small amounts and have limited gold reserves. A possible explanation for this is that gold from the Sahel region is exported via Togo and is inaccurately recorded as originating from Togo in the partner country (Extractive Industries Transparency Initiative (EITI) Togo, 2013). The recording of trade statistics at porous land borders is a challenge for many countries and the lack of customs enforcement can be a threat to national security, because organized crime will use the same trade routes for illicit trade, potentially in arms.

[21] Burundi, Eswatini, Gambia, Lesotho, Mali, South Africa, Togo, United Republic of Tanzania.
[22] Benin, Burundi, Lesotho, Togo, United Republic of Tanzania.
[23] Benin, Egypt, Madagascar.
[24] Egypt, Gambia, South Africa.

Figure 6

Intra-African partner-country trade gap, annual average 2000–2018

(Millions of dollars)



* Countries with an inconclusive gap are Algeria, Angola, Botswana, Burkina Faso, Burundi, Cabo Verde, the Central African Republic, the Comoros, Egypt, Eswatini, Ethiopia, the Gambia, Ghana, Guinea, Kenya, Lesotho, Malawi, Mauritania, Morocco, Namibia, Sao Tome and Principe, Senegal, Uganda and Zambia.

Source: UNCTAD calculations based on United Nations Comtrade.

For the intra-African partner-country trade gap, results are mainly inconclusive meaning that there is no consistent trend over time, that is, a large positive gap in one year followed by a negative gap in the next. These patterns cannot easily be attributed to errors in trade recording and systemic illicit behaviour. Where volatile fluctuations in a country's export trade gap are difficult to logically explain, they are placed in the inconclusive gap category (figure 6).

Figure 7 shows the same results as figure 6 but with country estimates weighted by total exports, which produces a different ranking of estimates.[25] When weighted by trade the

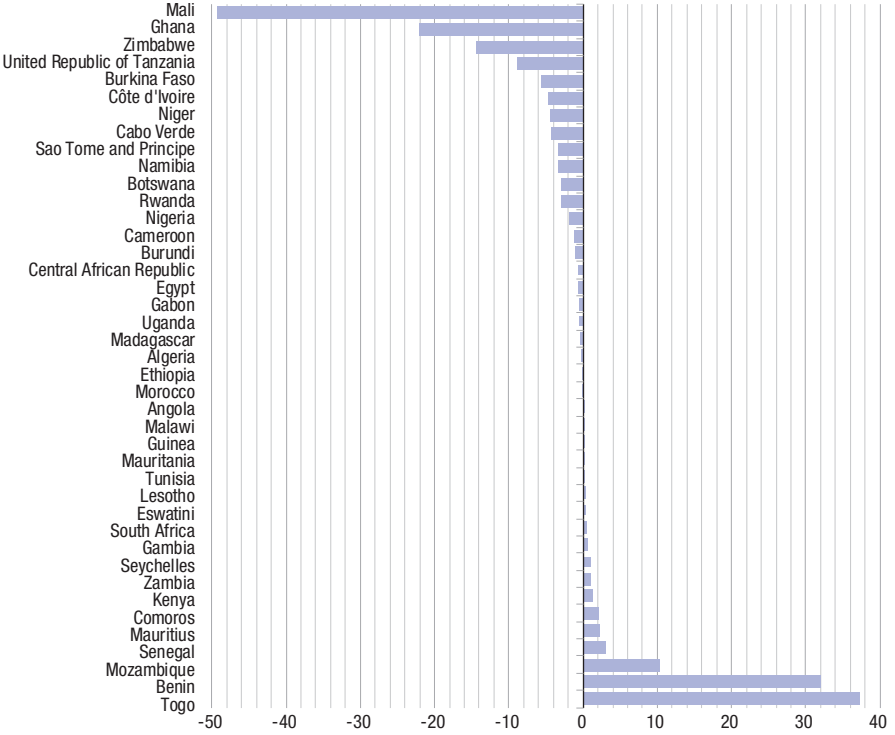
[25] The weighting of the partner-country trade gap is a delicate question. Generally, countries that trade more will have larger partner-country trade gaps, and this should be considered via weighting by GDP or total exports. Here the trade gap is weighted by total exports, which allows for a comparison between the intra- and extracontinental African trade gap, weighted by intra- and extracontinental African export value. At the same time, weighting by total exports introduces distortions when the trade gap is driven by systemic non-reporting on either side of the trading partners. Therefore, in chapter 5, which uses only the extracontinental African trade gap estimates, GDP is used for weighting purposes and Benin and Togo remain the largest outliers (for further information, see Schuster and Davis, 2020).

largest positive outliers are Benin and Togo, which may be attributed to gold trade rules of origin issues, as outlined above.

Figure 7

Intra-African mirror trade gap, 2000–2018

(Percentage of total exports, by value)



Source: UNCTAD calculations based on United Nations Comtrade.

According to Mayaki in "Colonialism was a system of illicit financial flows", most pre-independence infrastructure primarily linked mines to ports and was geared towards the extraction of minerals and agricultural products. Much of that infrastructure still stands in most of Africa (*Africa Renewal*, 2020). The lack of recorded intra-African trade is partly a function of such embedded historical and economic factors. For example, until 2008, the export statistics of Uganda were calculated at the port of Mombasa in Kenya, a legacy of colonial practices (Jerven, 2013), thus neglecting any intra-African trade in official statistics. When the Uganda Bureau of Statistics surveyed trade, it

concluded that informal cross-border trade was significant and contributed immensely to household welfare and growth (Kuteesa et al., 2010). Similarly, a United Nations Comtrade metadata survey showed that Sierra Leone did not include land border trade in the statistics reported to United Nations Comtrade.[26] As some countries do not report, or only sporadically report, the suitability of United Nations Comtrade data for the analysis of intra-African trade is questionable. Improving intra-African trade statistics is an important pillar for understanding opportunities for regional trade integration.

Another hurdle for the analysis is that informal cross-border trade is sizeable and important for many African economies. For some borders and specific products, informal trade might be as high as formal trade. For example, a recent survey concluded that the number of products being exported from Benin to Nigeria were five times greater than official records showed (Bensassi et al., 2016). Informal cross-border trade and porous borders mean that data at land borders is not collected rigorously, which in turn may limit the usefulness of the partner-country trade gap analysis for the inference of IFFs linked to intra-African trade. A systematic approach to assessing informal cross-border trade and its formalization will be necessary to identify growth potential and risks associated with intra-African trade. Informal cross-border trade should not be equated with IFFs, but illicit cross-border trade may use the same routes as other informal cross-border trade. However, the partner-country trade gap method can also be used to identify issues with trade recording and customs inefficiencies. For example, if all trade partners report importing a specific commodity at a higher value than a country's own export statistics, this might be an indication of significant informal (possibly illicit) cross-border activities or smuggling.

Extracontinental African asymmetries in bilateral trade data

Figure 8 shows the sum of mirror trade gaps, covering the eight commodity groups included in the sample. The largest outlier is South Africa, with a positive trade gap of $10 billion annually. If trade in gold is excluded, the annual average is $4 billion. The largest negative outlier is Algeria, with an annual average of almost $6 billion.

Based on the selected commodity sample, 23 out of 45 African countries covered in the analysis experience a positive and time-persistent partner-country trade gap, which can be used to infer illicit outflows via extracontinental trade in extractive resources (for data coverage, see table A.1). The extent of the trade gap is linked to the volume of total trade and data quality. This is in comparison with intra-African trade (figure 6), in which only seven countries fall into the time-persistent positive group, which allows for the inference of illicit outflows; these seven countries lost, on average, around $1 billion per year between 2000 and 2018. The results for intra-African trade are expected to be

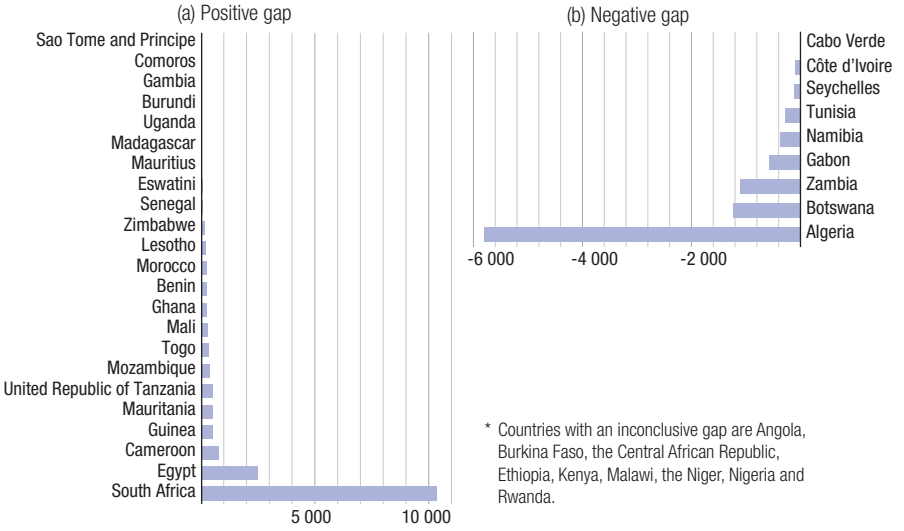
[26] See https://comtrade.un.org/survey/.

more mixed as it is generally easier to record trade at ports than at land borders, and may also be due to some countries not reporting on intra-customs-union trade.

When weighting the trade gap by total exports (figure 9), the largest positive outliers are Togo and Benin even though total trade covered in the sample is less than 10 per cent. This is mainly driven by countries reporting gold imports from these countries while at the same time they are not major gold producers. It may be that gold exported via Togo and Benin from the Sahel region is inaccurately recorded in partner countries. When weighting the trade gap by total exports the gap is large, since these orphan imports are not recorded in the total exports of either Benin or Togo.

Figure 8

Extracontinental partner-country trade gap, annual average 2000–2018
(Millions of dollars)



Source: UNCTAD calculations based on United Nations Comtrade.

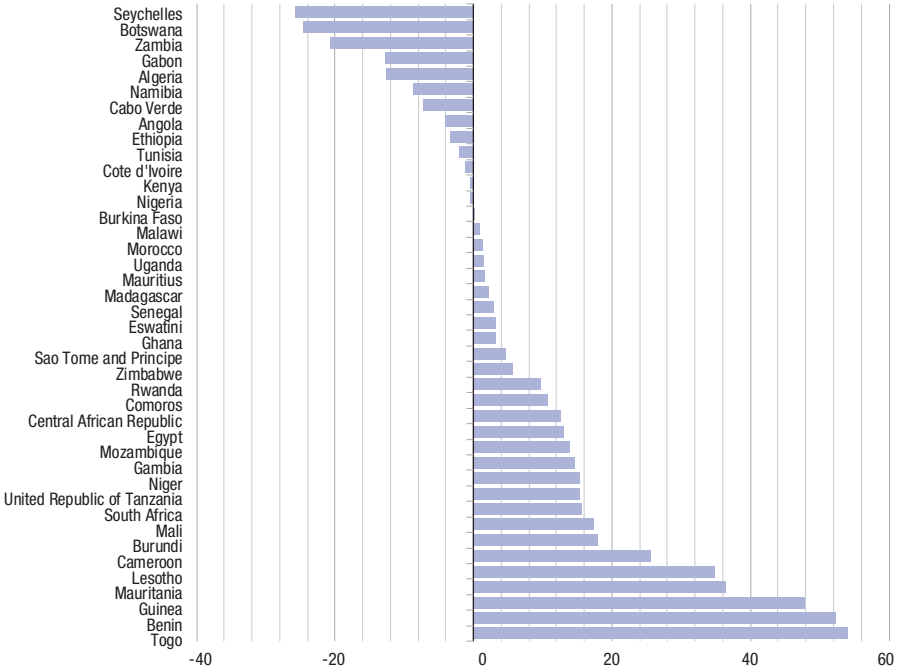
Generally, countries can be divided into three groups. For countries that have a consistently positive mirror trade gap, a case can be made for linking the positive export gap to export underinvoicing and thus illicit outflows. Given that many primary resources are stored in bonded warehouses, a persistent negative trade gap is expected in the data. For countries in the negative or inconclusive groups no inference can be made about trade misinvoicing. This does not mean that these countries do not have trade-related illicit outflows, but rather that trade statistics are recorded in a way that

makes it impossible to detect trade gaps that are associated with export underinvoicing. For countries with a persistent negative gap, any correlation with commodity prices must be carefully analysed (box 2). A negative correlation between the commodity-specific trade gap and commodity price, as for example in Zambia, is linked to the amount of commodity kept in stock, as any profit-maximizing firm has an incentive to sell more copper when prices are high, reducing the stock in bonded warehouses and decreasing the mirror trade gap. The third group consists of countries with large mirror trade gaps, but they vary significantly over time. This group is much harder to explain because if there was systematic trade misinvoicing that could be clearly detected in macro-level trade data, drivers should be consistent over time, or only change with significant political or economic events. For the 23 countries where there is a positive indication of systemic export underinvoicing, commodity and trade-related illicit outflows were an estimated average of almost $18 billion per year during 2000–2018 (figure 8).

Figure 9

Extracontinental African mirror trade gap, 2000–2018

(Percentage of total exports, by value)



Source: UNCTAD calculations based on United Nations Comtrade.

When comparing the pattern of intra- and extracontinental African trade gaps by country for the period 2000–2018 (figures 6 and 8) three interesting points emerge. First, the number of countries where the results of the partner-country trade gap method leads to inconclusive results is much larger for intra-African trade. This might be related to greater uncertainty concerning the recording of intra-African trade statistics. Second, some interesting cases emerge where the extracontinental African trade gap does not allow for the inference of illicit flows, but where the intra-African situation is different (see Seychelles and Tunisia). Third, when the trade gap is weighted by total trade, Benin and Togo are the largest positive outliers and both their intra- and extra-African trade gaps are largely driven by gold trade.

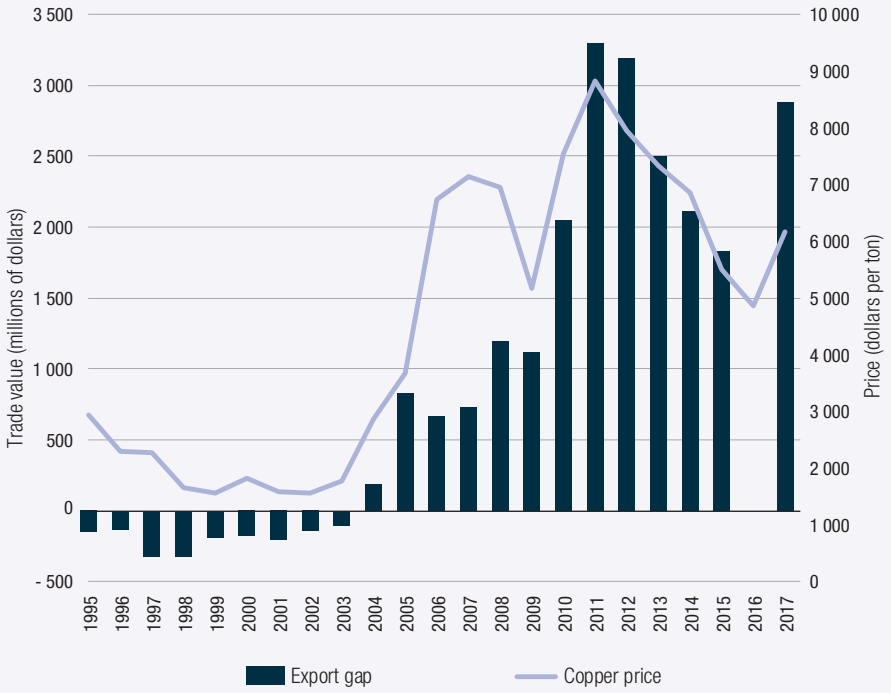
Box 2
Zambia: Exploring the copper trade gap

Based on United Nations Comtrade data, Zambia reports more than 50 per cent of its copper exports to Switzerland. In contrast, Switzerland does not report any copper imports from Zambia. This is termed merchanting and is often observed in trade data for commodity trading hubs such as Switzerland and the United Kingdom. The trading company Glencore, which has its headquarters in Switzerland and has a subsidiary in Zambia called Mopani Copper Mine, may be taken as an example; the company initially purchases copper that will be reported as an export to Switzerland. Typically, the copper does not physically enter Switzerland but is stored, for example, in one of the bonded warehouses of the London Metal Exchange, before entering other final destination markets, or is resold during shipping.

Such practices can lead to large mirror trade gaps. There will be a large negative gap between Switzerland and Zambia, which could prompt the assumption of massive export overinvoicing and a large positive trade gap between Zambia and the final destination country, which could be interpreted as export underinvoicing. Although UNCTAD (2016) has highlighted this problem, the suggested remedy, that is, the exclusion of exports from Zambia to Switzerland, would lead to a substantial positive bias in the mirror trade gap. Box 2 figure 1 shows the extent of the mirror trade data mismatch as reported by UNCTAD (2016), excluding copper exports from Zambia to Switzerland.

Box 2 figure 1

Partner-country trade gap: Zambia copper exports, excluding Switzerland as destination market

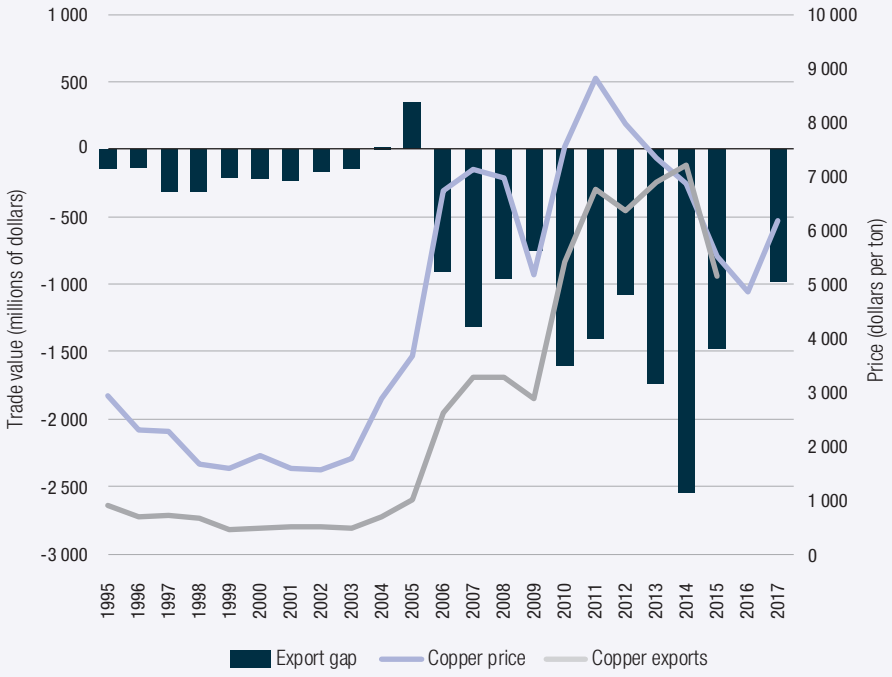


Source: UNCTAD calculations based on United Nations Comtrade and copper price data from the London Metal Exchange.

The results change significantly when including Switzerland in the difference between reported copper exports by Zambia and imports from Zambia reported by the rest of the world. Exports reported by Zambia to the rest of the world are larger than Zambian imports reported by the rest of the world, leading to an extensive negative trade gap. Furthermore, box 2 figure 2 shows the link between the size of the trade gap, total export value and price of copper. The trade gap is strongly negatively correlated with both the total export value and the copper price (that is, when copper prices and total exports increase, the trade gap decreases).

Box 2 figure 2

Partner-country trade gap: Zambia copper exports, all destination markets



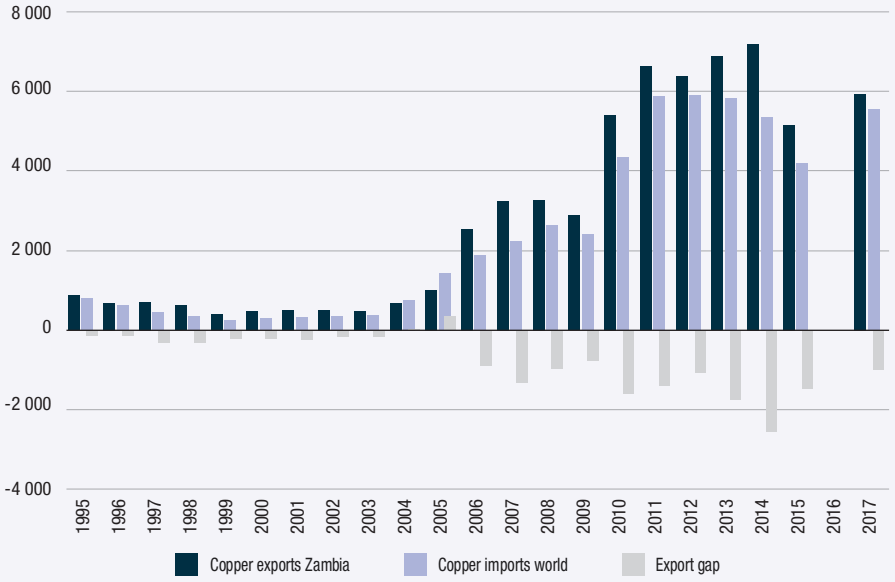
Source: UNCTAD calculations based on United Nations Comtrade and copper price data from the London Metal Exchange.

Box 2 figure 3 shows total copper exports from Zambia to the world and total copper imports reported by the rest of world. The import value is consistently below the export value, which is surprising since imports are generally recorded more rigorously, and the import value also includes c.i.f. There are two potential explanations for the lost copper exports, namely, storage in bonded warehouses and downstream transformation in industrial free zones. Countries that follow the special trade recording system do not report trade related to bonded warehouses and all types of industrial free zones, which means that if copper from Zambia was imported to an industrial free zone and then sufficiently transformed it would not appear as imports in international trade statistics. The bonded warehouses of the London Metal Exchange hold large volumes of metals such as copper, aluminium, lead, nickel,

zinc and precious metals. The Exchange houses as much as 250,750 metric tons of copper at any given time.[a] The evident negative correlation between the mirror trade gap and the copper price (-0.81) supports the hypothesis of copper being stored in bonded warehouses. The higher the demand and ultimately, the price, the more copper stocks will be sold from the warehouse, entering countries import statistics and closing the mirror trade gap.

Box 2 figure 3

Partner-country trade gap: Zambia copper exports and imports as reported by the rest of the world



Source: UNCTAD calculations based on United Nations Comtrade.

Although there is no evidence of export underinvoicing using the partner-country trade gap approach, Zambia is still experiencing significant losses related to the minerals industry, but via different channels that are largely undetectable in trade statistics.

Source: UNCTAD secretariat.

[a] See https://www.lme.com/en-GB/Metals/Non-ferrous/Copper#tabIndex=0.

The special role of gold as a conduit for illicit financial flows

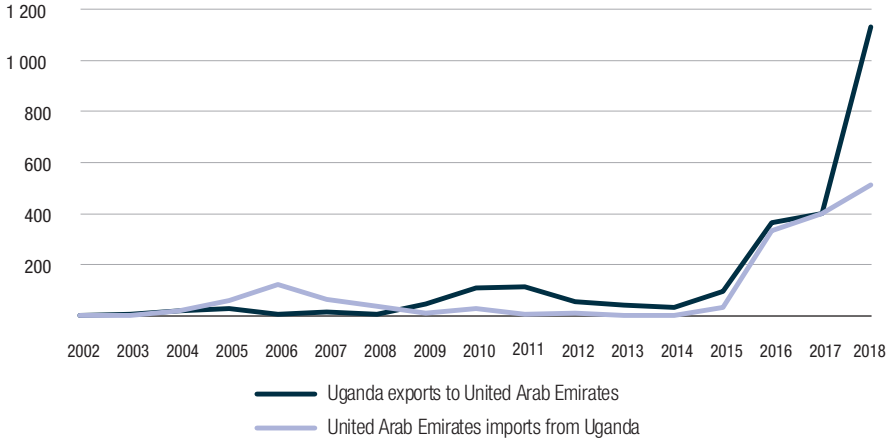
Gold, due to its physical properties, high value, low weight and tradability on international markets, is at high risk of money-laundering by organized crime networks (Financial Action Task Force, 2015) and smuggling. Switzerland refines between 40 and 70 per cent of the world's gold production. During the refining process, the gold loses all traces of its origin and is traded as Swiss gold on international markets (Switzerland, Interdepartmental Coordinating Group on Combating Money-Laundering and the Financing of Terrorism, 2015; Mbiyavanga, 2019).

Collier (2007) has highlighted the considerable economic and development costs associated with conflict, which in the African context is closely linked to the illicit extraction and trade of minerals (also Berman et al., 2017). Gold, tin, tantalum and tungsten have been identified as fuelling conflicts in many countries. Recognition of this is reflected in the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) section 1552 and by the European Commission implementing special regulatory regimes related to trade in these elements (European Commission, 2017). Estimates also show that exogenous price increases (commodity price super cycles) explained up to one fourth of the average level of violence across African countries during the period 1997–2010 (Berman et al., 2017). The United Nations Panel of Experts on Illegal Exploitation of Natural Resources and Other Forms of Wealth of the Democratic Republic of the Congo (United Nations, Security Council, 2002) found that Kampala's largest gold trading companies, Machanga Ltd and Uganda Commercial Impex, were buying gold from Ituri-based non-State armed groups. The United Nations Security Council established a Committee (Security Council resolution 1533 (2004)) that imposed sanctions on gold trade with that region under Security Council resolution 1596 (2005). This is because gold is often smuggled from the Democratic Republic of the Congo to Uganda and then exported to the United Arab Emirates (Reuters, 2019; United Nations, Security Council, 2002), and much of this trade is not reflected in the export statistics of the African countries; thus, large amounts of potential tax revenue is being lost to the country in which the gold is mined. Gold exports from Uganda have risen significantly over recent years, even though the country has only modest reserves (figure 10). Furthermore, recorded imports by the United Arab Emirates from Uganda are much larger than recorded exports from Uganda to the United Arab Emirates, which implies potential export underinvoicing and/or smuggling.

Figure 10

Uganda and the United Arab Emirates: Gold imports and exports

(Trade value in millions of dollars)



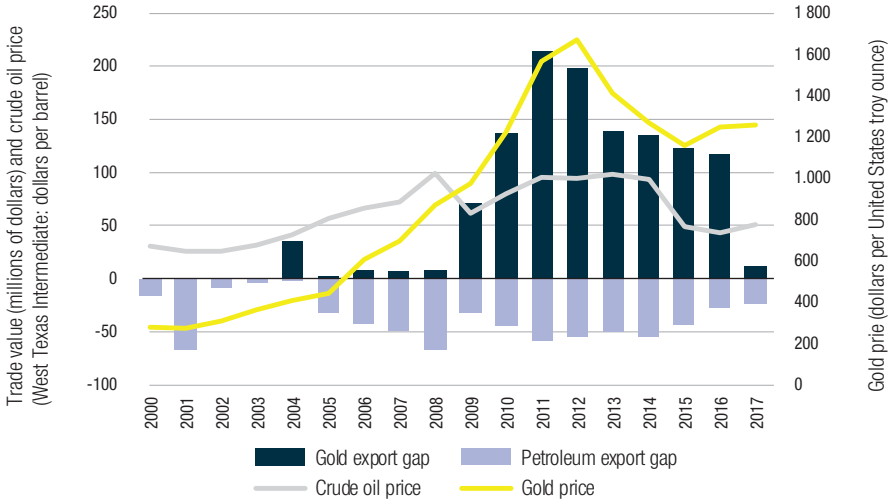
Source: UNCTAD calculations based on United Nations Comtrade.

This is also reflected in the results of the partner-country trade gap, whereby countries generally tend to have large positive trade gaps related to gold exports (in order of trade gap, South Africa, Togo, Benin, the United Republic of Tanzania, Mali, Burundi, Madagascar, Senegal and Kenya). The trade gap is correlated with the gold price on international markets. Figure 11 highlights the relationship between commodity prices and the size of the partner-country trade gap over time. For gold there is a strong positive correlation (0.85), whereas for petroleum there is a strong negative correlation (-0.68). The correlation of prices and the export gap is partially driven by the fact that both are linked to total export value (that is, if prices rise, the total export value increases and the export gap also rises). This shows the importance of different trading patterns and risks associated with diverse commodities and that gold has a high risk of related illicit outflows.

Figure 11

Madagascar: Partner-country trade gap and commodity prices

(Millions of dollars)



Source: UNCTAD calculations based on United Nations Comtrade and the IMF primary commodity price system for crude oil and gold price data.

2.3 Challenges in matching bilateral merchandise trade statistics

There are a multitude of challenges in matching bilateral trade data. Ideally, exports of country A to country B should be equivalent to imports of country B from country A, minus c.i.f., based on the principal of double accounting in trade statistics. Valid logistical and statistical reasons for asymmetries in bilateral trade statistics include: exchange rate volatility both between trade partners and vis-à-vis the value in which data is reported in United Nations Comtrade (which uses quarterly averages to convert figures into dollars); uncertainty surrounding the quality; destination mismatches; different classifications for the same good; timing and currency valuation (long sea cargoes, delayed customs processing or storing in warehouses can lead to trade being recorded in different years and goods being valued at different prices due to exchange rate volatility); and trade recording in customs unions and at land borders (Nitsch, 2011; Marur, 2019; UNSD, 2019).

Cost, freight, insurance

This encompasses the costs that occur when transporting goods from one country to another. The standard in international trade statistics is to report the export value, exclusive of these costs (that is, free-on-board) and the import value inclusive of c.i.f. (UNDS, 2011). Under the World Trade Organization (WTO) General Agreement on Tariffs and Trade of 1994, members may opt to include the value of freight, insurance and handling costs in the transaction value at the point of entry to a customs territory. For the partner-country trade gap analyses, it is important to account for these differences in valuation. In two survey rounds covering 34 African countries, all except South Africa reported the value of imported goods as inclusive of c.i.f. The South African Revenue Service reports both exports and imports as free-on-board. Other countries that report imports exclusive of c.i.f. are Australia, Brazil, Canada, the Dominican Republic, Mexico and Palau. This matters for the analysis because for these countries there is no need to control for c.i.f. when analysing the partner-country trade gap.

The standard practice in the partner-country trade gap method is to add 10 per cent to the export value of all countries in a sample to account for differences in valuation (Bhagwati, 1967; Nicolaou-Manias and Wu, 2016; UNCTAD, 2016; Ndikumana and Boyce, 2019). This approach has been widely criticized in the literature for being too simplistic (Nitsch, 2011; Marur, 2019). Nicolaou-Manias and Wu (2016) compare the results of the partner-country trade method using 10 per cent and 5 per cent to account for c.i.f. (as suggested by the South African Revenue Service) for a group of African countries; the impact on the estimated trade gap was significant. The 2018 release of IMF DOTS suggests a uniform 6 per cent markup on the export value for the calculation of trade gaps (Marini et al., 2018). In reality, c.i.f. differs significantly along the axes of distance between countries, mode of transport, value of merchandise and other commodity-specific characteristics such as weight. Furthermore, the cost is expressed as a percentage of the total value and will therefore vary over time, often countercyclical to commodity prices.

As the partner-country trade gap method has evolved from using total exports to being commodity specific, it is important to account for commodity-specific valuation differences. The OECD International Transport and Insurance Cost for Merchandise Trade database, which is classified by partner and commodity group over time, is analysed to explore the actual costs (Miao and Fortanier, 2017). For the 71,792 export observations in the OECD database, 50,556 can be matched along the exporter partner–commodity axis with the OECD c.i.f. estimates, covering around 70 per cent of export observations. The subsample covers 65 per cent of extracontinental African

bilateral country–commodity matches and 80 per cent of intra-African matches of the whole sample. On further analysis, the missing matches seem random and correlate with total export observations by country. Table 5 shows the matched subsample focusing on intra- versus extracontinental African trade costs, classified by commodity group and with an emphasis on landlocked countries.

Table 5

Cost of freight and insurance, by commodity group, 2000–2018

	Extracontinental			Intra-African			Landlocked countries		
Commodity group	Number of observations	Average (percentage)	Standard deviation	Number of observations	Average (percentage)	Standard deviation	Number of observations	Average (percentage)	Standard deviation
Gold	1 846	2.1	0.019	54	2.7	0.021	330	2.1	0.019
Platinum	453	2.2	0.017	111	2.1	0.021	43	2.4	0.022
Diamonds	1 823	1.9	0.021	335	1.3	0.021	349	1.8	0.023
Copper	10 878	4.8	0.023	6 544	4.5	0.031	1 114	2.7	0.028
Iron group	13 226	7.9	0.035	10 452	7.8	0.040	2 242	3.3	0.028
Aluminium	11 508	5.6	0.030	8 242	5.9	0.034	2 515	5.2	0.039
Petroleum	8.701	5.9	0.032	6 581	7.3	0.036	1 536	3.4	0.031
Manganese	2 281	9.5	0.054	607	8.4	0.053	1 339	4.9	0.063
	50 716	6.0		32 925	6.5		8 481	4.1	

Source: UNCTAD calculations based on the OECD International Transport and Insurance Cost for Merchandise Trade database.
Note: Landlocked countries in the sample: Botswana, Burkina Faso, Burundi, Central African Republic, Eswatini, Ethiopia, Lesotho, Malawi, Mali, Niger, Rwanda, Uganda, Zambia, Zimbabwe.

A variety of factors will impact c.i.f. such as geography (distance, landlocked or island status) and infrastructure (quality of transport facilities, as well as information and communication technologies) for transport costs (Limão and Venables, 2001). From the OECD database, the following trends are observable:

(a) For high value commodities (gold, platinum and diamonds), c.i.f. is around 2 per cent of export value (table 5);

(b) Copper, aluminium and petroleum are close to the 6 per cent of c.i.f. recommended by IMF;

(c) Manganese and iron are closer to the 10 per cent adjustment widely used in the literature;

(d) For intra- and extra-African trade, c.i.f. follow a similar pattern. However, the trade costs for landlocked countries seem to be lower than for all intra-African trade. In this case, the following needs to be determined: whether the cost for the final destination is included or only until the next border or transit point.

The gradual shift from estimating the partner-country trade gap based on total trade vis-à-vis partner countries towards the more detailed commodity-based approach needs more precise estimates of c.i.f. Adding 10 per cent of export value to account for the difference in valuation might be a good proxy when using total exports but hides significant heterogeneity across commodity groups.

Trade reporting within an African customs union

This chapter has presented an in-depth partner-country commodity-based analysis of trade misinvoicing, while also taking account of statistical errors stemming from the international merchandise trade statistics. The quality of available data varies across countries. For example, 55 per cent of developed countries use customs declarations as the main source of international trade statistics, and supplement these with other administrative records associated with taxation and enterprise surveys. In contrast, 98 per cent of developing countries rely purely on customs declarations (UNSD, 2008).

Other statistical challenges in matching bilateral trade data are linked to differences in trade reporting. The results of the 2006 and 2016 national compilation and dissemination practices survey conducted each decade by UNSD is used to highlight trade reporting differences in the African context. The survey covers up-to-date information on national compilation and dissemination practices, as well as the degree of compliance with United Nations guidelines (for more information, see Schuster and Davis, 2020). The survey results for 2006 and 2016 are not robust. For example, in 2016, Madagascar and Seychelles reported not being members of a customs union. Yet both countries are members of the Common Market for Eastern and Southern Africa, which has operated as a customs union since 2009, and are also part of the Southern African Development Community, which has operated as a customs union since 2010. Furthermore, some countries such as Botswana, Cameroon and the Gambia do not report intraunion trade, whereas others do, including Ethiopia, Lesotho, Malawi, Namibia, Rwanda and Sierra Leone. South Africa indicated that it did not report intraunion trade in 2006 but did so in 2016. This creates an additional layer of potential statistical error as not all countries are covered in the survey, some answers do not identify one or the other case precisely and trade reporting changes over time. This makes it necessary to undertake a careful descriptive data analysis to identify changes in intra-Africa trade patterns that can be attributed to changes in reporting.

Trade reporting systems

The trade reporting system governs how individual transactions are recorded at the national level and is the foundation of aggregates reported in United Nations Comtrade. There are two different types of trade reporting systems, general and special. In the case of the general trade system, the economic territory and the statistical system are consistent, meaning that all merchandise entering and leaving the country will be recorded. The special trade system allows for some exceptions, such as special economic zones, bonded customs warehouses or industrial free zones. Countries that apply the special trade system account for a smaller proportion of trade than countries that use the general trade system. If countries use different trade reporting systems, it introduces another statistical reason for discrepancies in mirror trade data.

The survey does not clarify why South Africa switched from the general to the special system between 2006 and 2016. The South African Revenue Service reports that it follows a hybrid special strict trade reporting system, which includes warehoused goods for local consumption, but goods imported and exported for processing are excluded from trade statistics. Efforts are being made to move towards the general trading system to allow for a better international comparison of trade statistics. The importance of the different application of trade systems is directly linked to the relative size of special economic zones in Africa. If a country uses the special reporting system but its special economic zones are relatively small compared with total international trade, such discrepancies might be ignored. Generally, the value of the metadata survey would be significantly increased if the results could be checked for inconsistencies with the countries when queries arise. In addition, the presentation of the results does not allow for a comparative analysis without manually summarizing them and would benefit end users if they could be downloaded in a spreadsheet. The change in numbering of survey questions, especially without a correspondence table, is another non-standard anomality, which makes a comparative analysis by end users more difficult. Other relevant questions related to the timing of regime switches, such as “When did you switch from the special to the general trade system reporting?” would make the survey results more meaningful and allow for a better comparison across time.

2.4 Concluding remarks

The magnitude of trade mispricing in Africa based on a range of estimates varies from $30 billion to $52 billion per annum. The scarcity of available geological information in Africa and the resulting information asymmetry between mining companies that have the means to acquire private information about reserves and Governments makes

the extractive sector particularly prone to illicit outflows (UNECA and African Minerals Development Centre, 2017). There are only rough estimates of potential reserves available on the continent, as significant information gaps impede robust data collection on mineral and metal resources in Africa (World Bank, 2017b). As noted for gold, high-value low-weight commodities are especially prone to smuggling (UNCTAD, 2016). With rapidly rising demand, the risk of smuggling of rare earth minerals is increasing and their improved governance should be a policy priority for well-endowed countries and requires comprehensive geological surveys.

There is uncertainty with regard to the quality of African trade statistics, especially for intra-African trade. The United Nations Comtrade metadata survey, which could shed light on what is covered in international trade statistics, lacks a comprehensive and consistent database. The frequency of reporting and quality of trade data is linked to institutional capacity and so is the probability of trade-related illicit financial outflows; thus, there is a downward bias in the estimates in this chapter, since countries that have the highest probability of incurring trade misinvoicing also have the highest probability of low-quality trade reporting, of being excluded from the sample due to non-reporting or of missing too many years of data (only countries with at least 10 observations between 2000 and 2018 are included).

Informal cross-border trade is estimated to be as large as officially recorded trade for some country borders and specific products in Africa (Morrissey et al., 2015). This renders the partner-country trade gap method less significant for the detection of systemic trade misinvoicing for intra-African trade as errors and variation in the data is more prevalent, which hinders the scope for inference about trade-related IFFs with a reasonable confidence interval. Nonetheless, the method adds value to the analysis of intra-African trade patterns because it helps identify gaps in trade recording and,

together with production or resource endowments information, could be used to identify potential rules of origin violations.

The partner-country trade gap method cannot capture the origin of IFFs but reflects a channel through which funds leave a country. Even when trade misinvoicing can be clearly recognized, it does not facilitate the identification of the underlying crime (for a critique of the method, see Forstarter, 2017). This may be due to the circumvention of capital controls, the evasion of taxes, the laundering of proceeds of crime, bribery or the financing of terrorism. However, the method can identify industries with a high risk of IFFs or at least alert government officials to areas in which trade is not being properly recorded as a good first line of defence, as it is based on publicly available data.

These limitations bring to light the necessity of a triangulated approach to identify IFFs, including information on other criminal activities that generate cross-border financial flows and evasive intrafirm trading that can drain countries' financial resources without the necessity of fraudulent invoices, to generate a comprehensive picture of the scale of IFFs. Even if trade misinvoicing can be clearly identified, customs fraud will only be captured by the mirror trade gap if smuggling or misinvoicing is only one sided. However, if trade partners at both ends of the transaction collude, the trade value reported in both countries will be equal. Other non-commercial pathways of IFFs are more opaque and it is thus more difficult to quantify their magnitude.

Chapter 2 annex

Table A.1

Data availability in United Nations Comtrade, 2000–2018

	Years
Algeria	2000–2017 (no gold exports)
Angola	2007, 2009–2018
Benin	2000–2018
Botswana	2000–2018
Burkina Faso	2000–2005, 2007–2017
Burundi	2000–2017
Côte d'Ivoire	2000–2017
Comoros	2000–2013
Cabo Verde	2000–2007, 2009–2018
Cameroon	2000–2017
Central African Republic	2000–2017
Egypt	2000–2018
Eswatini	2000–2007, 2013–2017
Ethiopia	2000–2016
Gabon	2000–2009
Gambia	2000–2017
Ghana	2000–2001, 2003–2013, 2016–2018
Guinea	2000–2002, 2004–2008, 2013–2015
Kenya	2000–2010, 2013, 2017–2018
Lesotho	2000–2004, 2008–2015, 2017
Madagascar	2000–2018
Malawi	2000–2017
Mali	2000–2008, 2010–2012, 2016, 2017
Mauritania	2000–2014, 2016, 2017
Morocco	2000–2017
Mozambique	2000–2018
Namibia	2000–2018
Niger	2000–2016
Nigeria	2000–2003, 2006–2014, 2016–2018
Rwanda	2001–2016
Sao Tome and Principe	2000–2018
Senegal	2000–2018
Seychelles	2000–2008, 2010–2018
South Africa	2000–2018 (no gold or platinum: 2000, 2002)
Togo	2000–2005, 2007–2017
Tunisia	2000–2017
Uganda	2000–2018
United Republic of Tanzania	2000–2018
Zambia	2000–2015, 2017–2018
Zimbabwe	2000–2002, 2004–2018

Table A.1

Data availability in United Nations Comtrade, 2000–2018 *(continuation)*

	Years
Countries excluded due to missing years:	
Congo	2007–2014, 2017
Djibouti	2009
Eritrea	2003
Guinea-Bissau	2003–2005
Libya	2007–2010
Sierra Leone	2000, 2002, 2014–2017
Sudan*	2000–2011
Sudan	2012, 2015, 2017
No data available	
Chad	
Democratic Republic of the Congo	
Equatorial Guinea	
Liberia	
Somalia	
South Sudan	

Source: UNCTAD calculations based on United Nations Comtrade as at November 2019.
* Reference corresponds to the name in use historically during the period covered by the data.

Table A.2

Commodities of interest and their derivative products

(Harmonized System four-digit level, 1992)

	Gold	Platinum	Diamonds	Copper	Iron	Bauxite	Petroleum	Manganese
Raw material (commodity)	-	-	-	2603, 7401	2601	2606	2709	2602
				Copper ores	Iron ores	Aluminium ores	Petroleum oils, crude	Manganese ores
Refined products (first derivative)	7108	7110	7102	7402, 7403	7201–7212	7601	2710	8111
	Gold	Platinum	Diamonds	7405–7412	Iron	7603–7609	Petroleum oils, not crude	Manganese and articles thereof
				Copper		Aluminium and articles thereof		
				7404		7602		
				Non-ferrous base metal: waste and scrap		Aluminium, waste and scrap		
By-products (second derivative)					2821	2818	2711	2820
					Iron oxides	Aluminium oxide	Petroleum gases	Manganese oxide

Source: UNCTAD secretariat.