Udvari B. (ed) 2020: Proceedings of the 4th Central European PhD Workshop on Technological Change and Development. University of Szeged, Doctoral School in Economics, Szeged, pp 415–439.

The magnitude of trade misinvoicing in Ghana and Hungary: Commodity and trading partner level analysis

Isaac Kwesi Ampah

The substantial and the persistent nature of trade misinvoicing in developing countries trade with advanced nations has gained considerable attention in academia and in policy cycles, especially due to its linkages with corruption and tax evasion, and its impact on global trade and domestic resources mobilization. Using the Harmonised System (HS) revision 2 commodity codes of the United Nations Commodity Trade Statistics (UN-COMTRADE) in 2017, this paper examines the magnitude and the nature of trade misinvoicing in Ghana and Hungary with a specific focus on the commodities, as well as the trading partners that are heavily involved in these misinvoicing practices. The evidence at both commodity and trading partner level indicate that Ghana and Hungary lose billions of dollars from trade due to misinvoicing practices in their economies. The results also highlight the need for both governments to increase their access to data, especially at their border sites, and possibly track custom valuations declared at their border stations to that of their trading partners to detect any possible trade corruption and institute sanctions against the companies and individuals involved to deter others from engaging in it.

Keywords: Ghana; Hungary; Export and Import misinvoicing; trade; UN-COMTRADE

1. Introduction

International trade is seen as a vital ingredient in the socio-economic development of any nation, especially in developing and emerging countries. Not only does it enhance their competitiveness by helping them reduce the cost of inputs and increase their value-added, but it also encourages innovation by facilitating the exchange of technology and technical know-how. Trade among countries also promotes export diversification by allowing countries involved to access new markets and new ideas which otherwise would not be available to them. However, for the benefit of trade to be sustainable and more inclusive, it is essential that the countries involved are able to amass their legitimate revenue and gains from it. Unfortunately, for many developing and emerging countries, the institutional framework coupled with imperfect monitoring and weak enforcement has created incentives for trade corruption by agents seeking to maximise their private profits and other gains.

Ideally, Ghana's total exports to Japan in a year should be equal to Japan's total imports from Ghana within the same year, after adjustment is made for the cost of transport, insurance, and duties. However, in practice, one can expect differences to occur as a result of arithmetical or statistical errors. GFI (2015) and Ndikumana et al. (2015) note that if such errors are genuine, one may expect it to be relatively small problem, as the capacity, experience, and training among customs agencies and statistical compilers in various countries has improved. Indeed, UNCTAD (2016) and Ndikumana and Boyce (2010) added that such errors will not persist or increase over

a relatively long period of time and may be rotating around a mean of zero or diminishing with time. But unfortunately, for many developing and emerging countries, these bilateral trade discrepancies are quite substantial, indicating the presence of either excessive normal or perverse discrepancies (UNCTAD 2016). The "perverse discrepancies" occur when the importers' value of a consignment of goods is significantly lower than the value reported by the exporters of the same goods, plus the cost of transport, insurance, and duties, signifying either over-invoicing on the part of the exporters or under-invoicing on that of importers, or both (UNCTAD 2016). These "excessive normal discrepancies" also occur when the value reported by the importers for the same good is greater than the value reported by the exporters by an amount that is considerably larger than the reasonable value acknowledged to be the costs of transport, insurance, and freight, indicating either under-invoicing in the case of the exporters or over-invoicing in the case of the importers or both (UNCTAD 2016).

Trade misinvoicing, which refers to either perverse discrepancies or excessive normal discrepancies, has received substantial attention in academia and policy circles recently due to its impacts on global trade and revenue mobilisation, especially among developing nations. The latest estimates by Global Financial Integrity (GFI) (2019) using the UN-COMTRADE indicates that, between 2006 and 2015, trade misinvoicing alone constituted about 1.128 trillion USD annually on average, representing about 22 per cent of their total trade. In terms of the dollar value of over-invoicing of trade, European nations such as Hungary, Romania and Bulgaria, as well as Latin American countries like Mexico, Brazil, Argentina and Peru were all among the top 30 countries found culpable of this erroneous act. Asian nations such as Malaysia and Thailand as well as African nations such as South Africa and Tunisia were all among top countries exhibiting cases of such trade misinvoicing act. Although many reasons can be attributed to this huge amount of trade misinvoicing, an emerging fear, is that some of the differences in trade transactions are as a result of deliberate actions by traders to circumvent capital controls, and avoid taxes and non-tariff measures, among other fraudulent motivations. Studies by GFI (2018) and Baker et al. 2014 note that trade misinvoicing in developing and emerging countries not only weaken their objective of reducing poverty and inequality, and enhancing growth in living standards, it also depresses government revenues and allows wealthy individuals and corporations to hide stolen money, evade taxes, and avoid the adverse impacts of currency depreciation.

In this paper, we disentangle the data that is currently available in the UN-COMTRADE to examine the nature of trade misinvoicing in Ghana and Hungary with a specific focus on the commodities as well as the trading partners that are heavily prone to these misinvoicing practices. By this level of estimation, this paper hopes to contribute to the literature on how trade misinvoicing disturbs both low and high-income countries trade performance and revenue mobilization, and also shed some light on how to move forward by offering possible solutions in dealing with the issues associated with it. The next section presents a brief review of the relationship between bilateral trade discrepancies and trade misinvoicing. Section three is devoted to the methodology used for the computation of trade misinvoicing and describes the method

of compiling the data. The results by country, commodities, and trading partner countries are presented in section four, and finally section five sums up the paper with conclusions drawn from the results and some policy recommendations.

2. Literature review

The concept of bilateral trade discrepancies and trade misinvoicing has generated various responses and even serious debate among scholars and policy analysts since the seminal work of Morgenstern (1963) and Bhagwati (1964) in the 1960s. There is one school of thought that believes that large and systematic trade discrepancies are essentially motivated by the intrinsic desire of both exporters or importers to evade tariffs or taxes, or hide payment to an associate by declaring a value that does not reflect the real value of the goods. Meanwhile, there is another school of thought that explicitly admits that trade discrepancies do exist but may not necessarily relate to misinvoicing. This section briefly reviews this literature.

2.1. Trade discrepancies correlate with and are caused by misinvoicing

Studies directing to the positive relationship between trade discrepancies and trade misinvoicing essentially derive their evidence from the notion that trade discrepancies occur as a result of trader's desire to avoid bureaucratic and lengthy administrative procedures from customs authorities, or desire to maximize profit by dodging tariffs or taking advantage of tax incentives aimed at promoting exports. Furthermore, it is claimed that trade discrepancies are intentionally created by importers and exporters to take advantage of the premiums in the exchange rate system (UNCTAD 2016). Along these lines, Bhagwati (1964) found that products facing high tariffs experienced substantial import under-invoicing relative to products facing low tariffs in Turkey. Epaphra (2015) also found that trade misinvoicing is highly correlated with tax rates with import misinvoicing being greater or higher for commodities facing higher tax rates than commodities facing low tax, authenticating the results of Bhagwati (1964). Again, a recent study by Kellenberg and Levinson (2016) also found evidence that tariff evasion is one of the ways that several lead firms 'intentionally misreport' trade data.

Fisman and Wei (2004) also studied the effect of tariff rates on trade misinvoicing practise between China and Hong Kong. The evidence shows that firms that engage in cultural property and antique trade in these countries mis-invoice their trade transactions to take advantage of the differences in tax rates across the products. Likewise, Yeats (1990) found that smuggling is widespread in trade among African countries because importers intentionally under-invoice to avoid high tariffs or quotas. Berger and Nitsch (2012) also found that trade discrepancies are highly positively correlated with corruption. In addition, empirical evidence from Bahmani-Oskooee and Goswami (2003), Barnett (2003), and Biswas and Marjit (2005) also suggest that traders engage in import over-invoicing and export under-invoicing to generate additional foreign exchange currencies to trade in goods and services with premiums on the black market.

2.2. Trade discrepancies are not necessarily the product of misinvoicing

Several authors have also provided evidence that trade discrepancies may not necessarily indicate trade misinvoicing. Östensson 2018 cited accidental errors in the classification of goods, recorded export destinations being different from actual ones as in the case of transit points, price changes while goods are in transit and discrepancies between estimated and actual freight cost as reasons behind trade discrepancies. Empirically, Hangzhou (2009) finds the attribution of imports to the country of origin, attribution of exports to the country of last known destination, and different valuations, as key reasons for the unusually large and growing statistical discrepancies in bilateral trade between China and the United States. Ferrantino and Zhi (2008) also found valuation issues, U.S. tariffs, and re-exporting through the United States itself as the cause of the robust discrepancies. Ajayi (1998) also mentioned diversion of goods en route to the final destination, re-exports, reporting lags, currency conversions, and exchange rate variations as potential reasons beyond misinvoicing. He also added that "in Sub-Saharan Africa, one of the basic causes of trade discrepancy stems from the fact that most imported or exported goods are routed through several countries before the final destination is reached. Martin (2016) confirmed that discrepancies also arise because of different definitions of exports and imports, different definitions of territory, timing, declarations of the country of origin, exchange rates, and intermediation, in addition to under-invoicing.

2.3. Literature adopted for the current study

While it is possible that discrepancies may exist in trade transactions between exporters and importers due to statistical, measurement or other related errors as shown in section 2.2, GFI (2015) noted that such errors should be relatively small as the capacity, experience, and training among customs agencies and statistical compilers in various countries has improved. Moreover, UNCTAD (2016) and Ndikumana and Boyce (2010) added that such errors will also not persist or increase over a relatively long period of time. Östensson (2018) writes that it is very doubtful that developing countries would accidentally omit over US$1 trillion from their economies from trade year after year, and never put in any mechanism to correct it.
Empirically, recent studies such as GFI (2019), UNCTAD (2016), Ndikumana et al. (2015), and Baker et al. (2014) using the standard International Monetary Fund (IMF) Direction of Trade Statistics (DOTS) have also noted that when trade discrepancies are greater than 10 per cent of the export value of the traded goods, then such discrepancies are in the region of trade misinvoicing. Other studies such as Ndikumana and Boyce (2018) examining used the same analytical framework when estimating trade misinvoicing in African sub-Saharan countries. Similarly, Jha and Truong, 2014, Beja, 2007 and Kar, 2010 also used the same framework analysing trade misinvoicing for India and other Asian countries. This paper is therefore premised on the notion that trade discrepancies greater than 10 per cent of the export value of the traded commodity are due to misinvoicing and this assumption is based on the aforementioned empirical studies.

3. Methodology

In achieving the objectives of this study, three empirical exercises are performed. The first is an investigation of the commodities or product in the study countries that are heavily involved in trade misinvoicing practices. The second empirical exercise also involves computation of trade misinvoicing for trading partners and the last part involves the computation of trade misinvoicing by commodity at the trading partner level.

3.1. Trade Misinvoicing by commodities Level Computation

In examining the commodities that are heavily involved in the trade misinvoicing practices in the study countries, two computation approaches are adopted.

- The first approach is the identification of the most traded commodities of each of the study countries. This is done by extracting the exports or imports of all commodities to the world (as the trading partner) using the Harmonised System (HS) revision 2 commodity codes and datasets from the UN-COMTRADE database. With the imports, since "the world" as a reporter does not appear in the UN Comtrade database, this paper estimates the imports as the sum of imports by all individual partners. This computation method has been used by UNCTAD 2016, the GFI (2015) and Baker et al. (2014). The major commodities are commodities with a relatively large share of the total export or imports in the study year.

- Once, the key traded commodities are determined, the second approach involves the computation of the trade misinvoicing. This is accomplished by comparing the exports or import data of the major commodities exported or imported in the world and the world's imports or export and interpreting the difference after the cost of freight and insurance are made as evidence of misinvoicing.

- For clarity, the computation of export misinvoicing by country *A* and product *i* at any time ***t*** is given as:

$$EMA_{it} = PMA_{it} - [XA_{it} + CIF(XA_{it})] \quad (1)$$

Where EMA_{it} is the export misinvoicing of country A for commodity *i* at time *t*. PMA_{it} is the value of the trading partners' imports from country A of product *i* at time *t*, XA_{it} is country A's exports to all the trading partners' as reported by country A, and the *CIF* is the factor which represent the costs of freight and insurance.

Positive values of EMA_{it} are evidence for export under-invoicing whereas negative values of the difference are evidence for export over-invoicing.

- Similarly, the import misinvoicing of major commodities involved in the trade misinvoicing of country *A* and product *i* at time ***t*** is given as:

$$IMA_{it} = MA_{it} - [PXA_{it} + CIF(PXA_{it})] \quad (2)$$

Where IMA_{it} is the import misinvoicing of country A of product *i* at time *t*. PXA_{it} is the value of all trading partners export of product *i* to country A at time *t*, MA_{it} is country A's imports from all the trading partner and *CIF* is the factor, representing the costs of freight and insurance.

In this case, positive values of IMA_{it} are import over-invoicing whereas negative values of the difference are evidence for import under-invoicing.

3.2. Trade Misinvoicing by Partner Level Computation

- Trade misinvoicing at the trading partner level also follows the same process as the product level computation, however, with this computation, the centre for the computation is the trading countries and not specific commodities as in the previous calculation. Once again, the main trading partners based on the relative shares in cumulative exports or imports in the study period are the first to be investigated. Once these leading trading partners have been identified, a similar computation follows to calculate trade misinvoicing by trading partner level.

- For export misinvoicing for country A at time t, the computation is given as

$$EMA_t = PMA_t - [XA_t + CIF(XA_t)] \quad (3)$$

Where PMA_t is the value of the trading country's imports from country A as reported by the trading partners, XA_t is country A's exports to the trading countries as reported by country A, and CIF is the factor, representing the costs of freight and insurance.

Again, positive values are evidence for export under-invoicing whereas negative values of the difference are evidence for export over-invoicing.

- For import misinvoicing, for the country, A at time t is given as

$$IMA_t = MA_t - [PXA_t + CIF(PXA_t)] \quad (4)$$

Where MA is country A's imports from its trading partners, and PXA_{it} is the trading partners' exports to country A, and CIF is the factor representing the costs of freight and insurance.

Similarly, positive values of the difference are evidence for import over-invoicing whereas negative values of the difference are evidence for import under-invoicing.

3.3. Trade Misinvoicing by commodity and trading partner level

- Export misinvoicing for the main commodities at trading partner level is given as

$$EMA_{jit} = PMA_{jit} - \left(XA_{jit} + CIF(XA_{jit})\right) \quad (5)$$

Where EMA_{jit} is the export misinvoicing of country A from its trading partner *j* of product *i* at time *t*. PMA_{jit} is the value of the trading partner *j* imports from country A of product *i* at time *t*, XA_{jit} is country A's exports to its trading partner j as reported by country A, and *CIF* is the factor representing the costs of freight and insurance.

Positive values of EMA_{jit} are evidence for export under-invoicing whereas negative values of the difference are evidence for export over-invoicing.

- Import misinvoicing of major product at trading partner level is also given as

$$IMA_{jit} = MA_{jit} - [PXA_{jit} * CIF\left(PXA_{jit}\right)] \quad (6)$$

Where IMA_{jit} is the import misinvoicing of country A from its trading partner *j* of product *i* at time *t*. PXA_{jit} is the value of the trading partner *j* export to country A of product *i* at time *t* as reported by *j*, MA_{jit} is country A's imports from trading partner *j* as reported by country A, and *CIF* is the factor, representing the costs of freight and insurance.

Similarly, positive values of IMA_{jit} are import over-invoicing whereas negative values of the difference are evidence for import under-invoicing.

4. Result and Discussion

Tables 1 and 2 and Figures 1 to 4 discuss the main results of the trade misinvoicing estimates for the major commodities and the main trading partners of Ghana. It also provides trade misinvoicing estimates for specific major commodity against its major trading partner level.

4.1.1. Ghana's Trade Misinvoicing by commodities group level

In Table 1, the major commodities and its associated misinvoicing are reported. The results in Table 1 shows that Ghana's exports are dominated by a few primary commodities such as precious pearls, metal and stones, mineral fuel and oil as well as cocoa and cocoa preparations. These three commodities alone contribute about US$11.94 billion out of the US$14.35 billion total value of Ghana's export. Per this value, these three commodities contribute about 83 per cent of Ghana's total export. In the case of imports, the shares of vehicles other than railway or tramway; Nuclear reactors, boilers, machinery and mechanical appliances, and salt, sulphur and stone contribute about 33 per cent of total imports representing about US$4.25 billion out of the total imports of about US$12.72 billion.

Table 1 Ghana's trade misinvoicing by commodity level

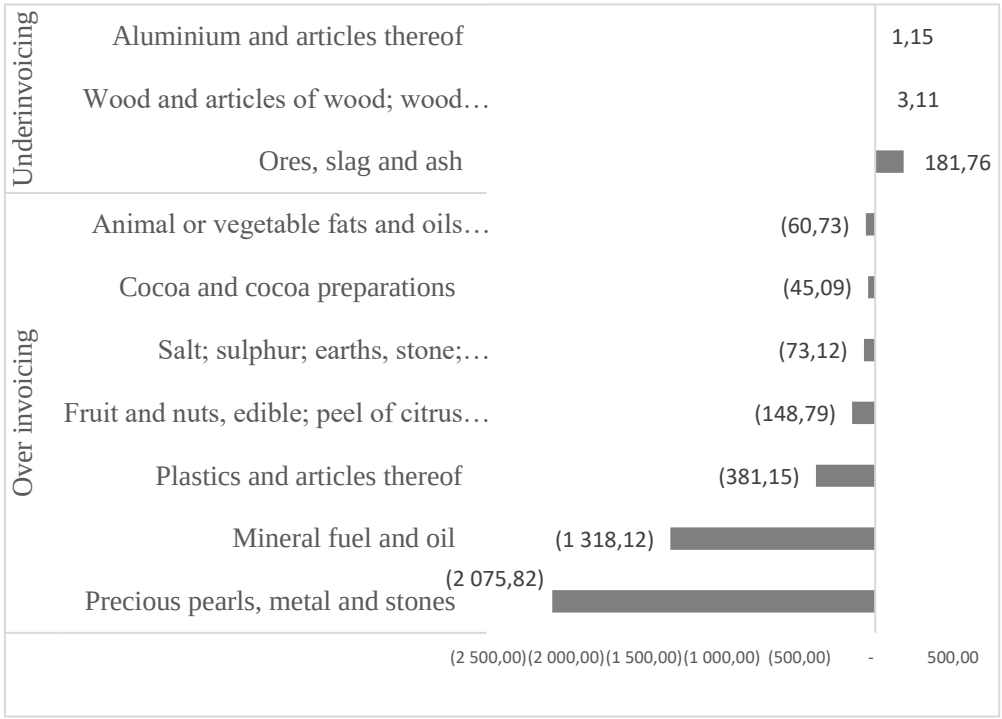
Co. Codes	Commodities	Export/ Import in million US$	Misinvoicing (% of export /import)
	Export		
71	Precious pearls, metal and stones	5,861.49	35.41
27	Mineral fuel and oil	3,639.25	36.22
18	Cocoa and cocoa preparations	2,433.74	1.85
8	Fruit and nuts	409.42	36.34
39	Plastics and articles thereof	370.32	102.93
44	Wood and articles of wood	189.03	1.65
15	Animal or vegetable fats and oils	187.97	32.31
26	Ores, slag and ash	186.09	97.67
25	Salt, Sulphur and stone	92.03	79.45
	TOTAL	*14,358.51*	
	Import		
87	Vehicles; other than railway or tramway	1,872.47	41.40
84	Nuclear reactors, boilers, machinery and mechanical appliances	1,392.84	21.45
25	Salt, Sulphur and stone	980.18	80.45
85	Electrical machinery and equipment	785.49	64.08
10	Cereals	716.15	68.82
48	Paper and paperboard	524.20	63.45
73	Iron or steel articles	517.46	9.78
39	Plastics and articles thereof	468.53	52.17
87	Iron and steel	412.37	4.87
	TOTAL	*12,718.14*	

Source: Author's computation using UN Comtrade data

Comparing Ghana's total export or import values of the identified commodities to her trading partners' data reveals excessive discrepancies for all the major commodities traded by Ghana. In the case of export, the evidence of export over-invoicing is common for all the trading commodities with the exception of ores, slag and ash, wood and articles of wood, and aluminium and articles thereof as shown in Figure 1. Precious pearls, metal and stones and mineral fuel and oil are the largest and most significant contributors to over-invoicing in the country, with the total misinvoicing amounting to US$2,075.82 million and US$ 1,318.12 million respectively. The misinvoicing of these two exported commodities cost Ghana about 24 per cent of her total export. Also, over 100 per cent of Ghana's export value of plastics and other articles of plastics exported by companies in Ghana and recorded in

Ghana's export data actually did not reach the exported partners countries as shown in Table 1. In the same way, about 97.67 per cent of imports of ores, slag and ash by trading partners of Ghana supposedly to be recorded as an export from Ghana were not recorded in Ghana's export data.

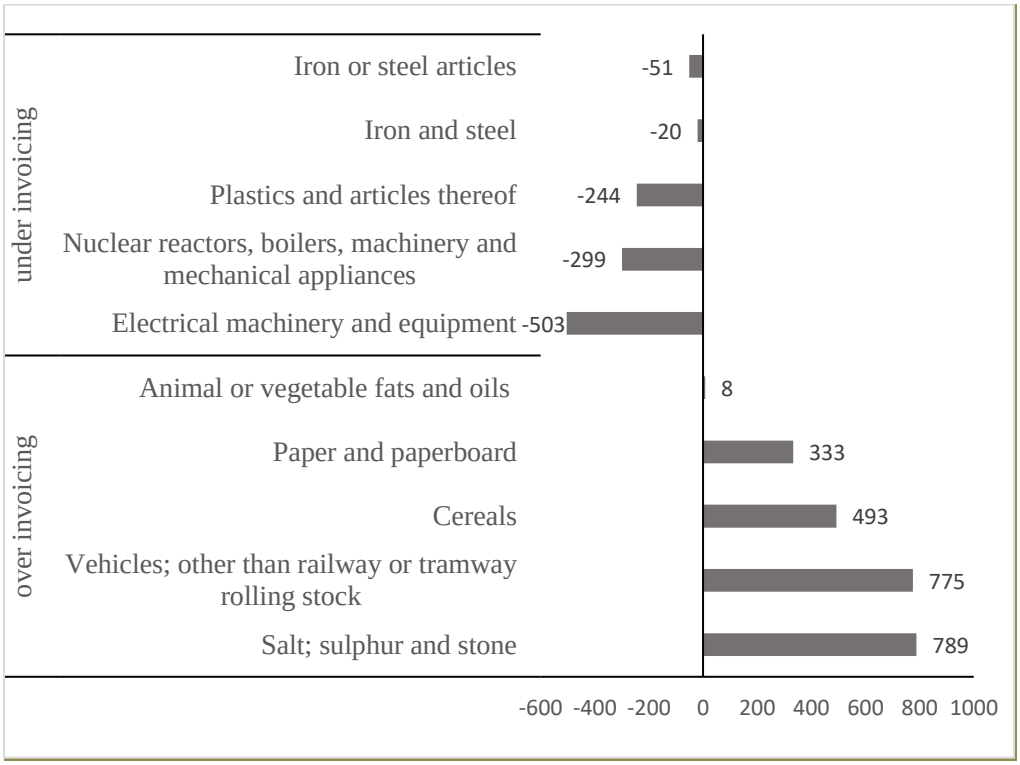
Figure 1 Ghana's export misinvoicing by commodity level



Source: Author's computation using UN Comtrade data

For imported commodities by Ghana, the trend is the same. over-invoicing is recorded for commodities such as vehicles other than railway or tramway, salt, sulphur and stones, cereals and finally, paper and paperboard. For commodities such as nuclear reactors, boilers, machinery and mechanical appliances, electrical machinery and equipment, iron or steel articles and plastics and articles, the study found evidence of under-invoicing. As shown in Figure 2, the evidence of misinvoicing is especially large for imported commodities such as salt, sulphur and stone, vehicles other than railway or tramway as well as electrical machinery and equipment. Table 1 also shows that about 80 and 69 per cent of the value of salt, sulphur and stone and cereals respectively imported by Ghana, were not actually recorded in the exporter's account. Likewise, the result in Table 1 also revealed that 52 per cent of the value of plastics and articles thereof imported by Ghana's trading partners were not recorded in Ghana's import.

Figure 2 Ghana's export misinvoicing by commodity level



Source: Author's computation using UN Comtrade data

4.1.2. Ghana's Trade Misinvoicing by trading partner's level

Table 2 shows the results of trade misinvoicing for the main trading partners in the case of Ghana.

The results show evidence of both under and over misinvoicing for imported and exported trading partners. Ghana's export to China, Canada and India exhibits very high levels of export over-invoicing, with a total of US$767 million, US$264 million, and US$195 million respectively. This practice is also observed in Ghana's exports to the United Kingdom, Germany, Spain, Netherlands, and Switzerland, but the proportion is relatively small compared to that of China, Canada, and India. Evidence of under-invoicing is also seen in Ghana's exports to USA and France, with the USA having the total amount of approximately US$332 million as misinvoicing out of total export of US$407 million. Ghana's trade with Canada needs further investigation since almost ninety-two per cent of Ghana's total export to Canada were not reported in Canada's import data even though they are reported in Ghana's export. Another case is the USA. About 82 per cent of imports recorded by the USA as goods from Ghana were not recorded in Ghana as export to the country.

Table 2 Ghana's trade misinvoicing by trading partner level

Country	Export/ Import in million US$	Misinvoicing	Misinvoicing (% Export or import)
	Export		
India	2,689.42	(195.17)	7.26
China	2,381.36	(766.56)	32.19
Switzerland	1,660.10	(1.30)	0.08
Netherlands	884.61	(37.74)	4.27
USA	*407.97*	*332.40*	*81.48*
United Kingdom	329.47	(123.83)	37.58
Canada	*287.37*	*(264.34)*	*91.99*
France	261.80	72.79	27.81
Germany	233.07	(52.02)	22.32
Spain	213.18	(69.98)	32.83
	Import		
China	*2,134.18*	*(3,173.10)*	*148.68*
USA	1,200.06	254.09	21.17
United Kingdom	*1,099.10*	*561.24*	*51.06*
Spain	*754.55*	*475.41*	*63.01*
Belgium	718.81	287.68	40.02
South Africa	410.86	22.99	5.60
Canada	*363.51*	*156.08*	*42.94*
Germany	341.51	8.46	2.48
Turkey	325.15	78.14	24.03
Rep. of Korea	307.17	38.91	12.67
Malaysia	303.47	22.06	7.27
Italy	289.76	2.51	0.87
Netherlands	*237.00*	*(598.45)*	*78.80*
Japan	200.59	56.30	28.07
France	192.90	(89.41)	34.84

Source: Author's computation using UN Comtrade data

Probing into the case of Ghana's imports, the results in Table 2 also reveal large discrepancies between the values reported in Ghana and those recorded in her trading partners' records. In Table 2, the results show that United Kingdom, Spain, USA, and Canada recorded the largest amount of over-invoicing with a total amount of US$ 561.24 million, US$ 475.41 million, US$ 254.09 million, and US$ 156.08 million respectively. There was also import under-invoicing in trade with other major trading partners. Along with France, the top two trading partners that accounted for the largest share of under-invoicing are China and Netherlands, with China amounting

to US$ $3 billion and the Netherlands amounting to US$ 598.45 million. France also accumulated a total amount of US$ 89.41 million under-invoicing.

Likewise, more than 100 per cent of China's export to Ghana (specifically *148.68 per cent)*, reported in China's export was not reported in Ghana's import data. A similar situation is also recorded in the Netherlands, where, about 79 per cent of its export to Ghana, though recorded in Netherlands export data, was never recorded in Ghana's imports. On the other hand, about 63%, 51% and 40% respectively of goods imported by Ghana from Spain, United Kingdom and Belgium were actually not recorded by these countries as export to Ghana.

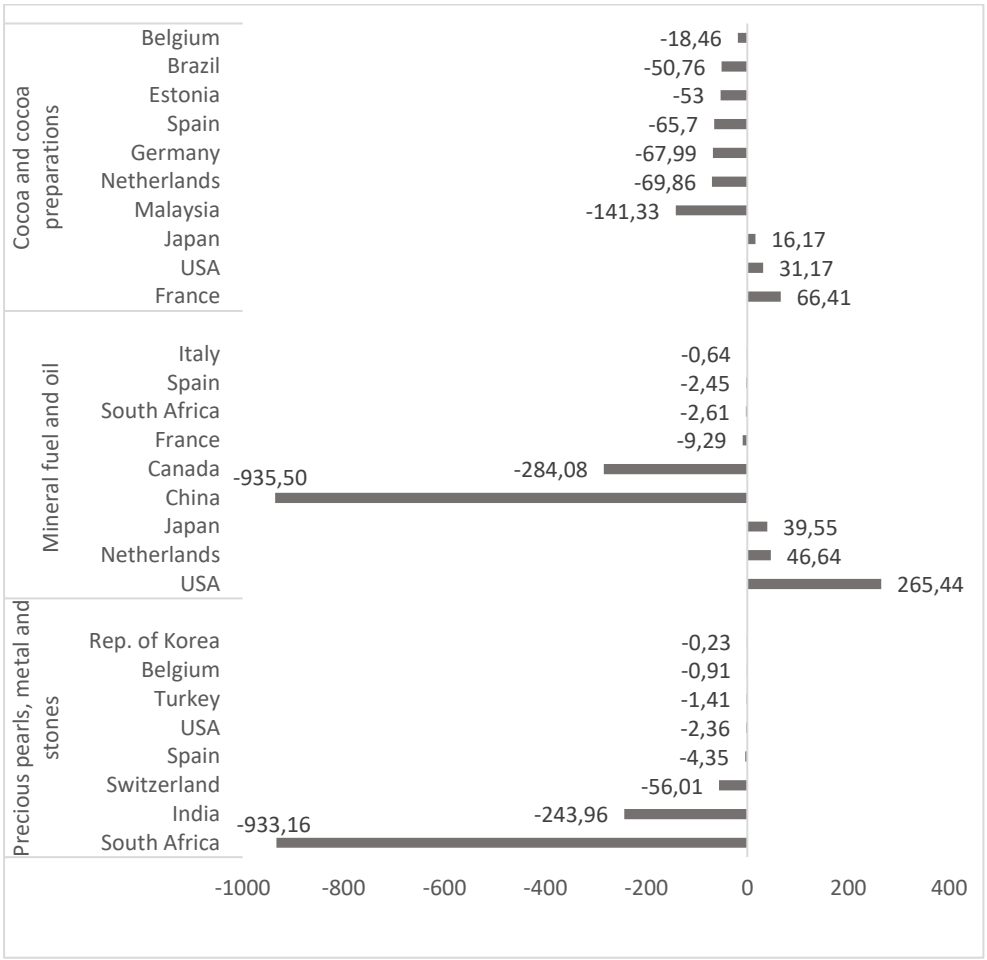
4.1.3. Ghana's Trade Misinvoicing by commodities and trading partner level

In this estimation, we focused on the major traded commodities and the partner countries that are heavily involved in misinvoicing for each of these commodities. The results in Table 1 in the Appendix shows that the export of precious pearls, metal and stones by Ghana exhibit heavy concentration among two trading countries, India and Switzerland. These two countries together accounted for about over 71% of the country's total exports: India with 43.27% and Switzerland with 27.82%.

The results in relation to export misinvoicing reported in Figure 3 show consistent under-invoicing occurring in all trading partners trade as far as the export of precious pearls, metal and stones is concerned. South Africa, India and Switzerland are the largest partner country destinations of export under-invoicing with the total amounting to about US$ 1.2 billion. Again, the results reported in Table 1 in the Appendix indicate that 99%, 95% and 91% of precious pearls, metal and stones imported by Spain, China and South Africa from Ghana respectively were not recorded in Ghana's export data. This needs further investigation. In the case of mineral fuel and oil, the results in Figure 3 shows large-scale under-invoicing in exports to China and Canada, accounting for the lion's share at US$ 935.50 million and US$ 284.08 million respectively. Over-invoicing was also recorded in Ghana's export of mineral fuel and oil to the USA. The amount involved is US$ 284.08 million representing about 90% of Ghana's export to the USA.

With respect to Ghana's export of cocoa and cocoa preparations, the result revealed systematic under-invoicing with Malaysia (US$141.33 million), the Netherlands (US$69.86 million), Germany (US$67.99 million), Spain (US$65.7 million), Estonia (US$53 million), Brazil (US$50.76 million), and Belgium (US$18.46 million) whiles countries like France (US$ 66.41 million), USA(US$31.37 million), and Japan (US$16.17 million) showing cases of trade over-invoicing. In fact, about 50% of Malaysia's imports from Ghana were not reported in Ghana's export data. Similarly, about 50% and 54% of imports recorded by Spain and France respectively as goods from Ghana were not recorded in Ghana's export to these countries. This is reported in Table 1 in the Appendix.

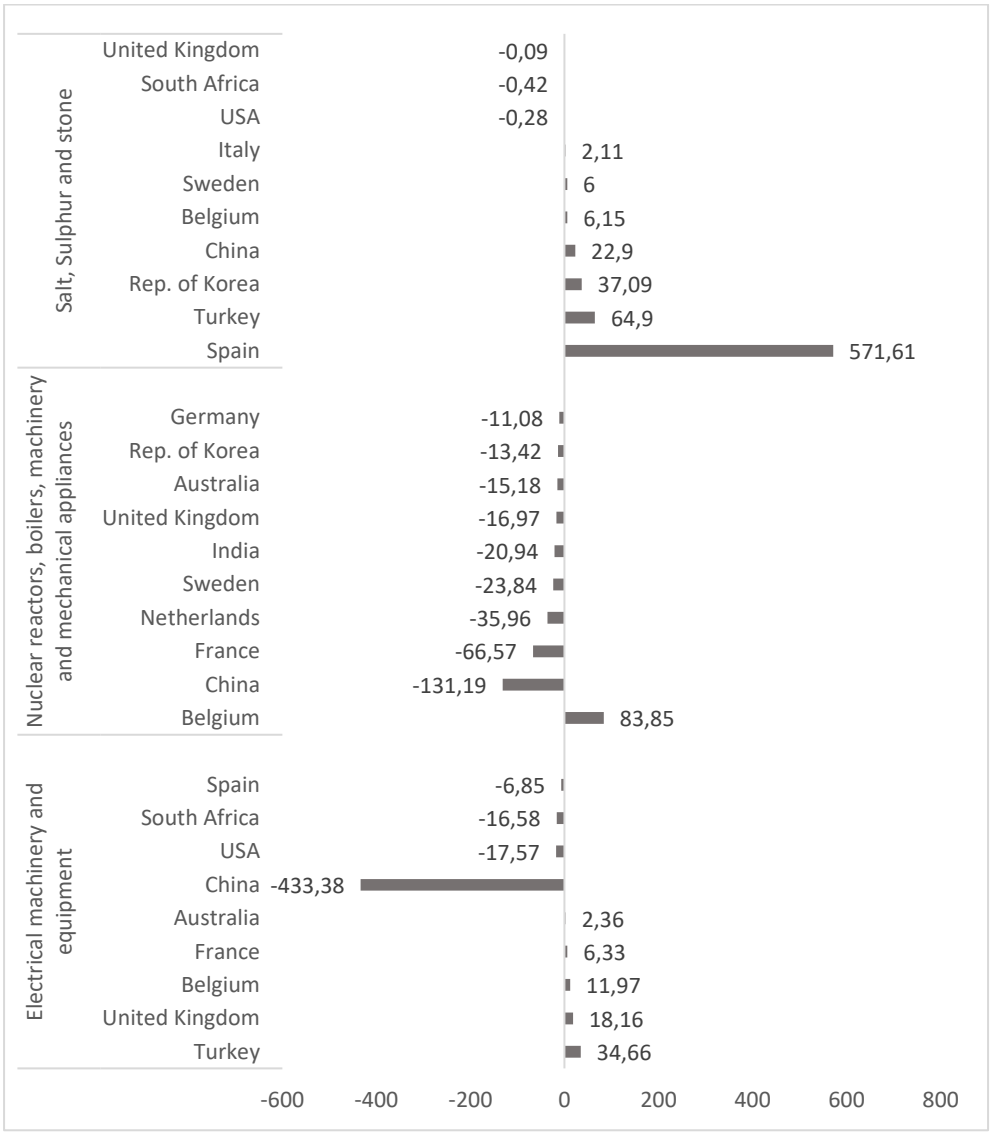
Figure 3 Ghana's Export misinvoicing by commodity and partner trading level



Source: Author's computation using UN Comtrade data

Figure 4 also reports Ghanaian import misinvoicing of the three main imported commodities and their associated bilateral trading partners. In the case of electrical machinery and equipment, import under-invoicing cases were seen in Ghana's imports from China, USA, South Africa, and Spain, with China recording the largest amount of under-invoicing totalling US$ 433.38 million. Also, the import of electrical machinery and equipment from Turkey, the United Kingdom, France, Belgium, and Australia reveal cases of over-invoicing. The results show that Turkey is the major trading partner of Ghana that is prone more import over-invoicing practices as far as the import of electrical machinery and equipment is concerned with a total of about US$ 34.66 million. Also, about half of China's export of electrical machinery and equipment to Ghana was not recorded in import data. This is shown in Table 2 of the Appendix.

Figure 4 Ghana's imports misinvoicing by commodity and partner trading level



Source: Author's computation using UN Comtrade data

Concerning Ghana's import of nuclear reactors, boilers, machinery and mechanical appliances, the results in Figure 4 also reveals large discrepancies between the values reported in Ghana's records and that of her trading partners' data. The analysis of the data in the UN-Comtrade revealed large discrepancies with import under-invoicing being predominant. China, France, and the Netherlands recorded the largest amount of under-invoicing with a total amount of US$ 131.19 million, US$

66.57 million, and US$ 35.96 million respectively. There was also import over-invoicing in an US$ 83 million trade deal with Belgium. Again, about 86.42 per cent of Netherland's export of nuclear reactors, boilers, machinery and mechanical appliances to Ghana, was not reported in Ghana's import data. Also, about 81.19% of export of nuclear reactors, boilers, machinery and mechanical appliances from the Republic of Korea was never recorded in Ghana's official imports. On the other hand, about half of Ghana's imports from Belgium was actually not recorded by these countries as exports to Ghana. This is shown in Table 2 in the Appendix. Unlike the case of imports of nuclear reactors, boilers, machinery and mechanical appliances, which was consistently afflicted with under-invoicing, the imports of salt, sulphur and stone were rather stricken with over-invoicing. Spain, Turkey, Rep. of Korea, China, Belgium, Sweden, and Italy are countries with the largest amount of import misinvoicing as far as salt, sulphur and stone are concerned.

4.2. Trade Misinvoicing in Hungary

Tables 3 and 4, as well as Figures 5 and 6, discuss the main results of the trade misinvoicing estimates for the major commodities and the main trading partners of Hungary. It also provides trade misinvoicing estimates for specific major commodity against its major trading partner level.

4.2.1. Hungary's Trade Misinvoicing by commodities group level

Unlike Ghana's exports, which show a heavy concentration on a few primary commodities such as precious pearls, metal and stones, mineral fuel and oil, as well as cocoa and cocoa preparations, that of Hungary in Table 3 shows an export concentration on a few industrial commodities. The share of electrical machinery and equipment, nuclear reactors, boilers, machinery and mechanical appliances and vehicles other than railway or tramway contribute about 56% of Hungary's total export. These three commodities contribute about US$63.07 billion out of the US$113.40 billion total value of Hungary's export. In the case of imports, these same commodities contribute the largest shares of Hungary's imports. Together, they contribute about 48% of total imports, representing about US$49.81billion out of the total imports of about US$104.28 billion.

Just like the case of Ghana, analysis of trade misinvoicing at the commodity level in Hungary reveals excessive discrepancies for both imported and exported commodities. In the case of exports, the results reveal systematic export over-invoicing for all the major trading commodities. The largest amount of export over-invoicing is recorded in commodities such as electrical machinery and equipment (US$4.24 billion); vehicles other than railway or tramway (US$ 2.31 billion), nuclear reactors, boilers, machinery and mechanical appliances (US$ 1.71 billion), and pharmaceutical products (US$ 1.26 billion). This same practice is also observed in Hungary's export of mineral fuels, oils and products; rubber and its articles; optical, medical or surgical instruments and apparatus; organic chemicals, and furniture and fittings.

Table 3 Hungary's trade misinvoicing by commodity level

Co. Codes	Commodities	Export/ Import in million US$	Mis-invoicing	Misinvoicing (% of Export/ Import)
	Export			
85	Electrical machinery and equipment	23,062.39	(4,236.94)	18.37
84	Nuclear reactors, boilers, machinery and mechanical app	20,709.38	(1,713.47)	8.27
87	Vehicles other than railway or tramway rolling stock	19,292.91	(2,291.59)	11.88
30	Pharmaceutical products	5,209.10	(1,259.83)	24.19
39	Plastics and articles thereof	4,365.18	(670.10)	15.35
90	Optical, medical or surgical instruments and apparatus	4,171.31	(487.49)	11.69
27	Mineral fuels, and oil	2,834.45	(751.70)	26.52
40	Rubber and articles thereof	2,554.53	(671.22)	26.28
29	Organic chemicals	1,865.16	(177.08)	9.49
Total		***113,382.08***		
	Import			
85	Electrical machinery and equipment	21,318.63	(594.99)	2.79
84	Nuclear reactors, boilers, machinery and mechanical app	17,214.52	(1,252.23)	7.27
87	Vehicles; other than railway or tramway	11,275.47	(1,763.99)	15.64
27	Mineral fuels and oils	8,090.65	3,441.16	42.53
39	Plastics and articles thereof	4,874.20	(143.28)	2.94
30	Pharmaceutical products	4,219.15	79.27	1.88
73	Iron or steel articles	2,441.79	(248.77)	10.19
72	Iron and steel	2,433.53	(217.81)	8.95
90	Optical, photographic, medical or surgical instruments	2,320.11	(1,171.11)	50.48
76	Aluminium and articles thereof	2,079.16	(170.15)	8.18
Total		***104,283.80***		

Source: Author's computation using UN Comtrade data

For imported commodities by Hungary, the trend is the same, with the only exception being Hungary's imports of mineral fuels and oils which recorded under-invoicing of US$ 3.44 billion. The import of mineral fuels and oils in Hungary calls for further investigation since about 50% of imports were not recorded in foreign exports accounts. As shown in Table 3, the evidence of over-invoicing is especially large for imported commodities such as electrical machinery and equipment; nuclear reactors, boilers, machinery and mechanical appliances; and vehicles other than

railway or tramway. This significant over-invoicing problem in Hungary's exports and imports can be related to the refundable and non-refundable incentives available from the Hungarian government and the EU Funds, which seek to encourage investors keen to enlarge their trade base.

4.2.2. Hungary's Trade Misinvoicing by trading partner's level

Trade in Hungary appears to exhibit a heavy concentration on the EU market, with Germany alone accounting for about 27% of its total export value of US$113,4 billion, and import value of US104.4 billion. Trade here also shows substantial misinvoicing.

In terms of export, the analysis in Table 4 shows substantial over-invoicing, occurring with nine (9) out of the eleven (11) trading partners selected for this study. However, the aggregate results are heavily influenced by Germany. Export to Germany generates a cumulative amount of $4.3 billion in export over-invoicing which represent 14% of the total export of Hungary to Germany. The USA and the Chinese are the other trading partners in the sample for whom trade with Hungary exhibits export under-invoicing accounting for US$ 1.67 and US$ 1.15 billion respectively. Also, about 46% of Hungary's export to the Netherlands were not reported in the Netherlands's import data. Similarly, about 53% and 43% of imports recorded by USA and China respectively as goods from Hungary were not recorded in Hungary's official exports to those countries.

As is the case for Ghana, Hungary's imports are also flawed with large sums of discrepancies between itself and its trading partners as recorded in Table 4. Both over and under-invoicing could be identified in this case. Imports from countries like China, the Netherlands, Austria, Russia, USA, and the United Kingdom exhibited various forms of over-invoicing, with China and the Netherlands being the most or the largest contributors at US$ 3.3 billion and US$ 1 billion respectively. Also, countries like Germany, Italy, Czechia along with other countries exhibited large sums of import under-invoicing. Again, about 63% of goods recorded in Hungary's data as an import from China is not recorded in Chinese accounts as exported to Hungary. The same situation can be said for the Netherlands where about 20% of its exports to Hungary were not recorded in Hungary's official imports.

Table 4 Hungary's trade misinvoicing by trading partner level

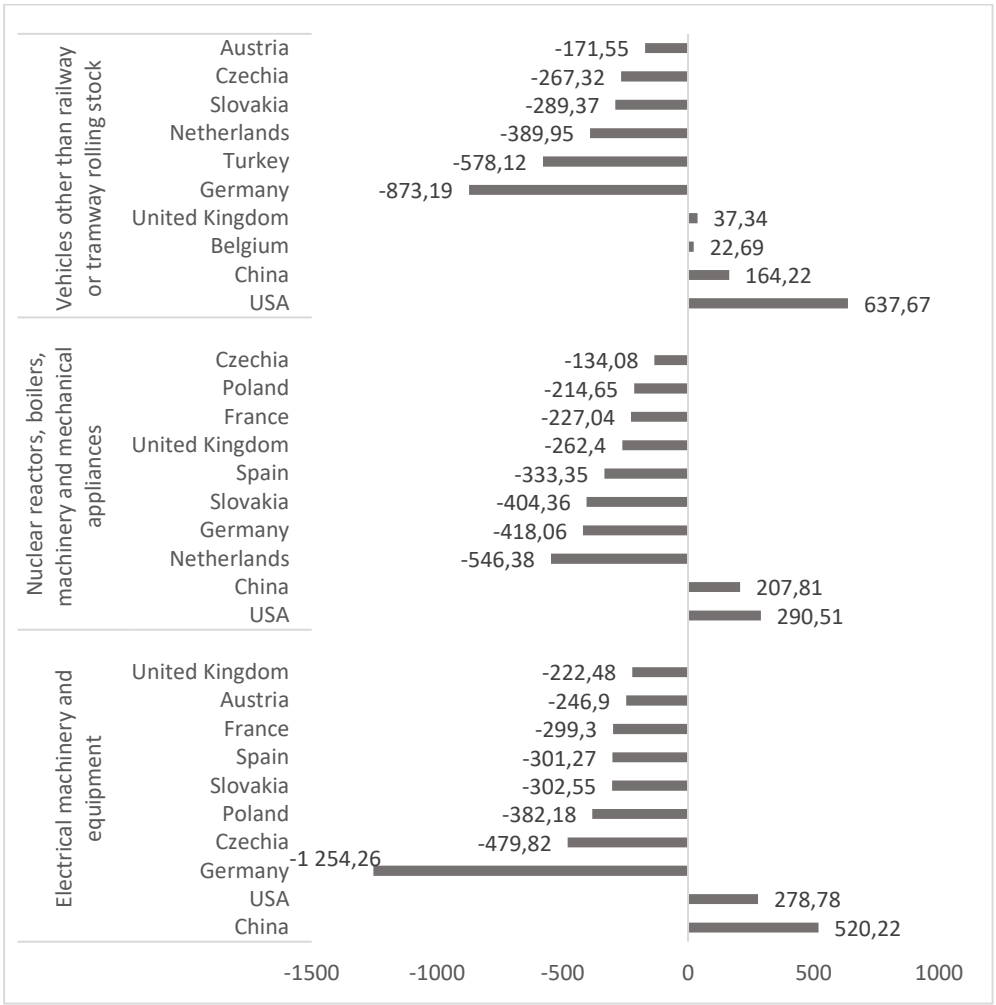
Country	Export/ Imports in million US$	Export misinvoicing	Misinvoicing (% of Export or Import)
	Export		
Germany	31,009.86	(4,392.63)	14.17
Austria	5,488.25	(1,570.75)	28.62
Slovakia	5,374.15	(1,891.77)	35.20
France	4,977.77	(747.24)	15.01
Czechia	4,879.21	(1,495.52)	30.65
Poland	4,673.16	(1,392.51)	29.80
United Kingdom	3,946.51	(763.22)	19.34
Netherlands	*3,898.95*	*(1,783.50)*	*45.74*
USA	*3,188.60*	*1,672.63*	*52.46*
Spain	3,170.26	(714.67)	22.54
China	*2,663.85*	*1,146.99*	*43.06*
	Import		
Germany	27,675.68	(3,234.66)	11.69
Austria	6,438.02	602.32	9.36
Poland	5,837.58	(543.30)	9.31
Slovakia	5,672.03	73.94	1.30
China	*5,291.35*	*3,336.61*	*63.06*
Netherlands	5,262.20	1,045.71	19.87
Czechia	5,140.03	(842.55)	16.39
Italy	4,973.52	(849.29)	17.08
France	4,198.13	(33.88)	0.81
Russian Federation	3,574.32	920.62	25.76
Romania	3,032.62	(620.42)	20.46
Belgium	2,313.50	(426.83)	18.45
USA	2,219.10	142.05	6.40

Source: Author's computation using UN Comtrade data

4.1.3. Hungary's Trade Misinvoicing by commodities and trading partner

The result of Hungary's export misinvoicing by commodity and trading partner in Figure 5 shows excessive negative discrepancies, suggesting export over-invoicing for all trading partners in the three main commodities considered. Whereas trade with Germany exhibits substantial export over-invoicing worth US $2.5 billion for the three main exported goods, that with China shows excessive under-invoicing for all the major commodities amounting to US$890 million.

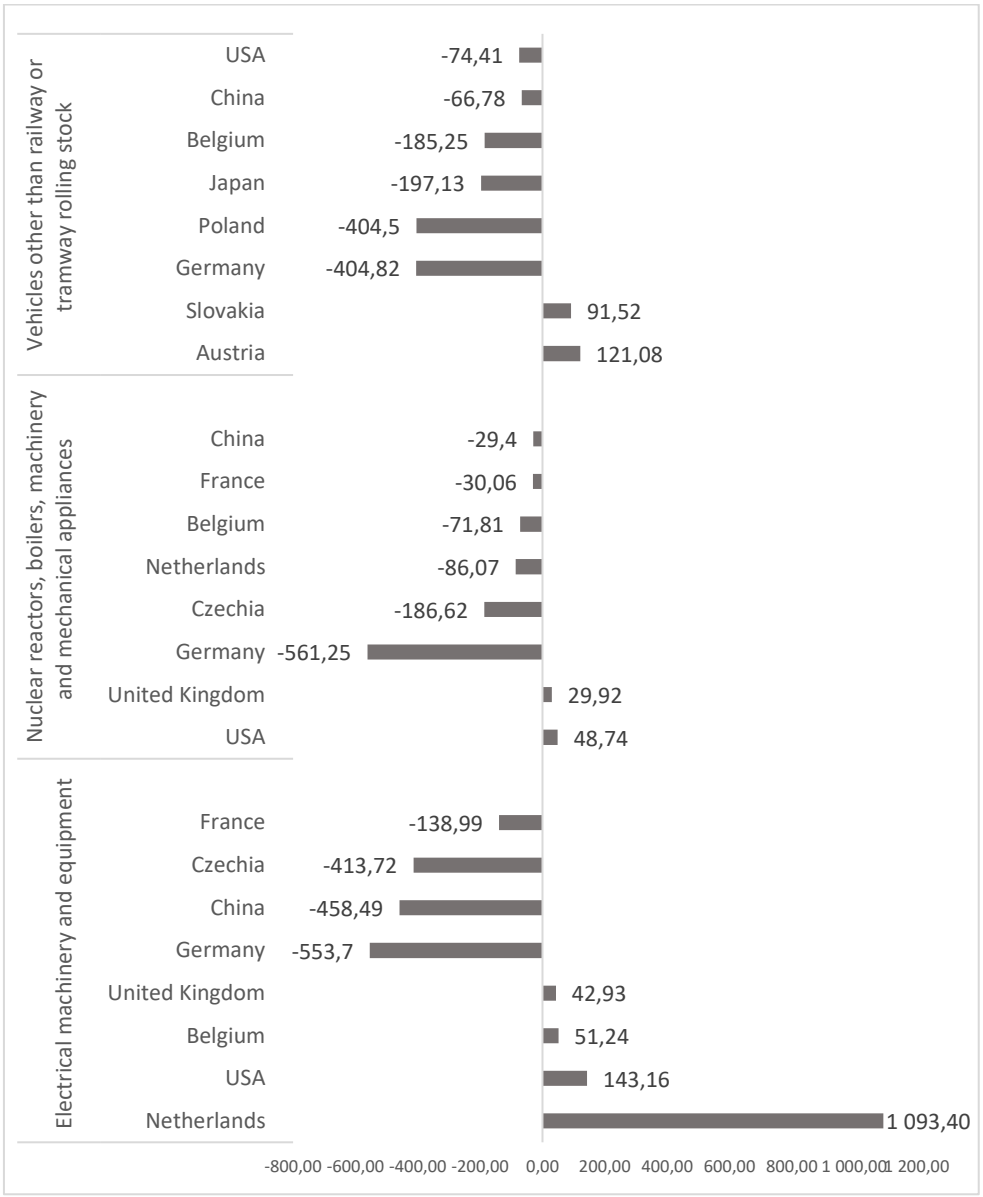
Figure 5 Hungary's Export misinvoicing by commodity and trading partner



Source: Author's computation using UN Comtrade data

Import misinvoicing by commodities and trading partner level in Hungary is also reported in Figure 6. The result shows evidence of both over and under-invoicing across all the three main traded goods. The results show that Hungarian imports from Germany, China, and Belgium across all the three main trading commodities witnessed under-invoicing. Other countries like the Netherlands and the United States witnessed both over and under import misinvoicing. In the case of electrical machinery and equipment, 60 per cent of Hungary's import is not recorded in its import data. Again, import misinvoicing of vehicles other than railway or tramway rolling stock account for the same value to the total import of Hungary from Belgium.

Figure 6 Hungary's import misinvoicing by commodity and trading partner



Source: Author's computation using UN Comtrade data

5. Conclusion and policy recommendations

This paper examines the magnitude of trade misinvoicing in Ghana and Hungary with particular emphasis on key commodity groups and trading partners that are heavily involved in the misinvoicing practice. The significant nature of the estimates highlights the seriousness of trade misinvoicing as far as revenue mobilization, and total trade is concerned. The results from a handful of commodity groups used for the analysis shows that Ghana loses about US$3 billion in the export of precious pearls, metal and stones and mineral fuel and oil alone. In imports, Ghana loses about US 2.3 billion to import over-invoicing in vehicles other than railway or tramway rolling stock; salt, sulphur and stone; cereals and paper and paperboard. Similarly, the Hungarian government also lost about US$9.5 billion in over-invoicing of commodities such as electrical machinery and equipment, nuclear reactors, boilers, machinery and mechanical appliances, vehicles other than railway or tramway rolling stock and pharmaceutical products. An additional US$3.6 billion is also lost to import under-invoicing to the former three commodities groups.

Ghana's trading partners, which were significantly prone to export over-invoicing include China, Canada, and India, whereas countries such as the USA and France contribute significantly to import under-invoicing. In terms of imports, Ghana's trade with the United Kingdom, Spain, the USA, and Canada recorded a large amount of over-invoicing while Ghana's trade with China, Netherlands, and France showed the opposite. For Hungary, exports to countries like Germany, the Netherlands, the United Kingdom, Belgium, Poland, Czechia, and France exhibit substantial over-invoicing. Moreover, imports from countries like China, the Netherlands, Austria, Russia, USA and the United Kingdom exhibited various forms of over-invoicing, with China and the Netherlands being the most significant or largest contributors. In contrast, countries like Germany, Italy, Czechia along with other countries exhibited large sums of import under-invoicing.

These results highlight the need for both governments to increase their access to data especially at their border sites and possibly track custom valuations declared at their border stations to that of their trading partners to detect any possible trade corruption, and institute punitive sanctions against companies found misinvoicing to deter others from engaging in it. Also, since trade incentives, high tariffs and non-tariff barriers encourage misinvoicing, a more pragmatic trade liberalisation policy should rather be pursued, especially by developing countries. However, if tax incentives are to be used, then it is imperative that it is targeted at nontraditional products to facilitate its trade.

References

Ajayi, S. (1998): Adjusting for international trade-faking. In Iqbal, Z. and Khan, M. S. (Eds.). *Trade reform and regional integration in Africa*. International Monetary Fund, (Vol 763).

Bahmani-Oskooee, M. – Goswami, G. G. (2003): Smuggling as another cause of failure of the PPP. *Journal of Economic Development*, 28, 2, 23–38.

Baker, R. – Clough, C. – Kar, D. – LeBlanc, B. – Simmons, J. (2014): *Hiding in Plain Sight: Trade Misinvoicing and the Impact of Revenue Loss in Ghana, Kenya, Mozambique, Tanzania, and Uganda: 2002–2011*. Washington DC: Global Financial Integrity.

Barnett, R. C. (2003): Smuggling, non-fundamental uncertainty, and parallel market exchange rate volatility. *Canadian Journal of Economics*, 36, 3, 701–727.

Beja, E. L. (2007): Brothers in Distress: Revolving Capital Flows of Indonesia, Malaysia, and Thailand. *Journal of Asian Economics*, 18, 6, 904–914.

Berger, H. – Nitsch, V. (2012): Gotcha! A profile of smuggling in international trade. In Storti, C. C. and De Grauwe, P. (Eds.): *Illicit Trade and the Global Economy*: CESifo Seminar Series. Cambridge and London: MIT Press, 49–72.

Bhagwati, J. (1964): On the under-invoicing of imports [with application to recent Turkish experience]. *Bulletin of the Institute of Economics and Statistics (Oxford University)*, 26, 389–397.

Biswas, A. K. – Marjit, S. (2005): Misinvoicing and trade policy. *The Journal of Policy Reform*, 8, 3, 189–205.

Epaphra, M. (2015): Tax rates and tax evasion: evidence from missing imports in Tanzania. *International Journal of Economics and Finance*, 7, 2, 122–137.

Ferrantino, M. J., – Zhi, W. A. N. G. (2008): Accounting for discrepancies in bilateral trade: The case of China, Hong Kong, and the United States. *China Economic Review*, 19, 3, 502–520.

Fisman, R., – Wei, S. J. (2004): Tax rates and tax evasion: evidence from "missing imports" in China. *Journal of Political Economy*, 112, 2, 471–496.

Global Financial Integrity (2017): *Illicit financial flows to and from developing countries, 2005–2014*, Washington, DC: Global Financial Integrity (April).

Global Financial Integrity (2019): *Illicit Financial Flows to and from 148 Developing Countries: 2006–2015.* Washington DC: Global Financial Integrity (January).

Global Financial Integrity (2015): Illicit financial flows to and from developing countries, 2005–2014, Washington, DC: April.

Hangzhou, P. (2009): *Report on the statistical discrepancy of merchandise trade between the United States and China.*

Jha, R. – Truong, D. N. (2014): *Trade misinvoicing and macroeconomic outcomes in India*. The Australian National University, Australia South Asia Research Centre, ASARC Working Papers.

Kar, D. (2010): The drivers and dynamics of illicit financial flows from India: 1948–2008. Washington DC: Global Financial Integrity (November).

Kellenberg, D. – Levinson, A. (2016): M*isreporting trade: tariff evasion, corruption, and auditing standards:* National Bureau of Economic Research, Inc.

Martin, M. (2016): What's the difference? comparing U.S. and Chinese trade data. Congressional Research Service. Retrieved from https://www.fas.org/sgp/crs /row/ RS22640.pdf.

Morgenstern, O. (1963): *On the accuracy of economic observations*. Princeton University Press.

Ndikumana, L. – Boyce, J. K (2018): *Capital flight from Africa: updated methodology and estimates*. PERI Working Paper. Retrieved from https://www.peri.umass.edu/publication/item/1083-capital-flight-from-africa-updated-methodology-and-new-estimates.

Ndikumana, L. – Boyce, J. K. – Ndiaye, A. S. (2015): Capital flight from Africa: Measurement and drivers. In Ajayi, S. I. and Ndikumana, L. (Eds.), *Capital Flight from Africa: Causes, Effects and Policy Issues* (pp. 15–54). Oxford: Oxford University Press.

Ndikumana, L. – Boyce, J. K. (2010): Measurement of capital flight: Methodology and results for sub-Saharan African countries. *African Development Review*, 22, 4, 471–481.

Östensson, O. (2018). Misinvoicing in mineral trade: what do we really know? *Mineral Economics*, 31, 1–2, 77–86.

UN-COMTRADE (2018): https://comtrade.un.org/. Accessed on December 20, 2018.

UNCTAD (2016) *Trade misinvoicing in primary commodities in Developing Countries: the cases of Chile, Côte d'Ivoire, Nigeria, South Africa and Zambia,* UNCTAD/SUC/2016/2, 2nd version.

Yeats, A. J. (1990). On the accuracy of economic observations: do sub-Saharan Africa trade statistics mean anything? *World Bank Economic Review*, 4, 2, 135–156.

Appendix

Table 1 Ghana's export misinvoicing by commodity and partner trading level

Country	Export in a million US$	Misinvoicing	Misinvoicing (% of export)
Precious pearls, metal and stones			
India	2,536.16	(243.96)	9.62
Switzerland	1,630.36	(56.01)	3.44
South Africa	851.75	(933.16)	91.28
China, Hong Kong	51.28	(54.13)	94.73
Turkey	33.81	(1.41)	4.18
Lebanon	23.27	0.55	2.35
USA	9.16	(2.36)	25.75
Spain	4.39	(4.35)	99.17
Belgium	2.60	(0.91)	35.18
Rep. of Korea	2.20	(0.23)	10.36
TOTAL	5,861.4		
Mineral fuel and oil			
China	2179.96	(935.50)	42.91
Canada	258.25	(284.08)	90.91
Netherlands	202.23	46.64	23.06
USA	160.45	265.44	60.45
France	91.79	(9.29)	10.12
Togo	62.66	(59.54)	95.02
Italy	52.87	(0.64)	1.21
Spain	52.50	(2.45)	4.66
South Africa	49.18	(2.61)	5.30
Japan	48.47	39.55	21.41
Cocoa and cocoa preparations			
Netherlands	584.15	(69.86)	11.96
Malaysia	273.79	(141.33)	51.62
Brazil	191.76	(50.76)	26.47
Germany	185.68	(67.99)	36.61
USA	181.11	31.17	17.21
Estonia	130.90	(53.00)	40.49
Spain	130.15	(65.70)	50.48
France	122.70	66.41	54.13
Japan	106.54	16.17	15.18
Belgium	106.17	(18.46)	17.39

Source: Author's computation using UN Comtrade data

Table 2 Ghana's import misinvoicing by commodity and partner trading level

Country	Import in million US$	Misinvoicing	Misinvoicing (% of Import)
Electrical machinery and equipment			
China	214.71	(433.38)	49.54
USA	120.84	(17.57)	14.54
Turkey	65.10	34.66	53.24
United Kingdom	54.18	18.16	33.52
South Africa	31.03	(16.58)	53.44
France	21.32	6.33	29.67
Belgium	21.06	11.97	56.83
Australia	9.85	2.36	23.93
Spain	5.86	(6.85)	116.82
TOTAL			
Nuclear reactors, boilers, machinery and mechanical appliances			
China	313.58	(131.19)	41.84
Belgium	165.47	83.85	50.68
United Kingdom	112.84	(16.97)	15.03
Germany	75.85	(11.08)	14.61
India	62.74	(20.94)	33.38
Netherlands	41.62	(35.96)	86.42
Australia	32.49	(15.18)	46.73
France	23.54	(66.57)	35.37
Rep. of Korea	16.53	(13.42)	81.19
Sweden	12.60	(23.84)	52.85
TOTAL			
Salt, Sulphur and stone			
Spain	602.94	571.61	94.80
Turkey	101.29	64.90	64.08
Rep. of Korea	39.61	37.09	93.65
China	34.82	22.90	65.77
Belgium	11.54	6.15	53.32
Sweden	9.22	6.00	65.11
Italy	4.30	2.11	48.95
USA	0.45	(0.28)	62.45
South Africa	0.23	(0.42)	55.68
United Kingdom	0.14	(0.09)	62.89
TOTAL			

Source: Author's computation using UN Comtrade data