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Gold Supply Chain Opacity and Illicit Activities: Insights from Peru and Kenya

RESEARCH

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ABSTRACT

Illicit gold flows constitute a major development challenge for governments and a social responsibility challenge for many industries along gold supply chains, including gold refiners and jewelry retailers. This paper highlights aspects of gold supply chains that lack transparency and may indicate junctures where illicit activities are taking place, resulting in a loss of tax and customs revenues. Using Peru and Kenya as case study countries, we draw from United Nations Comtrade data and qualitative data from field research to examine the magnitude of the gold trade, the forms in which gold is traded, discrepancies in reported trade data, and key trade partners for each country. We suggest that certain portions of gold supply chains should be given more attention, some types of gold exports and imports present greater traceability challenges than others, and some countries play a much more significant role in the global gold trade. We propose areas where further investigations may be warranted to ensure more transparent and responsible gold supply chains.

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1. INTRODUCTION

Gold is used in jewelry, dentistry, medicine, electronics, and aerospace, and has long been a form of monetary exchange and investment. Over 20% of this gold is produced by the artisanal and small-scale gold mining (ASGM) sector (IGF 2017), which provides income and employment for over 20 million workers worldwide (World Gold Council 2022). Although there is no common definition, typically artisanal and small-scale mining is characterized by individuals, groups, or cooperatives, with relatively small and labor-intensive operations and low-capital forms of production and processing (Hentschel et al. 2003; Malone and Martinez 2022). Gold supply chains originating from artisanal and small-scale mines are under scrutiny by governments, manufacturers, retailers, and consumers because of allegations of child labor, environmental contamination and degradation, money laundering, and other social problems. This has resulted in increased pressure on downstream buyers to source gold from 'responsible' supply chains, raising the fundamental question of whether artisanal and small-scale gold supply chains are or can be transparent.

The decentralized nature of gold supply chains, the extent to which gold aggregates along the supply chain, and its malleability are just some of the factors that make it challenging to trace gold back to its origin. This is especially the case for gold from artisanal or small-scale mines, as it often changes hands several times prior to being exported out of its country of production (legally or illegally). In most cases, gold is mined and traded by actors who operate informally in the 'extralegal' economy, generating household income outside the bounds of state institutions (De Soto 2000; Siegel and Veiga 2009). It is common for smaller quantities of gold from different locations to be aggregated together at different points during processing, refining, and trading. This not only obfuscates the origin of this gold, including the context in which it was produced and the potential risks present, but it also creates a greater number of entry points that can be intercepted by or infused with illicit activities, including other kinds of trafficking (i.e. drugs, weapons), money-laundering activities, and extortion (FATF and APG 2015).

Gold flows and their associated financial flows, which are often cash-based transactions and untraceable, constitute a major developmental challenge for artisanal and small-scale gold-producing countries. Illicit gold flows have been linked to other criminal activities, as gold can serve as an effective vehicle for laundering proceeds of crime or bypassing certain financial regulations put in place to combat terrorist financing (FATF and APG 2015). Further, the magnitude of the illicit gold sector in some countries constitutes a significant revenue loss for governments, which miss out on various forms of tax collection. Furthermore, illicit gold flows often originate from or intersect with the informal ASGM sector and communities in mining regions, resulting in an even more tenuous status for ASGM-based livelihoods. Consequences such as environmental damage and human rights violations can be more pronounced and less likely to be regulated or mitigated when mining is tied to illicit flows. Finally, illicit gold flows constitute a major compliance and corporate social responsibility challenge for various downstream industries.

In this paper, we provide an initial analysis of the non-monetary gold trade to reveal areas that may be potential causes for concern among downstream users attempting to source from transparent gold supply chains. To do this, we provide case studies from two countries, Peru and Kenya. Peru is the eighth-largest gold producer in the world and the largest (official) gold producer in Latin America (USGS 2020). Although Kenya is less of a player in the global gold trade, there are roughly a quarter of a million people who rely on informal ASGM activities for their livelihoods, and there are some indications that Kenya's role in illicit flows of artisanal gold produced in East Africa may be underestimated (IMPACT 2021; Solidaridad 2022).

For this analysis, we first examine the quantity and types of gold products exported from and imported to Peru and Kenya over a 21-year period, as reported to UN Comtrade by these countries and their trade partners. We specifically pay attention to discrepancies that appear in the reported values and volumes of material traded and highlight notable features to demonstrate long term trends; we supplement these analyses with qualitative data from interviews. We conclude that for Peru, while gold metal supply chains show relative obscurity from the sites of production to the sites of export, certain gold imports and exports, in particular those declared as ores and concentrates may present more traceability challenges than gold metal. In contrast, for Kenya, gold metal supply chains are relatively obscure throughout exportation. Both countries' analyses also highlight specific trade partners (US and Colombia for

Peru and the UAE and India for Kenya) where discrepancies in reported trade data may justify a closer look. These analyses highlight areas where further investigations may be warranted to ensure more transparent and responsible gold supply chains.

2. SEEKING TRANSPARENCY AND RESPONSIBILITY IN GOLD SUPPLY CHAINS

There have been efforts made at different scales to promote and assess transparency and responsibility in gold supply chains. Upstream actors in the ASGM sector, or those who are at the sites of extraction, have been targeted through laws and certifications administered by government and by non-governmental organizations (NGOs), while downstream actors, or those who handle post-manufactured goods, have been encouraged or mandated to use 'responsible' gold in their supply chains and to carry out greater due diligence on where and how the gold used in their products is produced.

2.1 REGULATING THE UPSTREAM SECTOR

Governments have focused primarily on formalizing artisanal and small-scale miners to address negative aspects of ASGM activities, including environmental damage, health and safety risk, illicit financing, and other issues. Globally, however, 70–80% of the sector continues to work informally (IGF 2017). In Peru, there are more formalized ASGM operators than anywhere else in the world, with estimates of the number of people in Peru working directly in ASGM ranging from 100,000 to 500,000 (De Echave 2016). Yet the number of miners formalized in Peru still only accounts for about 2% of the total ASGM population (Martinez et al. 2021). There are also several large- and medium-scale gold mining operations in Peru. Some medium-scale operations have agreements with artisanal and small-scale miners where they allow them to mine on their concessions and purchase their gold (Rodriguez-Novoa and Holley 2023). In other cases, gold is processed locally using mercury, a processing agent that can create deleterious environmental and health impacts and is then sold to buyers who sell to refineries for further processing (Smith 2019). These dynamics create complex gold supply chains, as several intermediaries are involved at various points before the gold leaves the country.

Most of Kenya's ASGM sector remains informal. Several factors have contributed to this, including, but not limited to, poor governance (Tampushi et al. 2022). Compared with other East African countries, Kenya has not garnered the same attention with respect to its role as both a small-scale gold producer and a transit country for illicit gold flows from other countries – including South Sudan and the Democratic Republic of Congo (DRC) (IMPACT 2021). Although a recent report published by the Global Initiative Against Transnational Organized Crime (GI-TOC) documented important nodes in Kenya that serve as transit points for gold originating in South Sudan en route to the United Arab Emirates (UAE) (Hunter and Opala 2023). Kenya's domestic ASGM sector produces an estimated 6.9 tons annually (Ministry of Environment and Forestry 2022). This is relatively small production compared to the region's larger producers, such as the Democratic Republic of Congo (DRC) (ACE 2020) or Tanzania (Vice President's Office 2020). Despite its relatively smaller size, the sector provides a significant contribution to livelihoods, supporting approximately 250,000 miners (Solidaridad 2022). Factoring in dependents, the sector is estimated to support approximately 800,000 individuals in the country (Ministry of Environment and Forestry 2022).

Kenya underwent a regulatory update of its mining code in 2016, which covers artisanal, small-, and large-scale mining. This update sought to provide further provisions for ASGM activity, including the zoning of land, permitting and licensing, and governance reforms at the local and national levels. In the Great Lakes region of Africa, where concerns over the use of gold and the 3Ts (tin, tantalum, and tungsten) as a source of conflict financing have garnered significant regional and international attention, a Regional Certification Mechanism (RCM) has been established by member states of the International Conference on the Great Lakes Region (ICGLR), with some members having domesticated this mechanism into national law (Mulungi 2016; Odyek 2020). The RCM is a regional standard that requires member states to have an internal chain of custody tracking system to ensure that gold and 3T minerals are traceable and conflict free (Blore and Smillie 2011). Though partially operationalized in some countries, overall implementation of the RCM – especially as it relates to gold – has been slow, and Kenya has not taken major steps to implement it.

Other initiatives targeting upstream actors in gold supply chains include voluntary gold certification schemes administered by NGOs. These include the Fairtrade gold certification administered by Fairtrade International and the Fairmined gold certification administered by the Alliance for Responsible Mining (ARM). These programs provide a premium for gold produced by small-scale miners who are working formally and who comply with a set of environmental and labor standards (Martinez et al. 2022). In some sites in Latin America, voluntary gold certification schemes have been shown to improve working conditions for miners and have led to better environmental practices (Martinez et al. 2022; Martinez et al. 2021); however, voluntary certification programs have not achieved the same level of success to date in sites in Africa (ARM 2022).

2.2 INITIATIVES TARGETING DOWNSTREAM USERS OF GOLD

The downstream gold buying market has also been targeted with a series of regulations and guidelines that mandate or encourage due diligence. Gold was one of the first minerals of focus in the creation of the OECD (Organization for Economic Co-operation and Development) *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, which seeks to "help companies respect human rights and avoid contributing to conflict through their mineral sourcing practices" (OECD 2016: 3). Gold is also one of four minerals targeted by Section 1502 of the US Dodd Frank Act and the European Union's Conflict Minerals Regulation (2010), which put in place a set of requirements for US and European importers of the 3Ts and gold from conflict-affected regions, respectively (Macchi 2022). These were some of the first regulations aimed at curtailing the sourcing of gold from the DRC (Dodd Frank) or other countries with armed conflicts or in violation of international law (EU Conflict Minerals Regulation). Although they represent steps toward ensuring more responsible and transparent gold supply chains, the reach of these regulations is relatively limited given that some of the largest gold market buyers are not captured by them – such as companies based in the UAE, India, Turkey, and China.

In the US, the Federal Trade Commission (FTC) regulates the jewelry industry by requiring companies to not misrepresent various aspects of gold used in their industry, including its origin (FTC 1996). The FTC also periodically publishes 'Green Guides,' which provide guidance for industries on how to make and substantiate environmental claims and avoid 'greenwashing.' Other organizations also set responsible sourcing standards for the jewelry industry, including the Responsible Jewellery Council (RJC), the largest industry-led standard-setting organization.

3. THE ILLICIT FLOW OF GOLD

Illicit flows of gold typically involve the deliberate obscuration of the gold's origin so that it can be merged into the legitimate supply chain. In this respect, the process of gold laundering is roughly analogous to that of money laundering, in that it necessitates three steps: placement, layering, and integration (Albanese 2011). The gold must first be 'placed' by being introduced into the supply chain. It can then be 'layered' through a series of moves that place barriers to due diligence between the gold and its origin as it moves along the supply chain. In money laundering, such layering involves a number of transactions, accounts, companies, and financial institutions; for gold laundering, the same process adheres, but with jurisdictions often playing the most important role. While intermediaries are important, especially for laundering gold within its country of origin, the more countries the gold transits, the more effectively its origin can be obscured or falsified. In this way, the gold can ultimately be 'integrated' as carrying no evident risk of illicit origins, and its value can be safely recaptured.

Some legal and regulatory frameworks related to the gold supply chain contain loopholes that can provide mechanisms for obscuring the origin of gold. The most prevalent of these involves what customs personnel sometimes term a 'tariff shift.' The basic principle is that when a substantive change occurs with a good as it passes through a transit hub, changing its Harmonized System (HS) code, the transit hub becomes, for customs purposes, the country of origin. For example, gold doré (HS Code 710812) from Country A might be exported to an intermediary in Country B, where it is smelted and used to manufacture gold jewelry (HS Code 711319) before being imported into Country C. The change in tariff code means that, on the gold's arrival in Country C, Country B can be listed as the gold's country of origin, effectively concealing the actual origin of the gold itself.

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Gold is also laundered into the legitimate supply chain through fraudulent paperwork, some of which exploits regulatory frameworks designed to prevent gold laundering. This typology is often linked to laundering gold within its country of origin. A small-scale miner enrolled in a formalization program may gain a degree of regulatory credibility; that miner can then be used to add a veneer of legitimacy to illegally mined or smuggled gold. One recent case in Peru, for instance, involved an organized criminal group concealing the origin of millions of dollars' worth of gold by falsifying documents through the Integral Registry of Mining Formalization (REINFO), which functions through the Regional Directorate of the Ministry of Energy and Mining (MINEM). The gold, which was warehoused at the Port of Callao for intended shipment to Dubai, China, and Switzerland, left a trail through official records, including those of Peruvian customs (Praeli 2020). Such document trails can expose key actors and convergence nodes in illicit supply chains and potentially reveal further contacts, front companies, and other inputs that in turn expose the illicit financial flows linked with the criminal supply chains.

Specifically, gold jewelry in the marketplace is not subject to being tested (i.e. fire-assayed) for purity, for the obvious reason that the jewelry would be ruined. This immunity to being assayed creates room for various kinds of fraud or money laundering using jewelry (OECD 2022). In Latin America, a series of criminal investigations dating back decades have found gold jewelry to be a favored mechanism for money laundering and gold laundering (OAS 2022). In 2019, for instance, a Colombian criminal organization was found to be smuggling gold bars to Panama, where the gold was sold via countertrade for bulk jewelry from Panamanian wholesale jewelers; the jewelry was then resold in Colombian retail stores beneficially owned by the criminal organization, effectively laundering large sums of narcotics proceeds (En Segundos 2019). In Peru, there is evidence that jewelry companies in large cities play a role as both gold buyers in, and mercury suppliers to, the illicit market (IUCN NL 2021). The pattern of illicit mercury dealers operating behind the veneer of a legal enterprise such as a jewelry or trading store is consistent with findings encountered elsewhere in Peru (Smith 2019), the DRC (Martin 2019), and Kenya (IMPACT 2021).

Beyond its own production, Kenya has served as a transit hub for gold produced in other countries in the region for several decades. South Africa Resource Watch (SARW 2014) has noted that Indian families that had established themselves in Nairobi began purchasing gold from Congolese traders as early as the 1950s, either by traveling to the DRC and bringing back undeclared gold or by purchasing it from Congolese traders who traveled to Nairobi. Kenyan traders continue to play a significant role in the DRC's artisanal gold sector, such as in Bunia, Ituri province, where they are involved in the trade of other goods and services beyond the purchase of gold, such as petrol. Beyond the DRC, Kenyan gold traders play a significant role across much of the East African region. For example, they play a significant role in South Sudan's informal gold markets – particularly in Kapoeta – repatriating gold purchased to Kenyan gold hubs in Nairobi and its vicinity (Hunter and Opala 2023). Further, Kenyan gold traders engage in considerable cross-border trade in gold – in both directions – into Uganda (Global Rights Alert, 2020).

Gold produced in Kenya or transiting through Kenya from other countries often makes its way to other transport points prior to leaving the continent and making its way onward to international gold trading hubs, like the UAE. For example, during our field research, one ASGM supply chain actor commented, 'It is easy to smuggle gold to Uganda, to Tanzania, and to Rwanda and easily export it as compared to Kenya.' Another trader remarked that he preferred to smuggle gold via road travel into Uganda or further to Kigali. The direction of the flow of illicit gold in the region is often dependent on a variety of factors, including legislative or policy change in one or more countries (particularly related to taxation), varying levels of scrutiny from different government agencies in different countries, corruption, the flow of funds that have pre-financed gold production and trade, oscillating security contexts from local to regional levels, and supply and demand factors.

3.1 INDICATORS OF ILLICIT FLOWS

Global trade discrepancies have long been examined as indicators of illicit activities within supply chains. Investigations into trade misinvoicing can be traced back to Ferraris (1885), who examined the accuracy of gold trade statistics. Since then, several studies have compared bilateral trade data to reveal discrepancies between countries in trade invoicing (see Bhagwati 1974; Biswas and Marjit 2005; Buehn and Eichler 2011; Fisman and Wei 2004; Kellenberg

and Levinson 2018). The basic principle underlying such investigations is that a commodity's reported value should be the same for the country that is exporting that commodity, as the value reported by the country importing it.

In the extractive industries, 'misinvoicing' may be more common because of the large volumes of exports and a lack of capacity among regulatory agencies in resource-rich countries of the Global South (UNCTAD 2016). Trade values can be deliberately under-invoiced to avoid import duties or not reported at all upon entry into a country, resulting in a loss of revenue from trade taxes (UNCTAD 2016). Deliberate misinvoicing is generally driven by three motives: maximizing profits by avoiding tariffs or by taking advantage of export subsidies (Bhagwati 1974; Buehn and Eichler 2011; Kellenberg and Levinson 2018); avoiding exchange and customs controls (Biswas and Marjit 2005); and circumventing bureaucratic processes (corruption/smuggling) (Fisman and Wei 2004). Although misinvoicing may reflect illicit flows of commodities, legitimate discrepancies may appear in the trade value data due to the cost of freight, insurance, and duties, which are paid by the importing country and are generally calculated at 10% of the total reported value (UNCTAD 2016). Lag time in reporting and misclassification of commodities, either deliberately or not, can also be responsible for discrepancies in commodity values (UNCTAD 2016).

In some cases, there are 'perverse' discrepancies where the value of a country's imports of a commodity is less than the value of the corresponding exports of its trading partner (Bhagwati 1974). In other cases, there are 'excessive normal' discrepancies, which appear when the importing country reports much more value for the goods than is to be expected, taking into account freight costs, insurance, and duties (Bhagwati 1974). Compromising the transparency of gold supply chains still further, not all misinvoiced trade results in a notable difference between export and import values. Trade volumes may also be manipulated resulting in significant discrepancies in trade data (Vincent 2004). Although discrepancies in trade volumes for gold have received less attention than trade values, in this study, they emerge as potentially important indicators for detecting illicit activities.

4. METHODS

To examine Peru and Kenya's gold trade, we used data from the UN Commodity Trade Statistics database (Comtrade; UN Statistics Division, various dates) on commodity imports and exports over a 21-year period (2000–2020). The database contains import and export values for over 7,000 commodities, as reported by authorities in approximately 200 countries. In the Comtrade database, globally traded commodities are assigned an HS code, which groups them according to the material of which they are composed. Customs authorities use these codes to calculate duty and tax rates on traded goods. We identified HS codes corresponding to four main categories of gold: metal, waste and scrap, jewelry, and ores and concentrates (Table 1).

GOLD FORM	HS CODES	DESCRIPTION
Metal	HS 7108.11 HS 7108.12 HS 7108.13	*Non-monetary gold (including gold plated with platinum) unwrought or in semi-manufactured forms, or in powder form*
Waste and scrap	HS 7112	*Waste and scrap of precious metal or of metal clad with precious metal; other waste and scrap containing precious metal or precious metal compounds, of a kind used principally for the recovery of precious metal*
	HS 7112.91	*Waste and scrap of gold, including metal clad with gold but excluding sweepings containing other precious metals*
	HS 7112.30	*Ash containing precious metal or precious metal compounds*
	HS 7112.9, HS 7112.99	*Other*
Jewelry	HS 7113, HS 7113.1, HS 7113.11, HS 7113.19, HS 7113.20	*Articles of jewelry and parts thereof, of precious metal or of metal clad with precious metal*
Ores and concentrates	HS 2616.90	*Precious-metal ores and concentrates, excluding silver ores and concentrates*

Table 1 Harmonized System codes used in this study.

Source: Authors' construction based on the Comtrade database.

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Both monthly and yearly trade data can be obtained using Comtrade, and for each trade transaction, there should be two reports in the dataset–one from the exporter (source) country and one from the importer (destination) country. Not all countries report all their trade activities to the UN, and many trade transactions are reported by only one party. Therefore, we mainly focused on transactions where both parties reported the trade values. We paid close attention to transactions that showed significant discrepancies between the amounts of trade reported by respective parties. Given that we do not know the exact causes of trade data discrepancies and there are some legitimate reasons for these, as mentioned, we centered our analyses on the temporal changes in trade volume and the discrepancies that surfaced among the different forms in which gold is exported.

Although our emphasis here is largely quantitative, we supplemented our analysis of the UN Comtrade data with data from field research in both Peru and Kenya. Members of our team have been conducting academic research in small-scale mining communities in Peru since 2016 and have been working in the African Great Lakes region on topics related to conflict minerals since 2005. Over the course of this period, we have carried out numerous interviews with government officials, regulators, miners, and community members and have practiced participant observation at mine sites, in government offices, and in artisanal and small-scale gold mining communities, as well as during NGO- and government-sponsored workshops and trainings in artisanal and small-scale gold mining regions. Through these endeavors, we have gained a better understanding of the nuances in gold supply chains in each country. During the past year, we focused some of the interview questions we asked of approximately twenty government and gold supply chain actors on topics more specifically related to regulating and participating in the gold trade in their jurisdictions. This interview protocol was approved by an International Review Board for Human Subjects Research, informed consent to participate in the study was obtained from participants, and all research subjects have been anonymized.

5. RESULTS

We first analyzed the amount and forms of gold exports and imports for Peru and Kenya to identify trade discrepancies and the scale at which they occur.

5.1 PERU'S GOLD TRADE

For Peru, gold exported in the form of metal had the highest value and showed the least discrepancies in reported values from 2000 to 2020 (Figure 1). Gold waste and scrap had the lowest value over time, and no data for gold scrap appeared in the Comtrade database until 2006. Thereafter, trade values for gold waste and scrap showed few, if any, discrepancies, with two obvious exceptions, including an excessive normal discrepancy (where the importing country reported a value exceeding the 10% margin for costs such as freight and duties) in 2016 and again in 2020. The value of gold jewelry traded was relatively consistent and did not exceed US$13 million until 2018, when it increased tenfold to nearly $130 million. Over the

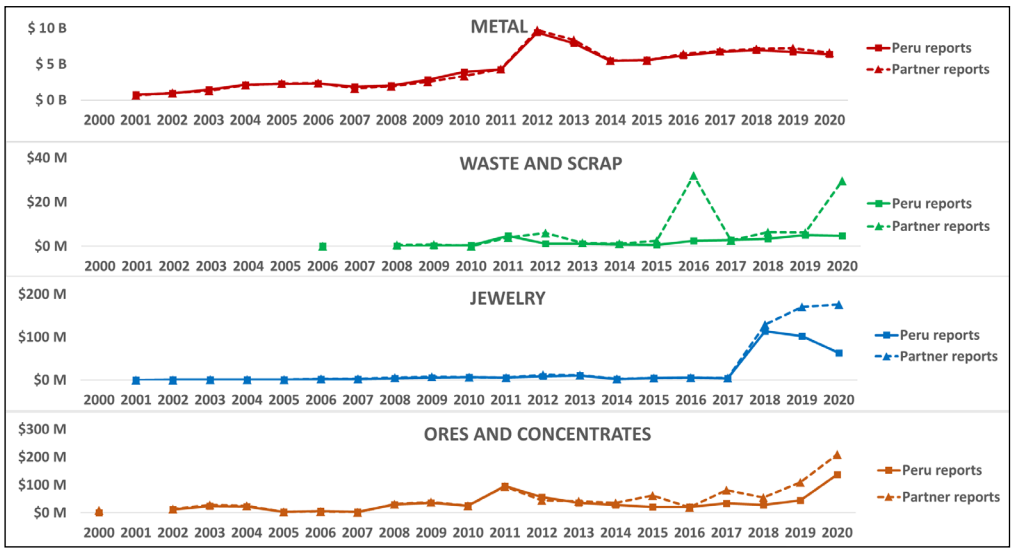


Figure 1 Peru's gold exports, 2000–2020.

Source: Authors' illustration based on Comtrade data.

next two years, jewelry trade values diverged significantly. This resulted in excessive normal discrepancies of more than 66% in 2019 and 178% in 2020. The value of ores and concentrates remained below $40 million until 2011, when it increased to nearly $100 million. The values increased after 2016, reaching the highest point in 2020. There were significant discrepancies after 2015, with the greatest excessive normal discrepancies in 2015 and 2019.

Gold metal was officially exported from Peru to seven countries, with Canada, Switzerland, and the US accounting for the majority (Figure 2). Notably, there was a lack of gold metal exported to Colombia. Most of the reported values showed few to no discrepancies after taking into account the 10% margin. However, the US and the United Kingdom (UK) showed perverse discrepancies, reporting a lower value of gold metal imports from Peru than Peru reported as exports to these countries.

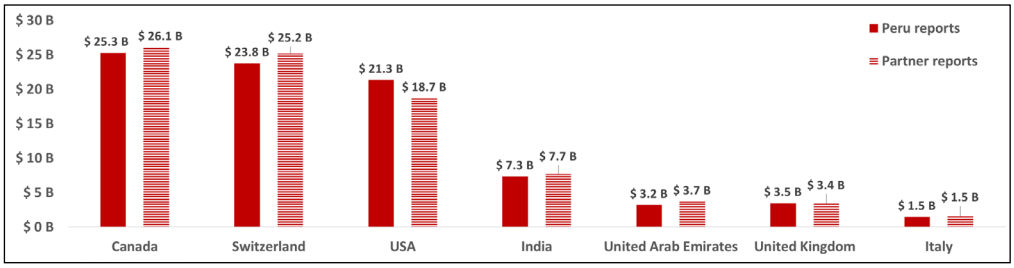


Figure 2 Peru's gold metal exports and importing countries, 2000–2020.

Source: Authors' illustration based on Comtrade data.

Gold waste and scrap was exported from Peru to six countries (Figure 3). The trade between Peru and Belgium showed the greatest discrepancies, with Belgium reporting a value of 32 times more in imports than Peru reported as exports to Belgium.

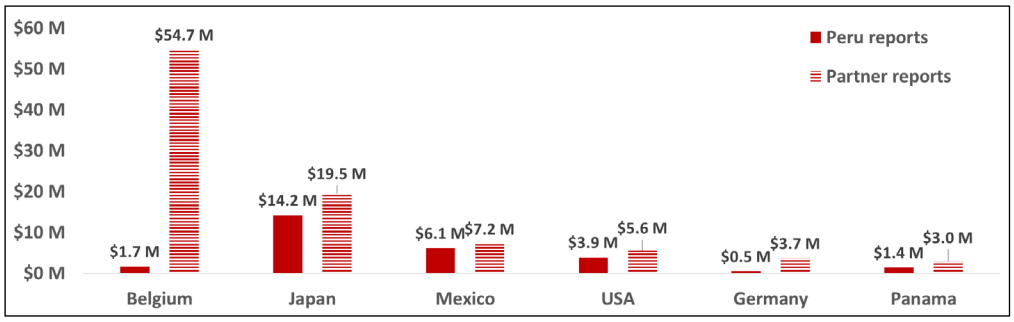


Figure 3 Peru's gold waste and scrap exports and importing countries, 2000–2020.

Source: Authors' illustration based on Comtrade data.

Within the 21-year period, the majority of Peru's gold jewelry exports went to the US (Figure 4). Over this time, Peru reported just over half of the value of gold jewelry that the US reported receiving from Peru. A closer look at the data showed that in 2020, both Peru and the US reported trade volumes of between 5.6 and 5.8 tons, but Peru valued those exports at US$59.1 million while the US valued them at $171.25 million. In 2021, the two countries again reported roughly commensurate trade volumes of between 10 and 10.7 tonnes, but Peru reported the value of that tonnage as $94.1 million and the US as $306.8 million. These discrepancies in reported values are pronounced. Also notable, was the excessive normal discrepancy in jewelry export reporting between Peru and Colombia, with Peru reporting jewelry exports worth $2 million to Colombia and Colombia reporting jewelry imports from Peru worth more than $11 million.

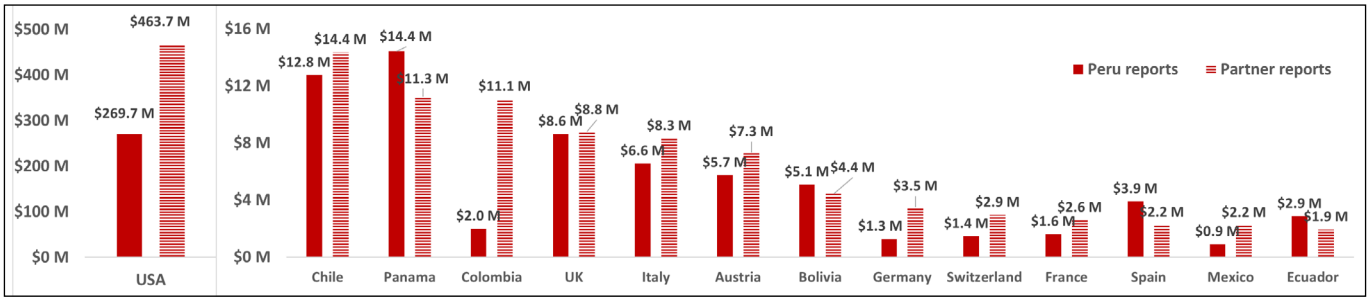


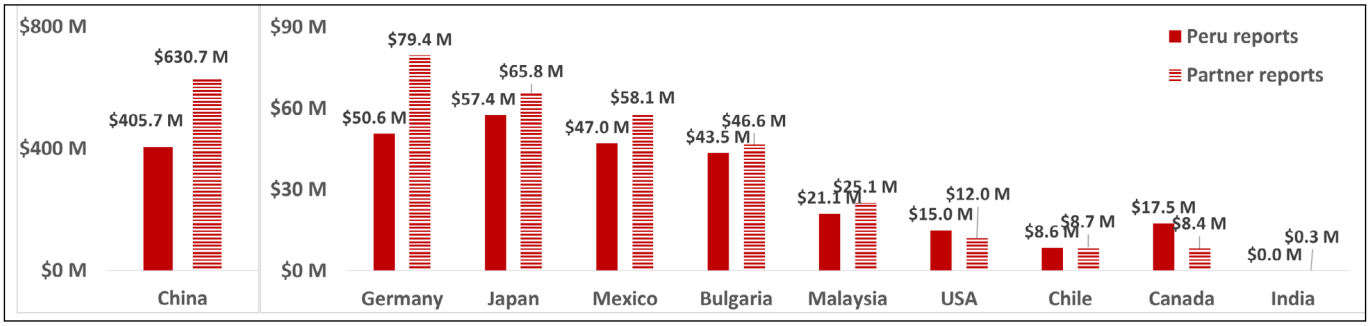
Figure 4 Peru's jewelry exports and importing countries, 2000-2020.

Source: Authors' illustration based on Comtrade data.

Most of Peru's gold ores and concentrates were exported to China (Figure 5) with trade values showing excessive normal discrepancies. This pattern also appears in the trade data reported between Peru and Germany and Peru and Mexico although to a much lesser extent. Japan is only slightly over the 10% margin, and the US and Canada show perverse discrepancies. Peru reported less than US$10,000 in gold ores and concentrates exported to India, while India reported imports worth $0.3 mill from Peru.

Figure 5 Peru's ores and concentrates exports and importing countries, 2000–2020.

Source: Authors' illustration based on Comtrade data.



Peru also imported gold in the form of metal, jewelry, and concentrate. During the 21-year period of this study, the US reported exporting nearly US$245 million in gold metal to Peru, but Peru reported receiving only about US$25 million in gold metal from the US, showing a quite large perverse trade discrepancy. Ecuador also exported gold metal to Peru, with commensurate trade values reported (Figure 6).

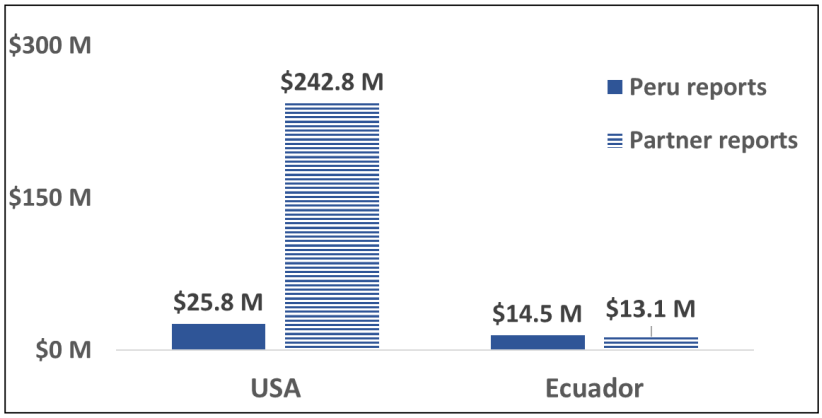


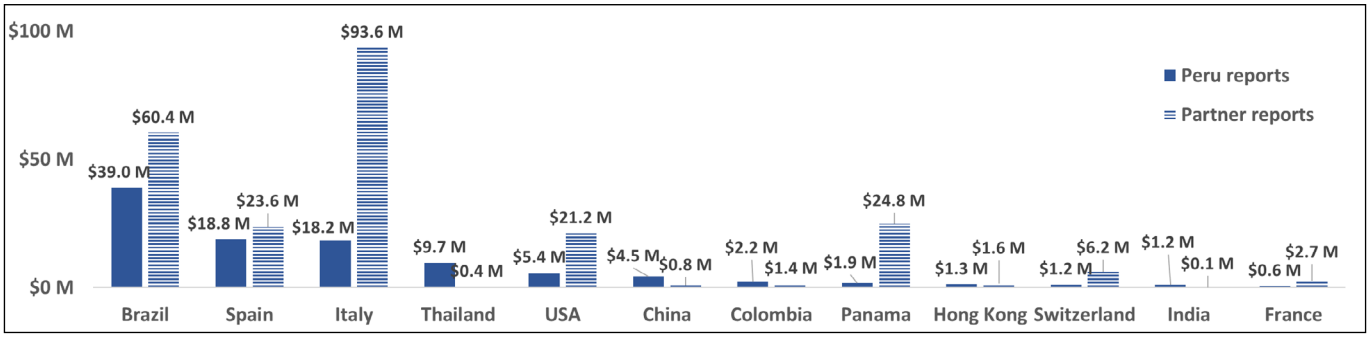
Figure 6 Peru's gold metal imports and exporting countries, 2000–2020.

Source: Authors' illustrations based on Comtrade data.

According to Peru's trade partners' data, Italy, Brazil, Panama, Spain, and the US exported significant amounts of gold jewelry to Peru; however, Peru's reporting on these imports was relatively minimal, showing perverse discrepancies (Figure 7).

Figure 7 Peru's jewelry imports and exporting countries, 2000–2020.

Source: Authors' illustrations based on Comtrade data.



5.2 KENYA'S GOLD TRADE

Over the past 21-year period, Kenya's reporting of gold exports was quite inconsistent, with gold metal showing the greatest discrepancies in reporting, when these data were reported (Figure 8). There was a relative lack of reporting of gold metal by Kenya from 2000–2015, and Kenya only reported only a minimal amount of gold scrap exports in 2015. The country's reported jewelry exports showed a different trend and were the most consistent, which differentiated it from other

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East African countries, including Rwanda, for which jewelry reporting was much more sporadic, and Uganda, which consistently reported both gold metal and jewelry. There was a gap between 2010 and 2015, except for 2013, when jewelry exports from Kenya were not reported by any countries. Of note is the fact that in 2007 and 2015 Kenya's trade partners reported a much higher value of jewelry imported from Kenya than Kenya reported exporting to these countries.

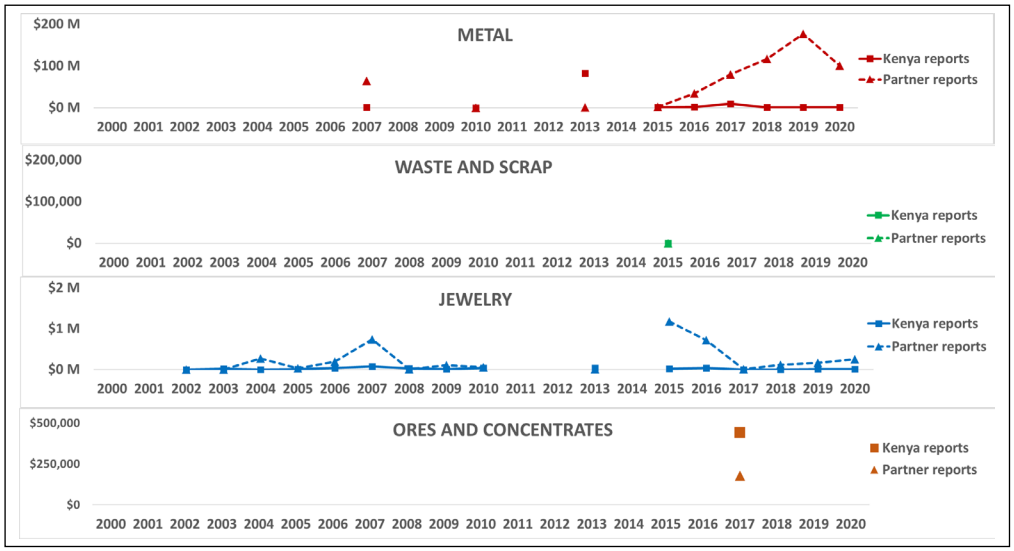

Figure 8 Kenya's gold exports, 2000–2020.

Source: Authors' illustrations based on Comtrade data.

Kenya reported gold metal exports to the UAE and South Africa, with the UAE receiving the majority of gold metal from Kenya and showing an excessive normal discrepancy and South Africa showing a perverse discrepancy (Figure 9). Kenya reported less than US$40,000 of exports to Switzerland; however, Switzerland reported gold metal imports from Kenya valued at over $5 million, showing an excessive normal discrepancy.

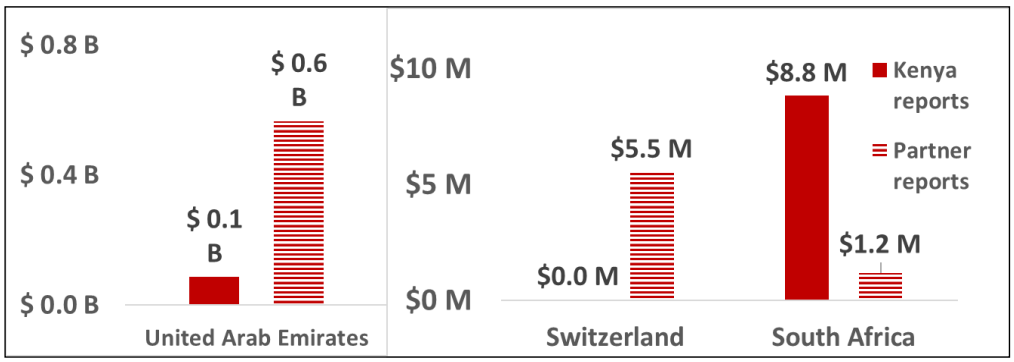

Figure 9 Kenya's gold metal exports and importing countries, 2000–2020.

Source: Authors' illustration based on Comtrade data.

Kenya reported exporting gold scrap to Uganda in only one year (2015), with a normal discrepancy after considering the 10% margin for taxes, duties, and transit costs (Figure 10).

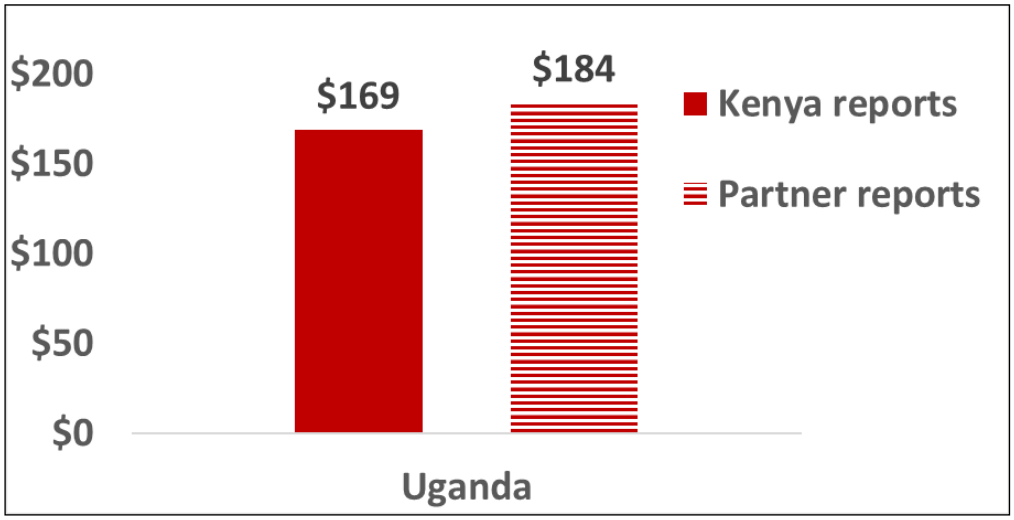

Figure 10 Kenya's gold waste and scrap exports and importing country in 2015.

Source: Authors' illustration based on Comtrade data.

Kenya declared exports of jewelry only to the UK, which, along with the US and UAE, reported receiving gold jewelry from Kenya (Figure 11). The UK showed an excessive normal discrepancy.

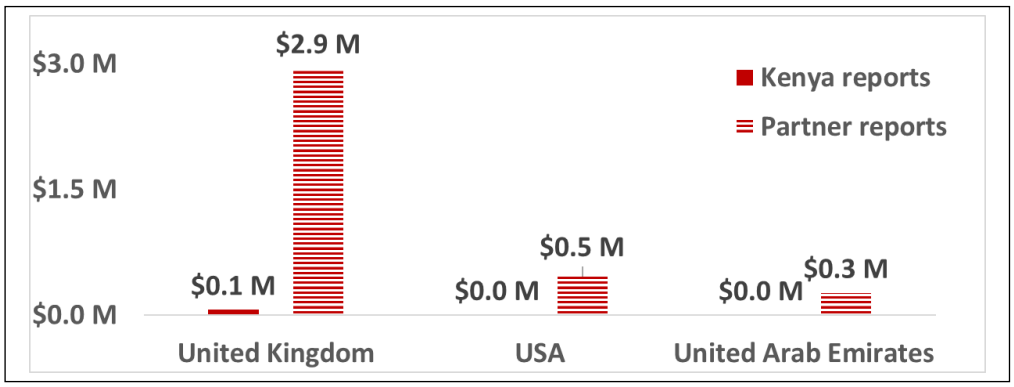

Figure 11 Kenya's jewelry exports and importing countries from 2000–2020.
Source: Authors' illustration based on Comtrade data.

Kenya reported exporting gold concentrates only to Germany in 2017, showing a perverse discrepancy (Figure 12).

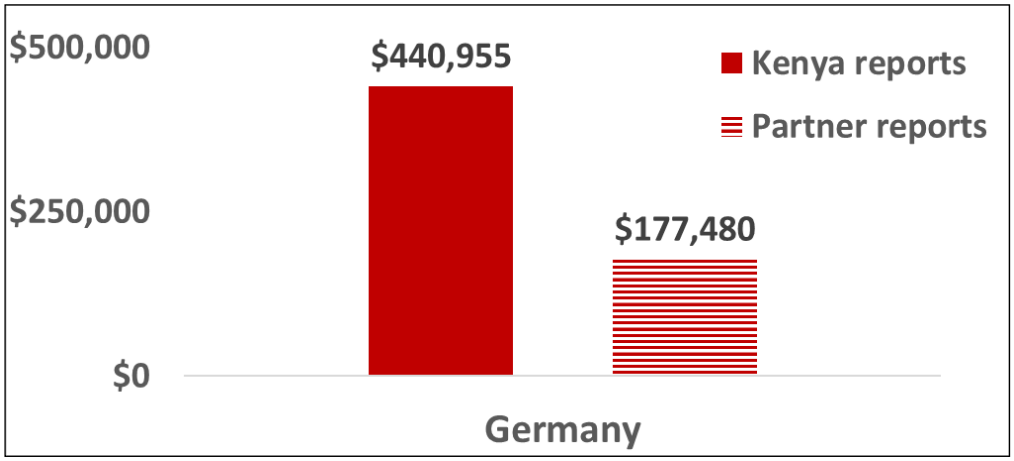

Figure 12 Kenya's ores and concentrates exports and importing country, 2017.
Source: Authors' illustration based on Comtrade data.

Kenya reported minimal gold metal imports, yet the UAE reported a significant amount of gold metal exports to Kenya, showing a perverse discrepancy (Figure 13).

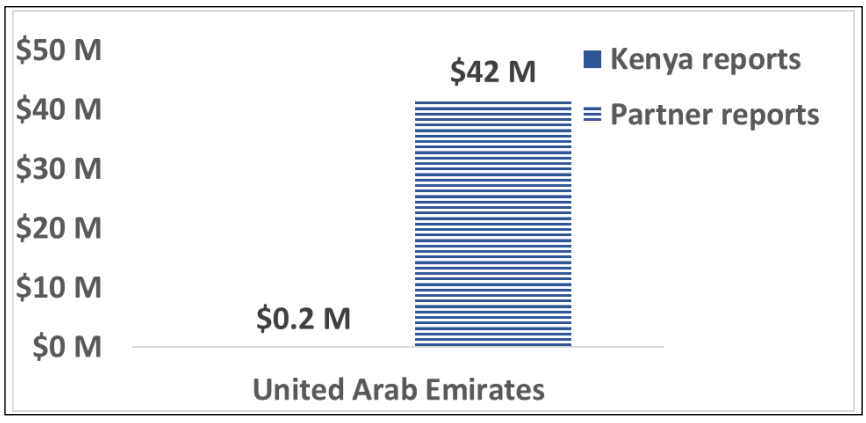

Figure 13 Kenya's gold metal imports and exporting country, 2000–2020.
Source: Authors' illustration based on Comtrade data.

Kenya did appear to import a significant amount of jewelry, primarily from the UAE (Figure 14). While Kenya did not report the bulk of these imports, in 2021 the UAE reported exporting gold jewelry to Kenya with a value of nearly US$45 million–double the amount that the UAE had reported exporting in previous years. The UAE was the only significant exporter of gold-based jewelry to Kenya, with the second-largest exporter being India and the third-largest export being the UK. All of these trade values showed a reverse discrepancy. Kenya did not report any imports of gold ores and concentrates or of gold waste and scrap, and no country reported exporting these goods to Kenya.

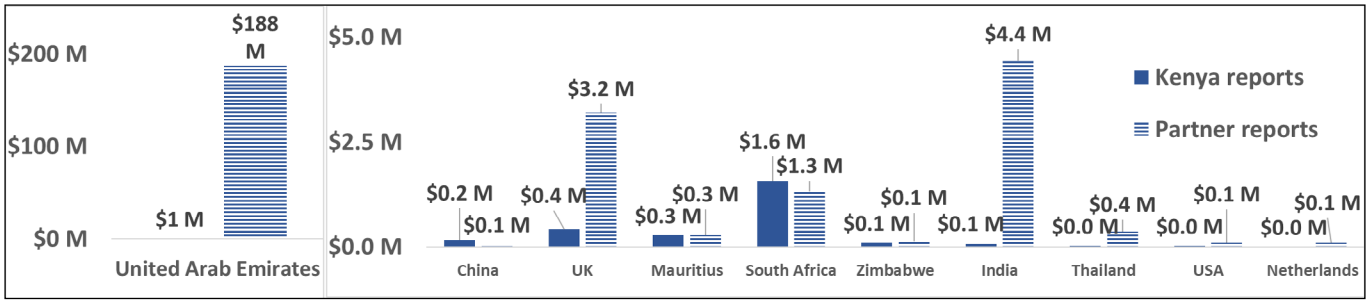

Figure 14 Kenya's gold jewelry imports and exporting countries, 2000–2020.

Source: Authors' illustration based on Comtrade data.

6. DISCUSSION

Some noticeable results emerged from our analysis. In this section, we highlight these and add depth by including qualitative data from our interviews, as well as supporting evidence from the literature. We first focus on Peru, where the scale of gold production and trade is significantly higher than that of Kenya. Our analysis of the Comtrade trade data on Peru's gold exports and imports provides new insights and generates questions about the gold concentrate trade, examines discrepancies in the volume of gold traded as a potential indicator of illicit activities, and highlights the role of a few of Peru's key trade partners. We then turn to Kenya, a smaller gold producer than Peru, but where discrepancies in gold metal and gold jewelry traded spotlights the largely informal nature of gold production in the country, as well as the roles of the UAE and India in the gold trade.

6.1 HIGHLIGHTS FROM PERU

For Peru, over the 21-year period of this study, gold metal exports showed the least discrepancies. There are several large gold mines in Peru owned and operated by multinational companies that export gold as metal, and generally, artisanal and small-scale mined gold is exported as metal. These activities are reflected in the sheer quantity of gold exported from Peru. Given that ASGM contributes up to 20% of Peru's total gold production, this apparent alignment between Peru's reporting and that of its trade partners' reporting is somewhat surprising due to conventional assumptions that ASGM is associated with illicit activities. However, diving deeper into Peru's gold production sheds some light on this. In 2021, the average monthly reported gold production in Peru was nearly half (44%) of the average monthly exports (Martinez et al. 2023), meaning that gold that was not registered with the tax authorities in Peru, was accounted for before it left the country. For Peru, this brings into question how and where gold is made legible within the country and to what extent accountability is assigned and demonstrated along the supply chain.

The reporting of gold waste and scrap and jewelry by Peru and its export partners was relatively aligned over time; however, there are a couple of areas to highlight that give justification for giving more legislative and regulatory attention to gold waste and scrap and jewelry. Gold waste and scrap showed significant excessive normal discrepancies in 2016 and again in the last year of this study, 2020. Gold jewelry showed excessive normal discrepancies in 2019, with an increase in this discrepancy in 2020. Although we cannot determine a relationship between gold waste and scrap and jewelry from these data, any kind of gold, especially unsold jewelry, may be labeled and shipped as scrap (Drummond 2011). This shift in designation can be exploited for anything from tax fraud to laundering the true origin of mined gold (Drummond 2011). The connection between gold waste and scrap and jewelry is evident in the marketing of 'recycled' gold. Big jewelry companies have engaged in the positive marketing of 'green' gold and have stated that they are moving to recycled gold by 2025 (Pandora 2020). This kind of marketing can be misleading and provide a guise of transparency and responsibility to illicit gold that easily makes its way into the licit supply chain.

The trade in gold ores and concentrates is especially opaque and open to a wide range of abuses, yet it has been paid scant attention by policymakers and regulators. There are several reasons why gold concentrates would be an ideal commodity for exploitation by illicit networks. First, there are no price benchmarks for gold concentrates, and prices are agreed ad hoc between buyer and seller. In addition, there are very few authorities, including customs personnel, who know what gold concentrate is or how to identify it, as it resembles sand and is classified under a completely different chapter code of the Harmonized System (HS 26) from other forms of gold.

Further complicating value and purity assessments, a cargo of gold concentrate cannot be fire-assayed or scanned with an XRF (X-ray fluorescence) gun. Sometimes gold concentrate goes to copper smelters instead of gold refineries, and these smelters separate out the gold and sell it. This follows a supply chain distinct from what we habitually think of as the gold supply chain, thereby escaping the scrutiny that attends more direct flows to refiners. Gold concentrate, unlike bullion, carries VAT in most jurisdictions, opening the door to various forms of VAT fraud. Finally, depending on processing technology, gold concentrates can be beneficiated from low grade to medium, or medium to high, which makes for a range of concentrate products that might be traded and shipped with varying prices. All these issues add layers of opacity to the actual value of the gold being moved, making it an exceptionally good vehicle for both gold smuggling and misinvoicing

Most of Peru's gold jewelry exports went to the US, and the excessive normal discrepancies evident in the values (not volumes) reported by Peru and the US bear deeper examination. These discrepancies in values could indicate gold smuggling through the jewelry trade, and they may also point to tax fraud or trade-based money laundering (TBML) in the form of large-scale misinvoicing. According to a former Peruvian government employee whom we interviewed, jewelry exports receive little to no scrutiny from Peruvian customs. Also of note was the discrepancy in the jewelry export values reported for similar volumes between Peru and Colombia, with Peru reporting jewelry exports worth US$2 million to Colombia and Colombia reporting jewelry imports from Peru worth more than US$11 million. Jewelry by its nature, could be a way to legitimize gold, whereby it is put into the market with a different label, such as scrap.

6.2 HIGHLIGHTS FROM KENYA

The Comtrade data from Kenya and its trade partners show some different features that can be further unpacked to highlight other aspects of the gold trade. Kenya's reporting, and that of its trade partners', on gold waste and scrap and gold ores and concentrates was essentially negligible. Whereas the reporting on gold metal showed that it was the highest-valued gold commodity, and in contrast to Peru, had the most trade discrepancies, demonstrating that gold supply chains originating in Kenya lack transparency through the export process. This may reflect Kenya's greater reliance on gold produced by a primarily informal ASM sector. Artisanally mined gold can be easily transported from one country to another without being detected, and there is evidence of an increasing amount of Kenyan gold being illegally brought to Uganda and Tanzania (Hunter et al. 2021). These routes are also those typically taken by mercury, given the interconnectedness of the chemical with gold processing. The Malaba border post along the Ugandan border is noted as a common mercury transit point (NEMA 2019). Price fluctuations for both gold and mercury are a primary factor in shifting trade flows from one direction to another.

A legal permit is required to export gold, but many gold exporters apparently circumvent this requirement, as was highlighted in a report by the auditor-general for the 2018/2019 financial year (Mutai 2021). The report noted several 'irregular' exports conducted by companies that did not appear to have valid export permits, as required by Kenyan law (Mutai 2021). Gold being illegally exported outside of the region from Kenya is often transported via air travel (NDTV 2022; Teyie 2021). Some larger traders use private jets (IMPACT 2021), while others use commercial airlines. In both cases, gold is actively obscured and not declared. A number of documented cases of attempted gold smuggling via commercial flights highlights the range of methods that smugglers have utilized in order to conceal gold, such as by using specially made gold items that can be worn and concealed under clothing (Shaikh 2018; NDTV 2022) or hiding gold within food and beverage items. In some cases, commercial airline employees have been involved in gold smuggling (Shaikh 2018). Where gold is transiting to other countries, such as Uganda or Tanzania, prior to leaving the region, gold is often carried over porous land borders where it is easily concealed and very difficult to detect.

Regardless of whether gold exits Kenya directly or via neighboring countries, it is well documented that the majority of East Africa's gold makes its way to Dubai in the UAE (Marks et al. 2021). The data from Comtrade confirmed this for Kenya, as most of Kenya's gold metal was exported to the UAE. It also appears that Kenya imported gold metal from the UAE, although Kenya's reporting on this was minimal compared with the UAE's. Kenya also imported a significant

amount of gold jewelry from the UAE. In 2022, the UAE was ranked as the second-largest exporter of precious metal jewelry in the world, a trade worth US$12.8 billion. Jewelry imported into Kenya from the UAE appears at least in part to serve domestic jewelry stores. According to one trader interviewed in Mombasa, gold jewelry found in Kenya is imported from UAE or India or is jewelry that has been stolen or improperly registered.

The trade data from Kenya highlight the important role that both the UAE and India play with respect to the global gold and jewelry market. Over the past ten years, the UAE and India have been among the top five gold metal importing countries in the world, with the exceptions of 2016 and 2020, when India was in sixth place. In the UAE, it is reportedly easy to declare gold as coming from somewhere else rather than its actual origin (Blore and Hunter 2020). In addition to being large importers of gold, both countries also export significant quantities of gold jewelry. In 2021, the UAE was the third-largest exporter of gold jewelry, with an export value of US$9.9 billion, while India was the fifth-largest exporter, with a value of $8.4 billion.

India's exports of gold jewelry are significant for several countries. In 2021, ten countries imported a value of nearly US$100 million in jewelry from India, with the US and the UAE reporting the most at $3.2 million and $2.7 million respectively. The UAE also exports a significant amount of gold jewelry, and in 2021, its top destinations included China/Hong Kong, Kuwait, Saudi Arabia, Iraq, Switzerland, Turkey, and the US. The extent to which these countries have been labeled as key destinations for illicitly traded gold (Marks et al. 2021; Martin, 2019), coupled with the volumes of jewelry being exported out of them to all corners of the world, presents a significant challenge for the global jewelry industry writ large. The extent to which gold from varying sources is aggregated together at various points along the supply chain, along with the general opacity of the supply chain, makes it nearly impossible for most jewelers to identify whether problematic gold is entering their products.

The Comprehensive Economic Partnership Agreement (CEPA), signed in 2022 between India and the UAE, emphasizes the vulnerability of scrap gold to illicit exploitation (CEPA 2022). The CEPA does not define scrap gold but eliminates all import taxes on it from the UAE to India, without requiring any value added or processing. As one industry observer has noted, the result is an open door for virtually any form of gold to be exported from the UAE to India and called 'scrap' (Shah 2022). This possibility for this gold to become duty-free is troubling given that much of the ASGM production out of Africa is reportedly imported into the UAE as scrap (Shah 2022), although Kenya reported no scrap exports. And while the UAE has recently taken first steps to limit gold smuggling and gold-based money laundering more rigorously within its borders, Indian regulations still incentivize these activities (IGPC 2022; Sahay and Nambiath 2020; Martin, 2019).

7. CONCLUSIONS

Taken together, the results presented here from Peru and Kenya are from data sources and contribute evidence that can be used to examine gold supply chains more closely. Moreover, they emphasize areas that should receive more attention when legislating and conducting due diligence on gold supply chains to identify their illicit components. It is evident from our analysis that gold supply chains are shaped by the contexts through which they flow, operating at different scales and with distinctive characteristics. Any effort to improve transparency in gold supply chains must be designed to fit these different contexts.

Illicit flows of gold present several risks to governments – including significant loss of revenues from the taxation of gold production and trade. While it is ideal for governments to extract value from national gold deposits, the informal nature of the ASGM sector and the ease with which gold can be smuggled necessitates a fiscal approach that does not inadvertently incentivize actors to produce, sell, or buy gold informally. Further, in contexts like Kenya, where gold production is more nascent and small-scale, the investment required to be able to apply the fiscal regime and extract revenue from the sector may outweigh the benefits the state may secure. Governments may want to focus more on creating a conducive environment for formalizing the sector and mitigating other potential risks, such as the use of mercury or injuries/deaths due to poor health and safety practices, prior to focusing on revenue collection. Further, governments need to carefully consider the extent to which overly burdening the ASM sector from a revenue-collection perspective may push actors to choose illicit channels to avoid these payments.

In general, the ASGM sector has been a primary focus of initiatives targeting transparency in gold supply chains. This may be an appropriate emphasis in Kenya given the discrepancies in gold metal trade data and the largely informal nature of gold mining and gold supply chains there. However, our research shows that in Peru, midstream sections of the supply chain may play a greater role in obscuring the origins and value of gold. While efforts should continue to encourage and support a more responsible and transparent ASGM sector, attention should also be given to sites where gold is traded, refined, and exported. On a global scale, trade partner countries which exhibit significant discrepancies in amounts and values of gold traded could be examined for potential legal loopholes in valuing and labeling gold, as well as political will and mechanisms to enforce regulations that are already in place.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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