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A review of the UNCTAD report on trade misinvoicing, with a focus on South Africa's gold export

December 2016

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Ref: A review of the UNCTAD study on trade misinvoicing, with a focus on South Africa's gold exports

Dear Madam, Sir:

At the request of the South African Chamber of Mines, Eunomix Research has conducted an independent, non-peer reviewed, analysis of the UNCTAD study entitled *Trade Misinvoicing in Primary Commodities in Developing Countries: The cases of Chile, Cote d'Ivoire, Nigeria, South Africa and Zambia*.

The UNCTAD study points towards a systematic practice of mis- and underinvoicing among mining companies in these countries, alleging that the mining industry has been engaging in this practice with the direct objective of avoiding taxes, or at the very least reducing tax burdens in producing countries. Specifically, the report states that mining and oil companies have misappropriated as much as 67% of export revenue in the countries studied.

The objectives of the present research have been to:

- Identify theoretical issues, limitations and/or flaws.
- Identify issues, limitations and/or flaws with the methodology and data used.
- Verify the accuracy of the analysis conducted.
- Propose an alternative approach.
- Conduct a counterfactual analysis based on this approach.

The focus has been limited to providing an analysis limited to South Africa's gold exports.

The Chamber of Mines defined the broad objectives of the study. It provided no guidance to Eunomix on the methodology and data used for the study. It did provide its publicly available data. The Chamber of Mines did not influence the approach nor the results provided herein.

This report has not been peer reviewed, but was subjected to rigorous internal review.

The report reflects the views of Eunomix Research, which takes sole responsibility for its content.

Sincerely yours,

Claude Baissac

Eunomix Group CEO

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1. Executive Summary

Summary of the UNCTAD study

- In July 2016 UNCTAD released a report entitled *Trade Misinvoicing in Primary Commodities in Developing Countries: The cases of Chile, Cote d'Ivoire, Nigeria, South Africa and Zambia*. The report points towards a systematic practice of mis- and underinvoicing among mining companies in these countries.
- The report states that mining and oil companies have misappropriated as much as 67% of export revenue in the countries studied.
- For South Africa, the report calculated cumulative underinvoicing over the period 2000-2014 to have amounted to USD 102.8 billion (2014 US dollars): USD 600 million for iron ore; USD 24 billion for silver and platinum; and USD 78.2 billion for gold.
- The UNCTAD study uses the United Nations Commodity Trade Statistics (UN Comtrade) database. It compares reported exports by product and country of destination with the reported imports of the products by those same countries. So, for example, it compares within the UN Comtrade database South Africa's reported iron ore exports to China with China's reported iron ore imports from South Africa. It does this annually for the period 2000 to 2014.
- The report finds substantial and systematic discrepancies between the export values reported by exporting countries and import values reported by importing counties for the same products. In some cases, it finds evidence of overinvoicing (e.g. copper from Chile) and of both over- and underinvoicing of the same product in different years (e.g. oil exports from Nigeria, copper from Zambia and silver and platinum from South Africa). But the overwhelming finding is of underinvoicing.
- One of the key conclusions of the report is that misinvoicing is likely to be the result of deliberate illicit action: "(As regards) the puzzling case of gold exports from South Africa, (…) the country's official statistics report very little gold exports while substantial amounts appear in its leading trading partners' records. This does not appear to be a simple matter of undervaluation of the quantities of gold exported, but rather a case of pure smuggling of gold out of the country. (…)" (UNCTAD, page 31)

Third party critiques

- The study has received significant attention, and its findings have been widely reproduced in the press. Critiques have pointed out the fact that the report fails to account for complexities of reporting destination country in case of re-exporting, of reporting destination country in case of storage, and reporting destination country due to 'virtual' trading hubs.
- In the case of South Africa, SARS and others have pointed out inaccuracies in how the report has accounted for the country's gold exports.

Theoretical review

- The UNCTAD study's central theoretical tenet is that discrepancies between reported exports from commodities producing countries and imports from their trade counterparts greater than 10 percent are allocated to misinvoicing. Misinvoicing might be overinvoicing, where the reported exports are greater than the reports imports, or underinvoicing, where imports exceed the value of exports.
- Crucially, the UNCTAD study advances that misinvoicing is not the product of discrepancies in trade data attributable to variations or errors in data reporting. Its main argument in support of this hypothesis is that statistical errors over time for a particular data set correct themselves through

probabilistic averages. Since trade discrepancies show either persistency or increase, misinvoicing must be the cause.

- The UNCTAD study does not provide a discussion of alternative theoretical propositions as regards the practice of trade misinvoicing, its prevalence, scale and origins. This leads to the conclusion that the theoretical proposition at the core of the report is undisputed.

- Yet, the subjects of (1) trade misinvoicing, and (2) the relationship between trade misinvoicing and trade discrepancy, have both received meaningful attention and have been the foci of significant debates. Contrary to the impression created by the UNCTAD study, the central proposition of the study is not the subject of consensus:
  - Firstly, there is no consensus, whether theoretical or empirical, that trade data discrepancies correlate with trade misinvoicing, much less that trade misinvoicing would be the primary cause of such discrepancies. Connected to this point, while trade misinvoicing is recognised as being a practice, it may not explain, in whole or in part, trade data discrepancies.
  - Secondly, therefore, there are alternative theoretical and empirical explanations for the existence and resilience of large trade data discrepancies. This point invalidates the notion that discrepancies caused by data error would be self-correcting.

Empirical review: limited counterfactual on South Africa's gold exports

- A key findings of the UNCTAD report relates to an alleged underinvoicing of USD 78.2 billion in gold exports from South Africa between 2000 and 2014. This claim in particular has garnered widespread international and national attention because, according to the UNCTAD study, this represents the largest instance of misinvoicing documented.

- Determining whether this finding is correct is therefore material for a number of reasons:
  - Firstly, it is material to the South African government, who, if the report is correct, would have been exposed to massive amounts of revenue losses. As discussed previously, SARS has publicly counteracted the UNCTAD study's findings.
  - Secondly, it is material to the South African mining industry, which has been tarnished by the report's findings and their wide distribution and reproduction.
  - Thirdly, it is material to the credibility of the UNCTAD study's itself, its author and this important international organisation.

- The UNCTAD study makes the implicit assertion that because South Africa does not report gold exports by country of origin to Comtrade this means the total value of South Africa's gold exports is not reported. This implicit assertion is invalid. Gold exports are appropriately and comprehensively reported elsewhere. And the total value of such exports is known by producer to both the South African tax and customs and excise authorities. It is also known to the relevant statistical authorities.

- Indeed, several alternative ways of recording gold export data are publicly available in South Africa. An examination of some of these different data sources demonstrates that the national revenue and banking authorities in South Africa have a firm grasp on the value of SA gold exports: Statistics South Africa (StatsSA); The South African Reserve Bank (SARB); The Chamber of Mines of South Africa.

- The limited counterfactual produced by Eunomix clearly demonstrates that the UNCTAD study's findings on South Africa's gold exports are in large part invalid, and notably:
  - The loss of gold export revenues amounting to USD 78.2 billion between 2000 and 2014 has been proven incorrect on the basis of alternative, publicly and readily available data. Instead, the amount of discrepancy identified here is USD 19.5 billion.
  - The total reported loss of USD 102.8 billion is by necessity false by at least USD 58.7 billion.

- The UNCTAD study's observation that "there is a perfect correlation between gold export underinvoicing and the volume of exports as reported by the country's trading partners" (page 28) is therefore obviously flawed.

- Furthermore, the presence of a remaining discrepancy in gold exports of USD 19.5 billion does not mean that this amount represents trade misinvoicing. While Eunomix does not reject off hand the possibility of some degree of misinvoicing, it supports the notion that misinvoicing is just one of the possible hypotheses of large trade data discrepancies, rather than the only available theoretical and empirical hypothesis.

Summary critique of the UNCTAD report

- Eunomix has demonstrated that the UNCTAD study's most significant findings – on South Africa's gold exports for the period 2000-2015 – is empirically incorrect by a factor of 4, where the trade discrepancy of USD 78.2 billion (2014 dollar) is in fact USD 19.5 billion. This very large margin of error in itself is sufficient to nullify the claim made in the UNCTAD study that systematic large trade discrepancies can only be caused by trade misinvoicing and not data errors because data errors are zero-mean-reverting over time. Clearly, in the case of South Africa's gold exports, the error has not self-corrected despite being large and consistent over time. This is because the error was not the product of some random statistical error which would have corrected itself through the laws of probability. It was one of data classification between the South African government and Comtrade. And one which the UNCTAD study appeared to not know about.

- This validates the school of thought that does not posit a connection between trade discrepancy and misinvoicing. It also reaffirms the call for prudence in trade data analysis using one database emitted by numerous authors and institutions – Comtrade's custodian included (UNStats). As concerning with the UNCTAD study is the fact that alternative sources of data which would have proven the findings to be incorrect – insofar at least as South Africa's gold exports are concerned – are readily and publicly available. The UNCTAD study, it appears, made no effort to verify whether such data existed.

- Equally concerning is the fact that the UNCTAD study did not seek to provide alternative hypotheses to explain its findings beyond the proposition that trade discrepancy is the product of misinvoicing. One such obvious hypothesis would have been to question the accuracy of data. But, as discussed above, the UNCTAD study pre-emptively eliminated this hypothesis. Clearly has proven to be a fundamental theoretical and empirical flaw.

- In addition to justifying questions on the scientific validity of the UNCTAD study, the lack of effort to find alternative data sources and the lack of alternative hypotheses render acceptable questions about the motives of the report. Indeed, the conclusion that the report sought to prove a tenuous hypothesis by excluding alternative perspectives and approaches, and focusing on a monodimensional empirical analysis without alternative hypotheses and data sources is not unreasonable.

2. Introduction

2.1. Background

In July 2016 UNCTAD released a report entitled *Trade Misinvoicing in Primary Commodities in Developing Countries: The cases of Chile, Cote d'Ivoire, Nigeria, South Africa and Zambia*. The report points towards a systematic practice of mis- and underinvoicing among mining companies in these countries, alleging that the mining industry has been engaging in this practice with the direct objective of avoiding taxes, or at the very least reducing tax burdens in producing countries. Specifically, the report states that mining and oil companies have misappropriated as much as 67% of export revenue in the countries studied.

The implication is that South African gold miners are committing deliberate fraud to pay no tax on these illegal exports, or to bypass South Africa's foreign exchange regulations. As a result, it is claimed, South Africa loses out on a significant amount of the foreign currency earned from gold sales. Iron ore and platinum are also accused of substantial misinvoicing, amounting to billions of dollars.

The report – and particularly its findings on South Africa's gold exports – has been exposed to criticism in a number of articles in the media. This includes responses by SA's Chamber of Mines, by SARS and a handful of economists. It has been pointed out that the UNCTAD study failed to recognise that because of gold's historical monetary role, SA does not report gold exports by country of destination. This astounding flaw has not been acknowledged, or even less, corrected by UNCTAD, despite representations made to it. Critics have also explained that the multiple nature of copper trading globally complicates the reporting of country of destination, as this often changes when the cargo is already on route.

While the UNCTAD website acknowledges some of these responses, it continues to claim that its results are valid. Its online response notes that: "these challenges do little to reassure about the lack of transparency in the trade of commodities from developing countries. As we have highlighted, this misinvoicing – a word that we use in its most technical sense, without attaching value or even accusation – means that some countries may be losing as much as 67 percent of their commodity exports."

If true, these claims would be very damaging to South Africa's economic performance. They fuel an already pervasive suspicion towards mining companies, and transnational companies in particular, which damages the ability of these companies to operate in South Africa.

Furthermore, the reputational damage to the mining industry in these countries, and to South African gold miners in particular, has been considerable. They are accused of deliberate, systemic misinvoicing to facilitate capital flight and tax avoidance. South African gold miners are accused of "smuggling" most of South Africa's gold out of the country unreported.

2.2. Objective and focus of this report

Considering the implications of the report's conclusions, and given the critiques levelled at it, the South African Chamber of Mines has retained Eunomix to provide an independent review of the UNCTAD study.

The objectives of the research have been to:

- Identify theoretical issues, limitations and/or flaws.
- Identify issues, limitations and/or flaws with the methodology and data used.
- Verify the accuracy of the analysis conducted.
- Propose an alternative approach.
- Conduct a counterfactual analysis based on this approach.

The focus has been limited to providing an analysis limited to South Africa's gold exports.

2.3. Report structure

The present report is organised as follows:

1. Part A – Summary of the UNCTAD study

2. Part B – Discussion of the UNCTAD study's methodology
3. Part C – Limited counterfactual analysis: South African gold exports
4. Part D – Assessment of the UNCTAD study

2.4. Project team

- Claude Baissac is the CEO of Eunomix and MD of Eunomix Research. A doctoral scholar in Political Science (Northern Arizona University), he holds an MPhil in Social Sciences and an MA in Geography (Université de la Reunion). Claude is an established expert on the relationship between economic growth, sustainable development and commodities in developing countries. He is a leading international specialist on economic diversification, particularly through special economic zones. He has significantly worked on mineral beneficiation. He advises the mining industry on improving its socioeconomic contribution. He started his consulting career with UNCTAD in 1995, and has since then extensively worked with the AfDB, the EU, the IFC, the UN and the World Bank. He is a published and quoted author, and regularly consult with the media.

- Gavin Keeton is Associate Professor of Economics at Rhodes University, South Africa. He holds a PhD in Economics from Rhodes University. He worked as an economist at the Development Bank of Southern Africa and then at Standard Bank Investment Corporation, before joining the economics office of Anglo American. As Chief Economist he was responsible for advising the Anglo American group on developments in the global economy and in financial markets and their implications for the mining industry. In 2009 he returned to Rhodes University. He has written widely on issues affecting mining and the South African economy. He writes a fortnightly column in South Africa's leading business publication, Business Day.

- Ferdinand Maubrey is a political economist and project consultant specialising on natural resource governance, economic diversification and investment promotion in Africa. He has conducted a number of studies on mineral beneficiation in Southern Africa, including an impact assessment of Zimbabwe's beneficiation strategy. He has worked on special economic zones, recently completing a seminal report for the AfDB on the topic with Claude Baissac. Prior to joining Eunomix he was a consultant for the World Bank and IFC on investment promotion and 'fragile states' in Africa.

2.5. Important notice

The Chamber of Mines defined the broad objectives of the study. It provided no guidance to Eunomix on the methodology and data used for the study. It did provide its publicly available data. The Chamber of Mines did not influence the approach nor the results provided herein.

This report has not been peer reviewed, but was subjected to rigorous internal review.

The report reflects the views of Eunomix Research, which takes sole responsibility for its content.

3. Part A – Summary of the UNCTAD study

3.1. Objectives of UNCTAD study

The objective of the UNCTAD study is to:

> contribute to research and policy debates by providing empirical evidence on the magnitude of trade misinvoicing in the particular case of primary commodity exports from five natural-resource-rich developing countries: Chile, Côte d'Ivoire, Nigeria, South Africa and Zambia.[1]

The focus on trade misinvoicing is explained in the report's introduction as being the product of widespread capital flight and illicit financial flows affecting developing countries:

> The problem of trade misinvoicing has generated increasing attention in the research and policy communities. It is an issue that has gained particular traction through the current debates on illicit financial flows, since trade misinvoicing continues to be used as a key mechanism of capital flight and illicit financial flows from developing countries.[2]

3.2. Methodology

3.2.1. Theoretical tenet

The UNCTAD study's central theoretical tenet is that discrepancies between reported exports from commodities producing countries and imports from their trade counterparts greater than 10 percent are allocated to misinvoicing. Misinvoicing might be overinvoicing, where the reported exports are greater than the reports imports, or underinvoicing, where imports exceed the value of exports.

The UNCTAD study's analysis is conducted using trade data. As explained, this follows established practice in the study of trade misinvoicing:

> Estimates of trade misinvoicing have been based, traditionally and primarily, on bilateral trade data published in the Direction of Trade Statistics (DOTS) of the International Monetary Fund (IMF), which provides aggregate values of imports and exports between a country and its trading partners. More recently, there has been growing interest in investigating trade misinvoicing at more disaggregated levels, at sector and product levels, and by trading partner. This interest is motivated by two major factors. First is the presumption that some products may be more prone to trade misinvoicing than others based on their idiosyncratic characteristics. Second, there may be variations among trading partners with regard to transparency and enforcement of trade recording rules that may generate differences in trade misinvoicing across partners.[3]

As the report explains:

> Trade between two countries A and B is said to exhibit export misinvoicing when the value of exports from country A to its trading partner country B, as reported by country A, is significantly different from the value of imports by country B from country A, as reported in country B's data.[4]

The report allows for the differences in value represented by freight and insurance. It defines trade misinvoicing as the result of systematic discrepancy between the terms of the following equation:

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[1] UNCTAD. 2016. Trade Misinvoicing in Primary Commodities in Developing Countries: The Cases of Chile, Cote d'Ivoire, Nigeria, South Africa and Zambia. Page 3.

[2] *Ibid.*

[3] *Ibid.*

[4] *Op cit*, p. 12.

Country B's imports from country A = Country A's exports to country B + freight and insurance

Crucially, the UNCTAD study proposes that misinvoicing is not the product of discrepancies in trade data attributable to variations or errors in data reporting. It advances a number of explanations for this:

> While it is possible that recorded import and export data might be affected by statistical errors, these errors would not persist and have a trend over time. The series of the errors would be zero-mean-reverting.[5]

Stated differently, statistical errors over time for a particular data set correct themselves through probabilistic averages.

For the report, rather than being zero-mean-reverting, trade discrepancies show persistency or increase, demonstrating misinvoicing;

> Empirical evidence shows not only large values, but also persistent, and in some cases upward trending levels of trade misinvoicing. A number of recent studies (e.g., Ndikumana et al. (2015), and Baker et al. (2014)) have provided evidence of large and persistent trade misinvoicing in African countries. And a recent study for India shows a clear upward trend in trade misinvoicing since 2000 (Jha and Truong, 2014). A similar phenomenon is found in other Asian countries (Beja, 2006, 2007; Kar, 2010).[6]

The report dismisses the notion that reporting delays may account for discrepancies:

> delays in reporting of trade statistics would not be so systematic as to generate persistent trade misinvoicing, particularly given that most studies have used annual data. The impact of periodic recording delays is likely to be minimal on annual series; and the estimated effect of these delays on cumulative trade misinvoicing over a long time period is likely to be even smaller.[7]

The report acknowledges based on a body of literature that trade discrepancies are more likely to originate from imperfections in data from developing countries. To counter this effect, the report states that

> It is for these reasons that the estimation of trade misinvoicing typically considers trade with developed countries as a benchmark, based on the assumption that developed countries' data are less prone to substantial measurement and recording errors. Thus total misinvoicing is obtained by scaling up the volume of trade misinvoicing with developed countries with the inverse of the share of this group in the particular developing country's total trade. (See Ndikumana and Boyce (2010), for an elaborate description of the methodology).[8]

The "developing countries trade data distortive effect" is dealt with in the report by focusing on the trade between the exporting countries under study and their developed country trading partners.

3.2.2. *Empirical process*

The UNCTAD study uses the United Nations Commodity Trade Statistics (UN Comtrade) database. It compares reported exports by product and country of destination with the reported imports of the products by those same countries. So, for example, it compares within the UN Comtrade database South Africa's reported iron ore exports to China with China's reported iron ore imports from South Africa. It does this annually for the period 2000 to 2014.

Insofar as South Africa is concerned, the Comtrade database uses information from the South African Revenue Service in compiling the data on import and exports. In the case of other countries, Comtrade gathers data from either a similar national revenue agency or statistics agencies.

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[5] *Op cit*, p. 7.

[6] *Ibid.*

[7] *Ibid.*

[8] *Ibid.*

In terms of the detailed empirical steps undertaken, the report uses the following methodology:

- Step 1: To determine the main export commodities that are the subject of the export misinvoicing estimation, the first step consists of extracting and downloading exports of all commodities to the world (as trading partner). The leading products are determined using the product's share in cumulative exports over the period reported in UN Comtrade. In this study, the average shares over the period 2010–2014 are used to determine the leading export products.
- Step 2: Once the leading products are determined, the next step is to extract series for exports of these products by the country under study to all its trading partners over the sample period. The partners (importers from the country under study) are then ranked based on average shares in cumulative exports over the investigation period. The aim is to assemble a sample of trading partners that represents a high proportion of total exports from the country under study, preferably over 90 per cent. Only partners with a meaningful length of time series are included in the sample.
- Step 3: Next, export series for the identified products to the identified leading trading partners for the period reported in UN Comtrade are extracted.
- Step 4: Import data by the identified leading partners from the country under study are then extracted. These series are compared to the country's exports to estimate export misinvoicing.
- Step 5: The last step is to organize the data so as to compare exporter data and partner data for the computation of trade misinvoicing. This requires generating a panel that combines exporter data and partner data. This step is labour-intensive as it involves filling gaps with missing cells where no data are reported. This is because when there are no reported exports or imports in a particular year, this particular year-country observation does not appear in UN Comtrade. This is a particular inconvenience in the use of UN Comtrade. In other databases such as the DOTS, the year-country observation would be reported with a missing value for the particular variable, which makes it possible to generate time series and panel data sets without any manual manipulations of the original data. Note that any manual manipulation of the original data runs the risk of contamination of the data due to possible mistakes by the researcher. [9]

3.3. Findings and recommendations

The report finds substantial and systematic discrepancies between the export values reported by exporting countries and import values reported by importing counties for the same products. In some cases, it finds evidence of overinvoicing (e.g. copper from Chile) and of both over- and underinvoicing of the same product in different years (e.g. oil exports from Nigeria, copper from Zambia and silver and platinum from South Africa). But the overwhelming finding is of underinvoicing (iron ore and gold from South Africa). This is attributed in the report to deliberate fraud by exporters with the goal of facilitating capital flight and avoiding paying tax. Key findings from the UNCTAD study are quoted below for each of the countries studied.

3.3.1. Key findings

Chile

> The results show export overinvoicing (negative values) for all trading partners except France, Germany and Spain. Whereas trade with Germany exhibits substantial export underinvoicing worth $9.4 billion in net terms, the values are small for France and Spain. Therefore, it is reasonable to conclude that export overinvoicing is the most predominant phenomenon in Chile's copper trade.[10]

[9] *Op cit*, p. 9.

[10] *Op cit*, p. 14.

Zambia

> The results for Zambia (see table 4 and figure 2), a country that is also heavily dependent on copper exports, differ drastically from those of Chile. In contrast to widespread export overinvoicing in Chile, Zambia's results show copper export underinvoicing, with the notable exceptions of trade with Switzerland and the United Kingdom which exhibits export overinvoicing of $31.8 billion and $4.4 billion, respectively. Trade with Singapore, South Africa and the United Republic of Tanzania also exhibits export overinvoicing, albeit a relatively smaller proportion compared to Switzerland.[11]

Nigeria

> The pattern of oil export misinvoicing changed over time, switching from a regime of export underinvoicing over the 1996–2003 period to export overinvoicing from 2006 to 2014 (figure 5). This leads to the finding that there was not only a switch in the direction of export misinvoicing, but also the relative intensity of misinvoicing diminished in the second period. Nonetheless, export overinvoicing remains an important issue for the Government of Nigeria which it needs to address as part of a broader strategy to manage its oil wealth.[12]

Cote d'Ivoire

> Cocoa exports by Côte d'Ivoire exhibit heavy geographical concentration, with the top two partners accounting for nearly 50 per cent of the country's total exports: the Netherlands with 31.3 per cent and the United States with 18.3 per cent. (…)
>
> The trade misinvoicing estimations (table 8 and figure 6) show systematic cocoa export underinvoicing, occurring in trade with 10 partners over the period 1995–2014.[13]

South Africa

> The results for South Africa vary substantially by commodity.[14] (…)
>
> (For silver and platinum) The data show systematic export underinvoicing throughout the period. However, the amounts of misinvoicing are relatively small, representing generally less than 10 per cent of total exports.[15] (…)
>
> South Africa's iron ore exports, which rose steadily and rapidly until 2010, were accompanied by an equally rapid increase in export underinvoicing (table 10 and figure 8). But there was a drastic change in the pattern after 2010, from systematic export underinvoicing to systematic export overinvoicing.[16] (…)

For South Africa, cumulative underinvoicing over the period 2000-2014 is reported in the UNCTAD study (in 2014 constant US dollars) for silver and platinum to have amounted to USD 24 billion, iron ore to USD 600 million, and gold to USD 78.2 billion. In total, underinvoicing for South Africa over the nearly 15 year period is stated by the UNCTAD study to have amounted to USD 102.8 billion (2014 US dollars).

[11] *Op cit*, p. 16.

[12] *Op cit*, p. 19.

[13] *Ibid*. p. 23.

[14] *Op cit*, p. 25.

[15] *Ibid.*

[16] *Op cit*, p. 27.

Table 1: UNCTAD findings of misinvoicing in South Africa (in USD million of 2014 constant USD), 2000-2014

Commodity	Exports (South African data)	Exports (partner's data)	Export underinvoicing
Silver and platinum	103,738	138,122.2	24,010.4
Iron ore	51,733	57,527.1	620.8
Gold	34,507.5	116,197.7	78,239.5

Source: UNCTAD, 2016, using UN Comtrade data

The findings on gold are by far the largest of any product examined in the report and are reproduced by country in Appendix 1. Massive underinvoicing of gold exports is found for all of South Africa's major trading partners. The larger the trade, the greater the claimed underinvoicing. The report observes that

> there is a perfect correlation between gold export underinvoicing and the volume of exports as reported by the country's trading partners.
>
> Gold traded with the leading partners also exhibits the highest amount of underinvoicing: India (USD 40 billion), Germany (USD 18.4 billion), Italy (USD 15.5 billion) and the United Kingdom (USD 13.7 billion).[17]

The report concludes that the cumulative value of South Africa's reported gold exports over the period 2000-2014 was USD 34.5 billion in 2014 constant dollars, while reported imports of South African gold was "more than three times higher"[18] at USD 116.2 billion. By these calculations, 70% of South Africa's gold exports – USD 78.2 billion – are unreported.

3.3.2. Conclusions and recommendations

The report makes a number of key empirical conclusions, derived from the analysis and its findings. It then extrapolates from these conclusions a number of key behaviour/intent hypotheses, from which it derives a number of policy recommendations.

Empirical conclusions

The UNCTAD study makes a number of key conclusions, quoted here:

Conclusion 1: primary commodities dominate exports of the countries in the study

> The analysis of the data confirms the widely known dominance of primary commodities in these countries' exports.[19]

Conclusion 2: exports are concentrated to a few trading partner countries

> But it also highlights another important dimension of concentration, namely that a few trading partners account for a large share of total primary commodity exports of each of the sample countries studied.[20]

Conclusion 3: trade misinvoicing is substantial, and underinvoicing is preponderant

> The results show substantial export misinvoicing – both underinvoicing and overinvoicing – in all the five countries, with a clear preponderance of export underinvoicing, except for copper exports from Chile.[21]

[17] *Op cit*, p. 28.

[18] *Ibid.*

[19] *Op cit*, p.31.

[20] *Ibid.*

[21] *Ibid.*

Conclusion 4: trade misinvoicing is likely to be the result of deliberate illicit action

> (In the case of Nigeria's oil) there appears to be systematic smuggling of oil into the country. (…)
>
> (In the case of all case studies except Chile) (i)t is therefore clear that export misinvoicing could be an important channel of capital flight from these countries. (…)
>
> (As regards) the puzzling case of gold exports from South Africa, (…) the country's official statistics report very little gold exports while substantial amounts appear in its leading trading partners' records. This does not appear to be a simple matter of undervaluation of the quantities of gold exported, but rather a case of pure smuggling of gold out of the country. (…)
>
> Puzzling results also emerge at the trading partner level. Trade with the Netherlands presents a peculiar case, with systematic and substantial export overinvoicing. It appears that primary commodities exported to the Netherlands never dock in the Netherlands. This is also the case for copper exports from Chile and Zambia to Switzerland. The question is whether this is the outcome of smuggling or incorrect reporting of the residence of the buyers. Answering this question may require an investigation at the company level.[22]

Conclusion 5: trade misinvoicing correlates with trade concentration, which may be causal to the former

> There is a close correlation between concentration of trade and concentration of trade misinvoicing suggesting that trade misinvoicing is a systemic problem in these countries.[23]

Behaviour/intent hypothesis

Hypothesis 1: tax evasion is a possible motive for misinvoicing

> Tax evasion is a possible motive for the large degree of export overinvoicing observed in most countries in the sample (except Chile). It is also possible that in some cases of export overinvoicing (as in trade with the Netherlands and Switzerland), products may end up in other destinations than the ones listed in official records as a result of transit trade.[24]

Hypothesis 2: tax incentives are a possible motive for overinvoicing

> Export overinvoicing could also be motivated by the attempt of exporters to take advantage of tax incentives aimed at promoting export-oriented activities.[25]

Hypothesis 3: foreign exchange and capital controls as a motive for misinvoicing

> Foreign exchange and capital account controls could also be a motive for trade misinvoicing.[26]

Policy recommendations

Recommendation 1: governments should investigate trade misinvoicing by scrutinising exports

> First, the fact that exports of primary commodities are concentrated by product and market could be a blessing in disguise. Export concentration implies that policy efforts could be focused on a limited number of products and partners to increase the effectiveness of reforms. In each country, the government and its development partners should be able to identify which

[22] *Ibid.*

[23] *Ibid.*

[24] *Ibid.*

[25] *Ibid.*

[26] *Op cit*, p. 32.

products and export destinations need to be scrutinized when investigating trade misinvoicing.[27]

Recommendation 2: trade statistics should be substantially improved

In particular, improvements are urgently needed in data gathering at the product and partner levels, and there should be coordination between national statistics and international statistical databases such as UN Comtrade and the IMF's DOTS. This will require scaling up both financial and technical assistance to developing countries to help improve human capacity as well as the infrastructure for the compilation and management of trade statistics.[28]

Recommendation 3: transnationals and jurisdictions involved in misinvoicing should be investigated

Third, the results from this study highlight the need for an investigation into the role of TNCs involved in the exploitation, export and import of commodities, as well as the role of secrecy jurisdictions in facilitating trade misinvoicing. Such an investigation may shed light on the mechanisms of export overinvoicing and import underinvoicing. Enhanced transparency in global trade is indispensable, especially through coordinated enforcement of the rules on country-by-country reporting by TNCs at the global level.[29]

[27] *Ibid.*

[28] *Ibid.*

[29] *Ibid.*

4. Part B – Discussion of the UNCTAD study

4.1. Third party critiques of the report

Since its release, the UNCTAD study has received significant attention, and its findings have been widely reproduced in the general and economic press.

Criticism has focused both on its theoretical approach and methodology. For instance:

- **Complexity of reporting destination country in case of re-exporting:** a commodity shipped from a producer country may be warehoused, split, combined with others, or repacked before being re-exported from an intermediary country or regional trading hub before being delivered to its ultimate destination. The final destination might be recorded as the home-base of a commodity company or the first port of consignment, even though it would not be reported as an import there.[30]
- **Complexity of reporting destination country in case of storage:** additionally, there are cases in which produced commodities do not directly go to end users around the world, but will end up in storage in bonded warehouses. Seeing as though these warehouses are bonded, they would not be recorded in the import statistics of any country, as they have not entered a country in the legal sense. This could explain the discrepancies shown in the UNCTAD report between Chile and Netherlands, seeing as though Netherlands is a centre for bonded warehouses.[31]
- **Complexity of reporting destination country due to 'virtual' trading hubs:** making matters even more complex, at times, *virtual* trading hubs exist, where the physical product never actually arrives, but is directly shipped to buyers in other countries. Clough of the international group Global Financial Integrity uses Zambian copper 'exports' to Switzerland as an example: Zambian copper, although reported by Zambian customs authorities of going to Switzerland, never arrives in Switzerland, but is directly shipped to other buyers by the Swiss mining company Glencore, which also owns the Zambian copper mine.[32]

These observations provide initial alternative explanations other than misinvoicing for the trade discrepancies shown in the UNCTAD study. The following sections will go into more detail on how the UNCTAD study could have added more robustness to its findings and conclusions.

4.2. Trade misinvoicing and export/import discrepancies

4.2.1. The report's central theoretical tenet and its support in the literature

The UNCTAD study's central theoretical tenet is that discrepancies between exports from commodities producing countries and imports from their trade counterparts greater than 10 percent are caused by trade misinvoicing. Empirically, this is demonstrated by comparing trade data between exports and importers, allowing for the marginal differences between price of exports and cost if imports represented by transport and insurance. Indeed, exports are priced free on board (FOB) and imports are priced at cost-insurance-freight (CIF).

This central theoretical proposition is supported in the report through a brief literature review which first names early authors who documented the existence of

[30] Forstater, M. "Misinvoicing or misunderstanding?" Independent. July 20, 2016.

[31] Worstall, T. "Countries Are Losing 67% Of Export Revenue Due To Misinvoicing - UNCTAD Needs To Get A Clue." *Forbes.* July 18, 2016.

[32] "Misinvoicing of commodities costs billions to developing world." *Financial Times*. July 17, 2016; Forstater, M. "Misgivings over report on commodities invoicing." *Financial Times.* July 21, 2016.

> systematic discrepancies in bilateral trade data starting in the 1960s. Bhagwati (1964) pointed out substantial trade misinvoicing in the case of Turkey. Naya and Morgan (1969) provided similar evidence of export misinvoicing in the case of South-East Asian countries.[33]

The report states that specific focus on misinvoicing developed in the 1980s and cites Lessard and Williamson (1987) as providing work that identified "the practice (…) as a major mechanism through which developing countries lose valuable capital."[34]

The report quotes a number of authors who have provided additional evidence in support of the theoretical proposition: Ndikumana et al. (2015), Beja, (2006, 2007), Jha and Truong (2014), Kar (2010), Kar and Cartwright-Smith (2010), Kar and LeBlanc (2013), Kar and Spanjers, (2014).

4.2.2. *Literature review*

The UNCTAD study does not provide a discussion of alternative theoretical propositions as regards the practice of trade misinvoicing, its prevalence, scale and origins. This leads to the conclusion that the theoretical proposition at the core of the report is undisputed.

Yet, the subjects of (1) trade misinvoicing, and (2) the relationship between trade misinvoicing and trade discrepancy, have both received meaningful attention beyond the authors cited in the UNCTAD study and have been the foci of significant debates.

A more comprehensive review of the literature shows that at least three school of thoughts exist:

- **Trade discrepancies correlate with and are caused by misinvoicing:** the UNCTAD study belongs to a school of thought that supports the notion that systematic trade discrepancies are caused by misinvoicing. For most of the authors belonging to this school of thought there is a foundational *assumption* (i.e., hypothesis) that trade discrepancies automatically indicate misinvoicing. Empirical work therefore focuses on correlations and patterns within the data to determine the scope, scale and duration of misinvoicing.

- **Trade misinvoicing exists but may not correlate with trade discrepancies:** other authors interested in misinvoicing have explicitly admitted that it is difficult to find empirical evidence for misinvoicing. Part of the literature on misinvoicing does not claim to provide empirical evidence for misinvoicing. Instead, these authors assume illegal trade exists and are more interested in the *theoretical* explanations for the phenomenon.

- **Trade discrepancies are not necessarily the product of misinvoicing:** there is also literature providing evidence that trade discrepancies identified are *not* necessarily explained by misinvoicing, either as a primary or subsidiary causal explanation. Indeed, a stream of literature focusing on bilateral trade discrepancies has found that there are a plethora of reasons – other than misinvoicing – for why such discrepancies arise.

Trade discrepancies correlate with and are caused by misinvoicing

In addition to the authors quoted in the UNCTAD study, authors like Yeats (1990), Fisman and Wei (2004), and others have provided evidence in support of misinvoicing.

Yeats (1990) uses the fact that reported 'free on board' exports frequently exceed matched reported 'cost, insurance, and freight' imports to suggest that smuggling is wide-spread in trade among African countries or that importers are intentionally underinvoicing to avoid high tariffs or quotas. Fisman and Wei (2004) find that trade discrepancies negatively correlate with tax rates on closely related products, suggesting that evasion takes place through misclassification of imports from higher-taxed categories to lower-taxed ones. They also show that trade discrepancies are larger when measured in values rather than quantity, suggesting that evasion takes the form of underreporting. Several authors have also found that trade discrepancies are

[33] UNCTAD. 2016. Page 5.

[34] *Ibid.*

highly positively correlated with corruption (Fisman and Wei, 2007; Berger and Nitsch, 2008). Biswas and Marjit (2007) use partner trade statistics to find a positive (negative) correlation between the 'black market premium and export (import) underinvoicing since illegal traders sell (buy) the foreign exchange of unreported transactions on the black market.

Trade misinvoicing exists but may not correlate with trade discrepancies

Some authors interested in misinvoicing have explicitly admitted that it is difficult to find empirical proof for misinvoicing, which is why they must rely on descriptive analysis. In one seminal paper Fisman and Wei (2004) admit that tax evasion, "by its very nature, is difficult to observe." Farzanegan (2008) also sees illicit trade as "an unobservable variable."

Several authors provide evidence that trade discrepancies may not necessarily indicate misinvoicing. McDonald (1985) concludes that there is "mediocre statistical evidence" that smuggling incentives, such as the 'black market premium' [35] and export taxes, explain variations in trade discrepancies and that great caution should be exercised in using trade data discrepancies to infer a scale of smuggling activity.

Furthermore, the majority of literature on misinvoicing does not claim to provide empirical evidence for misinvoicing. Instead, they assume illegal trade exists and are more interested in *potential* incentives for the phenomenon. For instance, Bhagwati and Hansen's seminal 1973 paper – also cited by the UNCTAD study – focuses on the *theoretical* ways in which illegal trade arises. Farzanegan (2008) focuses on tariffs, fines, and the unemployment rate as *hypothesized* determinants of illegal trade. Barnett (2003) also does not focus on empirical evidence for misinvoicing itself, but rather on foreign currency restrictions and the black market premium as key incentives for the theoretical practice. Smuggling has also been viewed as another source of deviations of the exchange rate from purchasing power parity (Bahmani-Oskooee and Goswami, 2003).

Trade discrepancies are not necessarily the product of misinvoicing

Importantly, a large stream of literature focusing on bilateral trade discrepancies has found that there are a plethora of reasons – not just misinvoicing – for why such discrepancies arise.

Martin (2016) explains data discrepancies that arise because of differing definitions of exports and imports, differing definitions of territory, timing, declarations of country of origin, exchange rates, and intermediation, in addition to underinvoicing. Hangzhou (2009) finds attribution of imports to country of origin, attribution of exports to 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. He also mentions conceptual and methodological differences in data collection, differences in statistical territory definitions, timing, and re-exports. Ferrantino and Wang (2007) find robust correlations between discrepancies and tariff costs, valuation issues, and re-exports. Ajayi (1998) also notes diversion en route to the final destination, re-exports, reporting lags, currency conversions, and exchange rate variations as potential reasons beyond misinvoicing. He further writes that, "in Sub-Saharan Africa, one of the basic causes of trade discrepancy stems from the routing process for trade transactions."

The Comtrade website itself notes that differences in reported trade may be due to various factors including valuation, differences in inclusions/exclusions, and timing. [36] The UN's *International Merchandise Trade Statistics: Compilers Manual* also notes the following:

> Objectives of reconciliation and basic procedures: A short-term aim may be limited to the identification of major differences in the statistics of the two countries. That process may reveal systematic measurement errors and gaps, which should be corrected immediately.[37]

and further:

[35] The black market premium on the exchange rate is the difference between the value of currency on the black market (= illegal system) and its official exchange rate (= value) in relation to another currency.

[36] UN Comtrade website. "Limitations". http://comtrade.un.org/db/help/uReadMeFirst.aspx. Accessed on October 26, 2016.

[37] http://unstats.un.org/unsd/publication/seriesf/seriesf_87Rev1_e_cover.pdf, p. 92

> Reasons for differences in data: Even where both partners comply with United Nations guidelines for trade statistics, there can be differences between partner data. In fact, some of the discrepancies are a direct result of following those guidelines (…) In order to identify conceptual reasons for discrepancies the following areas should be reviewed: (a) coverage; (b) trade system applied; (c) time of recording; (d) interpretation and application of the commodity classification; (e) valuation; (f) partner country attribution; and (g) other sources of discrepancy.[38]

Thus, the Comtrade methodology confirms the conclusions by earlier authors on which potential reasons may account for data discrepancies beyond misinvoicing.

In sum, *in addition to misinvoicing,* authors have shown that the following elements could potentially explain trade data discrepancies:

- Differing definitions of exports and imports
- Differing definitions of territory
- Timing
- Declarations of country of origin
- Exchange rates / currency conversion issues
- Intermediation / diversion en route to the final destination
- Valuation issues
- Re-exports of goods
- Differences in statistical territory definitions
- Shipping, tariff and insurance costs and
- Product classifications
- Partner country attribution and treatment of processing trade
- Differences in data collection / reporting lags

4.2.3. Observations from the literature review

Contrary to the impression created by the UNCTAD study, the central proposition of the study is not the subject of consensus. As made clear in the above literature review:

- Firstly, there is no consensus, whether theoretical or empirical, that trade data discrepancies correlate with trade misinvoicing, much less that trade misinvoicing would be the primary cause of such discrepancies. Connected to this point, while trade misinvoicing is recognised as being a practice, it may not explain, in whole or in part, trade data discrepancies.

- Secondly, therefore, there are alternative theoretical and empirical explanations for the existence and resilience of large trade data discrepancies. This point invalidates the notion advanced by the UNCTAD study, without literature or empirical support, that discrepancies caused by data error would be self-correcting.

[38] *Ibid.*

5. Part C – Limited counterfactual analysis: South African gold exports

On the basis of above observations and of the critiques that have been levelled at the UNCTAD study as regards its analysis, findings and conclusions on South Africa's exports of gold, this section of the report seeks to provide a more in-depth examination of the empirical validity of the UNCTAD study.

As noted earlier, one of the key findings of the UNCTAD study related to an alleged underinvoicing of USD 78.2 billion in gold exports from South Africa between 2000 and 2014. This claim in particular has garnered widespread international and national attention because, according to the UNCTAD study, this represents the largest instance of misinvoicing documented.

Determining whether this finding is correct is therefore material for a number of reasons:

- Firstly, it is material to the South African government, who, if the report is correct, would have been exposed to massive amounts of revenue losses. As discussed previously, SARS has publicly counteracted the UNCTAD study's findings.
- Secondly, it is material to the South African mining industry, which has been tarnished by the report's findings and their wide distribution and reproduction.
- Thirdly, it is material to the credibility of the UNCTAD study's itself, its author and this important international organisation.

5.1. Alternative explanations for discrepancies in SA gold discrepancies

In addition to the broader potential alternative explanations mentioned above, the following summarises the main methodological criticisms for that particular claim:

- **South African gold's classification as 'monetary':** up until 2010 the vast majority of South African gold exports were classified as 'monetary' and consequently not captured in the Comtrade database. Also, even after 2010 the vast majority of South African gold exports are recorded, but the destination countries are not reported due to historic practices of South African tax and customs authorities. Thus, in Comtrade the 2011-2014 gold exports are all reflected as 'unallocated.'[39]
- **South African gold reported as 'Origin of Goods Unknown': t**he South African Trade Law Centre (Tralac) explains that gold exports are treated both as a good and as a country and reported under a special code 'Origin of Goods Unknown'. The South African Reserve Bank and SARS do not report details of where the nation's gold exports go to. Thus, the data would not show up on Comtrade.[40]
- **Trade statistics reported under UN Special Trade System:** A further methodological problem in the UNCTAD study, SARS warns, is that South African export statistics "specifically exclude non domestic Gold refined and exported from South Africa"[41]. This is because South Africa reports its trade statistics according to the UN Special Trade System. If the importing country reports according to the General Trade System it will include all gold imported from South Africa, including substantial amounts of non-domestic gold refined at the Rand Refinery.

Since most of these claims have come in the form of opinion pieces and articles, the following section provides a limited empirical counterfactual using alternative sources of data.

[39] Dewald van Rensburg, *City Press*, August 2016

[40] Maya Forstater, July 2016

[41] South African Revenue Service

5.2. Limited empirical counterfactual using alternative public data

The UNCTAD study makes the implicit assertion that because South Africa does not report gold exports by country of origin to Comtrade this means the total value of South Africa's gold exports is not reported. This implicit assertion is invalid. As a matter of fact, gold exports are appropriately and comprehensively reported elsewhere. And the total value of such exports is known by producer to both the South African tax and customs and excise authorities. It is also known to the relevant statistical authorities.

Indeed, several alternative ways of recording gold export data are publicly available in South Africa. An examination of some of these different data sources demonstrates that the national revenue and banking authorities in South Africa have a firm grasp on the value of SA gold exports.

Three different sources of gold export data are analysed in the following sections:

- **Statistics South Africa (StatsSA)** produces monthly statistics of South Africa's mining production. The source of this data, according to StatsSA, is the Department of Mineral Resources.
- **The South African Reserve Bank (SARB)** publishes South Africa's balance of payments statistics with the rest of the world on a quarterly basis. Because of gold's importance to South Africa, the balance of payments statistics contain a specific line item entitled "net gold exports".
- **The Chamber of Mines of South Africa** produces quarterly gold production statistics compiled by the South African Chamber of Mines. This report is of the volume of gold produced (in kilograms).

The following table provides a summary of the annual production/export figures across those three sources. The Chamber of Mines data has been converted into value terms using the monthly average London gold price[42] published by the SARB.

Table 2: South African annual gold production/exports by source, in USD million

Year	SARB (exports)	StatsSA (production)	Chamber of Mines (production
2000	4,014	3,651	3,829
2001	3,403	3,381	3,419
2002	4,150	3,947	3,928
2003	4,244	4,391	4,380
2004	4,449	4,557	4,487
2005	4,248	3,869	4,239
2006	5,241	5,341	5,330
2007	5,656	5,537	5,687
2008	5,882	5,587	6,085
2009	6,255	5,858	6,377
2010	8,126	7,278	7,668
2011	10,381	9,422	9,606
2012	8,654	9,379	8,941
2013	6,620	7,290	7,551
2014	5,778	5,846	6,464
Total	***87,102***	***85,332***	***87,990***

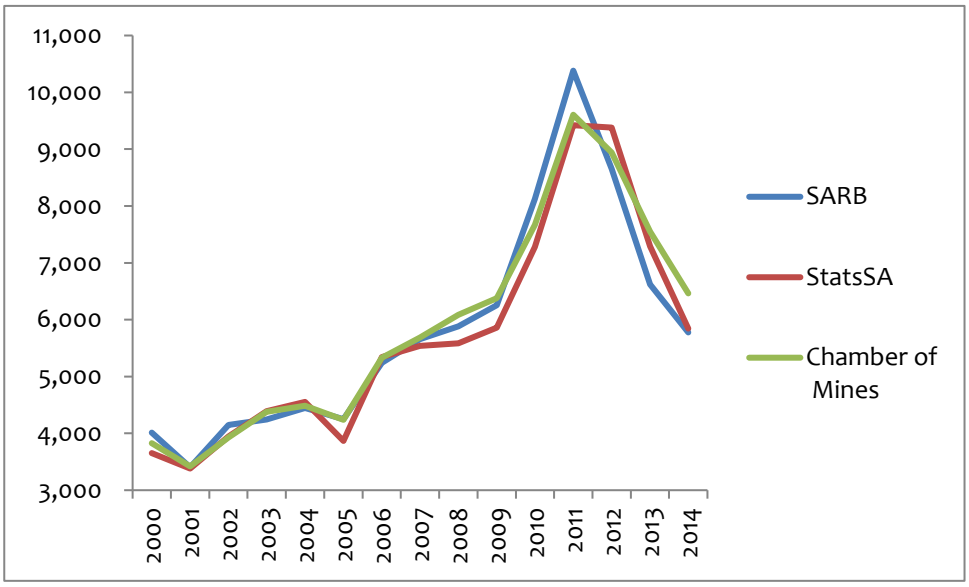
Source: SARB, StatsSA, Chamber of Mines of South Africa

[42] It is expected that this methodology will over-report the value of gold exports because some major gold exporters sold gold forward in the 1990s and early-2000s to capture the higher forward price at a time when the gold price was very low. When the gold price rose rapidly from 2005-06 these producers were forced to sell the gold they had sold forward at prices substantially lower than the prevailing market price. The forward sales were subsequently unwound and the full extent of their impact on the value of SA's gold exports is unknown.

5.2.1. Analysis

Table 2 shows that total production/export figures are largely consistent across all three sources. The total value of gold exports between 2000 and 2014 is USD 87.1 billion according to the SARB, while the total value of gold produced over that same time period is USD 85.3 billion according to StatsSA and USD 88 billion according to the Chamber of Mines. The SARB figure is only 2% higher than the StatsSA figure. On average, the Chamber of Mines values are 1.6% per annum higher than the Reserve Bank values in both Rand and Dollar terms and 3.5% higher than the StatsSA values in Rand terms and 3.3% in Dollar terms. The following Figure charts the three sources annually.

Figure 1: South African annual gold production/exports by source, in USD million



Source: SARB, StatsSA, Chamber of Mines of South Africa

The graph shows that both the total values and the yearly values largely correspond. Thus, it is quite likely that the Chamber of Mines' official position that virtually all of South Africa's gold production is exported, stands true. Thus, in addition to the SARB gold export figures, the gold *production* figures provided by StatsSA and the Chamber of Mines provide a valuable indication of the value of gold exported during the timeframe investigated by the UNCTAD study.

The slight differences in reported values can be explained by the volatility in the exchange rate and gold price as well as different timing of reporting. For instance, it is likely that the timing of actual export will differ from the date of production. Monthly changes in the rand gold price over the period 2000-2014 were highly volatile. On one occasion the monthly price increase was 19%. On another, the monthly fall was 13%. Monthly changes were greater than 2% (up or down) in 60% of the months under consideration. The period was mainly one of rising prices and a weakening rand exchange rate. Monthly prices increased 60% of the time. The value of gold produced in a particular month would be measured by StatsSA using that month's Rand gold price. But if physical export occurred only the following month, the Reserve Bank would value the gold in its balance of payments statistics at the price that was actually received. The difference would be positive 60% of the time, inflating the value of the Reserve Bank's exports relative to the StatsSA data. In a market where the gold price and exchange rate can be very volatile, differences in reported values are therefore unsurprising.

The difference between the Chamber of Mines statistics and the other two sources is equally unsurprising, as annual production statistics applied to an average annual price cannot fully take into account monthly differences in the production of a commodity or its highly volatile price. Importantly, not all gold produced in South Africa is exported. Thus, it is to be expected that the Chamber of Mines production value will exceed the export values of the Reserve Bank. The volatility of monthly prices and output discussed above will inevitably create differences between the annual averages of the Chamber of Mines calculation and the monthly values reported by StatsSA.

The Chamber of Mines' statement from July 2016 that it "is confident that the South African gold export statistics reported by the companies over the past few decades match the average rand gold prices and production numbers,"[43] can therefore be broadly affirmed by the above calculations.

In order to compare these values to the UNCTAD study, the production and export values were converted into constant 2014 USD, the value used by the authors of the UNCTAD study. The results are shown in Table 3 below.

Table 3: South African annual gold production/exports by source, in constant 2014 USD million

Year	SARB (exports)	StatsSA (production)	Chamber of Mines (production)	Average, SARB, StatsSA, CoM	UNCTAD (exports) (SA data)	UNCTAD (exports) (partner data)
2000	5,335	4,852	5,088	5,092	28	4,018
2001	4,422	4,393	4,442	4,419	6	3,915
2002	5,311	5,050	5,027	5,129	32	5,387
2003	5,325	5,509	5,496	5,443	232	5,090
2004	5,433	5,564	5,479	5,492	394	4,607
2005	5,025	4,577	5,015	4,873	392	5,402
2006	6,016	6,130	6,118	6,088	191	4,684
2007	6,323	6,191	6,359	6,291	418	6,599
2008	6,449	6,126	6,672	6,416	202	8,444
2009	6,807	6,375	6,940	6,707	218	5,091
2010	8,736	7,824	8,244	8,268	247	6,525
2011	10,936	9,925	10,119	10,326	11,188	12,867
2012	8,951	9,701	9,247	9,300	9,166	14,254
2013	6,739	7,421	7,687	7,282	6,925	16,649
2014	5,778	5,846	6,464	6,029	4,866	13,123
Total	***97,586***	***95,485***	***98,396***	***97,156***	***34,505***	***116,654***

Source: SARB, StatsSA, Chamber of Mines of South Africa, UNCTAD using Comtrade data

The table shows that the gold export data sourced by UNCTAD from South Africa differs widely from the largely consistent three other sources. The total value of South African gold exports in constant 2014 USD between 2000 and 2014 is lower than the average value provided by the three alternative sources by a staggering USD 62.7 billion. Yearly UNCTAD values labelled as 'SA data' were off by up to USD 8 billion (in 2010). Furthermore, the trend captured by the Comtrade SA data does not reflect the export trend shown by the three alternative data sources.

The sudden broad convergence of the Comtrade data and the alternative three data sources from 2011 to 2014 confirms one of the earlier mentioned alternative explanations for data discrepancies: up until 2010, the vast majority of South African gold exports were classified as 'monetary' and consequently not captured in the Comtrade database.

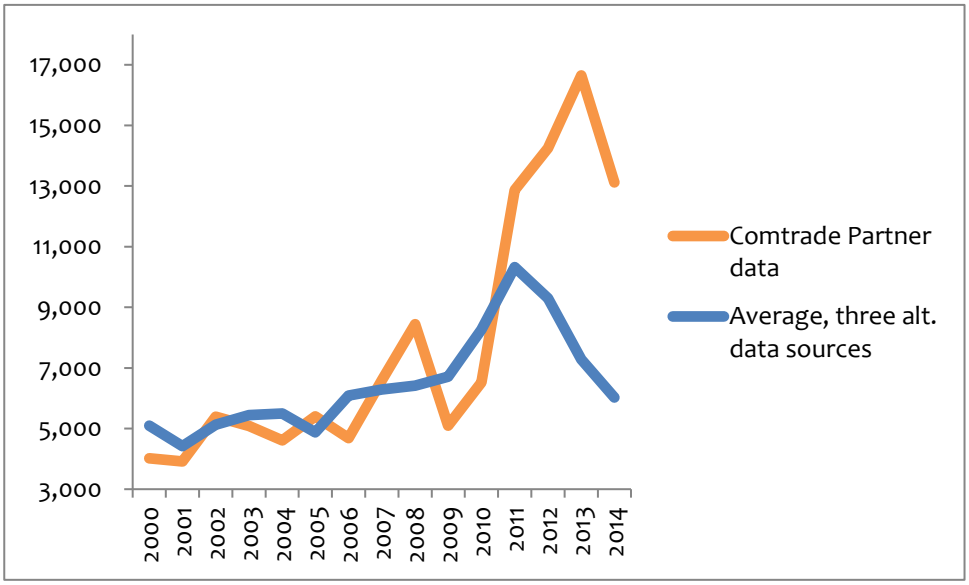
Given their broad convergence, it can thus be assumed that the export data supplied by SARB, StatsSA, and the South African Chamber of Mines provide a more accurate indication of the true value of gold exported from South Africa between 2000 and 2014 than Comtrade. If this is the case, South Africa's gold exports are in fact much higher than reported in the UNCTAD study, thus significantly closing the gap UNCTAD explained by supposed underinvoicing. Indeed, the trade discrepancy in gold exports between partner country data and the average across the three alternative data sources shrinks from the initially alleged USD 78.2 billion to USD 19.5 billion (in constant 2014 USD).

This observation, in return, puts into question the overall conclusion of the report, which is that the sheer size of the reporting gap must indicate underinvoicing. The smaller the data discrepancy, the less likely it is that smuggling is the true cause for these divergences. Rather, a smaller data discrepancy makes it more likely that some of the other factors mentioned earlier may have contributed to differences in data.

[43] Chamber of Mines

Such a claim, however, requires a more in-depth counter-factual that should more closely investigate the remaining discrepancies. Of note in that regard is not only the total remaining reporting gap of USD 19.5 billion (in constant 2014 USD), but also the diverging trends between the export figures provided by the three alternative sources and the Comtrade partner data, as visualised in Figure 2 below.

Figure 2: South African annual gold production/exports by source, in constant 2014 USD million



Source: SARB, StatsSA, Chamber of Mines of South Africa, UNCTAD using Comtrade data

A follow-up counterfactual would have to closely investigate these differences and particularly the significant spike reported by Comtrade partner data after 2011. One initial explanation may be that partner statistics have included non-South African exports if the partner country reports according to the General Trade System. Much of the discrepancy could also be the inclusion of non-South African gold refined at the Rand Refinery. The other alternative explanations listed earlier would also have to be examined before a definite rebuttal of the claim of smuggling can be made.

5.2.2. *Conclusions on the limited counterfactual analysis*

The limited counterfactual produced here clearly demonstrates that the UNCTAD study's findings on South Africa's gold exports are in large part invalid, and notably that the conclusion of that report:

- That the country experienced a loss of gold export revenues amounting to USD 78.2 billion between 2000 and 2014 has been proven incorrect on the basis of alternative, publicly and readily available data. Instead, the amount of discrepancy identified here is USD 19.5 billion.
- That, as a result of this loss, total losses for the same period amounted to USD 102.8 billion is by necessity false by at least USD 58.7 billion.

The UNCTAD study's observation that "there is a perfect correlation between gold export underinvoicing and the volume of exports as reported by the country's trading partners"[44] is therefore obviously flawed.

Furthermore, the presence of a remaining discrepancy in gold exports of USD 19.5 billion does not mean that this amount represents trade misinvoicing. While the present report does not reject off hand the possibility of some degree of misinvoicing, it supports the notion that misinvoicing is just one of the possible hypotheses of large trade data discrepancies, rather than the only available theoretical and empirical hypothesis.

[44] *Op cit*, p. 28.

As stated in the previous section, the remaining discrepancy might be attributable to non-South Africa gold refined in South Africa at the Rand Refinery, and recorded as exports from these countries in their counterpart trade data. This is a hypothesis that Eunomix Research will seek to validate in the near future.

Also important is the conclusion here that the findings of the present report on gold exports calls into question the accuracy and veracity of the UNCTAD study's other findings on South African exports as relate to silver, platinum and iron ore. It is possible that empirical counterfactuals for these product exports using alternative sources of data would further reduce the accuracy of the UNCTAD study's findings.

As for the UNCTAD study's claim that "the puzzling case of gold exports from South Africa" "does not appear to be a simple matter of undervaluation of the quantities of gold exported, but rather a case of pure smuggling of gold out of the country", it appears to be a reckless statement and is probably a baseless accusation.

This is all the more likely when consideration is given to South Africa's important auditing, accounting, and legislative barriers exist to prevent the deliberate corporate misbehaviour described in the UNCTAD study.

In theory, the misinvoicing claimed by the UNCTAD study would mostly occur in the form of transfer pricing, a practice where earnings from one geography are transferred to an entity of the same group resident in a lower tax regime, while the funds involved remain within the company.

However, South Africa is recognised for its stringent regulatory and tax enforcement regime. South African authorities helped develop the OECD Transfer Pricing Guidelines for Multinational and Tax Administration, which are, according to the Income Tax Act, applied by South African tax authorities. Furthermore, SARS also applies the UN's Practical Manual on Transfer Pricing.

In 2015, the Chamber of Mines commissioned consulting firm Deloitte to conduct research into South Africa's transfer pricing regime and how it measures up to international standards. The Deloitte report notes that South Africa has adopted the best international standards of the time since the mid-1990s: "The administration of the legislation requires a high level of disclosure by multinational enterprises operating in SA in respect of their transfer pricing practices,"[45] the report says.

A recent review of South Africa's tax policy framework by the government-commissioned Davis Tax Committee reached a similar conclusion. Furthermore, a SARS official told Parliament in 2015 that it recovered ZAR 5 billion in additional tax since 2012, which involved transfer pricing of more than ZAR 20 billion, 40% of which involved mining companies. This indicates that the policy is working.

Furthermore, because most major South African gold producers are publicly listed on the Johannesburg Stock Exchange (JSE), the International Financial Reporting Standards (IFRS) apply to these companies. The Companies Act also requires public companies to have audited financial statements and adhere to all required reporting standards. Lastly, the 2009 King Report on Corporate Governance (King III) requires publicly listed companies in South Africa to produce integrated reports. The Public Finance Management Act and the Promotion of Access to Information Act also encapsulate these principles. A transfer to a company's offshore subsidiary or bank account would appear as such in the company's audited financial statements.

Thus, it seems very unlikely that South African gold producers could transfer funds to an offshore entity. Seeing as though the holding companies are South African, they must report the worldwide earnings of its operations. Fraud on the scale UNCTAD suggests, involving multiple producers and all of their gold mines, would therefore be quickly exposed in companies' accounts.

[45] Deloitte. 2015. P. X

6. Part D – Assessment of the UNCTAD study

The present report has found significant limitations with the UNCTAD study as regards both its theoretical foundation and its empirical findings insofar as the case of South Africa's gold exports are concerned:

1. The UNCTAD study's core theoretical proposition is that discrepancies between exports from commodities producing countries and imports from their trade counterparts greater than 10 percent are allocated to misinvoicing. The present report has demonstrated that this core proposition is not the subject of consensus amongst experts.
2. The lack of inclusion of alternative perspectives in the UNCTAD study has had the effect of *de facto* presenting this theoretical proposition as representing the only valid explanation for persistent large trade discrepancies. This is seriously problematic, and brings into question the scientific quality of the report. Given the global attention it garnered, and given the reputational implications for governments of commodity exporting and importing countries cited, the mining industry and its customers in these countries, and UNCTAD itself, it would have been critical for the report to provide a comprehensive account of the different schools of thoughts on the relationship between trade discrepancies and trade misinvoicing. As highlighted in the present report, a more comprehensive review of the literature shows that at least three school of thoughts exist (section 3.2.2):
    - Trade discrepancies correlate with and are caused by misinvoicing
    - Trade misinvoicing exists but may not correlate with trade discrepancies
    - Trade discrepancies are not necessarily the product of misinvoicing
3. The lack of consensus in the literature on the nature of the relationship between trade discrepancies and trade misinvoicing brings into question the UNCTAD study's methodology, which posits a 1 to 1 relationship between the two phenomena, with misinvoicing being the sole and unmediated cause of discrepancies. The present report therefore rejects the UNCTAD study's conclusion 3: trade misinvoicing is substantial, and underinvoicing is preponderant (section 2.3.2).
4. The limited counterfactual conducted in the present report has easily demonstrated that the UNCTAD study's most significant findings – on South Africa's gold exports for the period 2000-2015 – is empirically incorrect by a factor of 4, where the trade discrepancy of USD 78.2 billion (2014 dollar) is in fact USD 19.5 billion. This very large margin of error in itself is sufficient to nullify the claim made in the UNCTAD study that systematic large trade discrepancies can only be caused by trade misinvoicing and not data errors because data errors are zero-mean-reverting over time. Clearly, in the case of South Africa's gold exports, the error has not self-corrected despite being large and consistent over time. This is because the error was not the product of some random statistical error which would have corrected itself through the laws of probability. It was one of data classification between the South African government and Comtrade. And one which the UNCTAD study appeared to not know about.
5. This validates the school of thought that does not posit a connection between trade discrepancy and misinvoicing. It also reaffirms the call for prudence in trade data analysis using one database emitted by numerous authors and institutions – Comtrade's custodian included (UNStats). As concerning with the UNCTAD study is the fact that alternative sources of data which would have proven the findings to be incorrect – insofar at least as South Africa's gold exports are concerned – are readily and publicly available. The UNCTAD study, it appears, made no effort to verify whether such data existed.
6. Equally concerning is the fact that the UNCTAD study did not seek to provide alternative hypotheses to explain its findings beyond the proposition that trade discrepancy is the product of misinvoicing. One such obvious hypothesis would have been to question the accuracy of data. But, as discussed above, the UNCTAD study pre-emptively eliminated this hypothesis. Clearly has proven to be a fundamental theoretical and empirical flaw.
7. In addition to justifying questions on the scientific validity of the UNCTAD study, the lack of effort to find alternative data sources and the lack of alternative hypotheses render acceptable questions about the motives of the report. Indeed, the conclusion that the report sought to prove a tenuous hypothesis by

excluding alternative perspectives and approaches, and focusing on a monodimensional empirical analysis without alternative hypotheses and data sources is not unreasonable.

8. By implication, the behaviour/intent hypotheses that have been derived from the UNCTAD study's findings, and the policy recommendations made on this basis (section 2.3.2) can be called into question:

   - Conclusion 4: trade misinvoicing is likely to be the result of deliberate illicit action. If the theoretical premise of the UNCTAD study and part of its empirical demonstration are incorrect, then so is its accusation that trade misinvoicing is the result of deliberate illicit action. This is not to say that trade misinvoicing does not occur, as it is not to say that when it occurs it may not be the product of deliberate action, as it is not to say that when it occurs it may not be the product of illicit action. Trade misinvoicing probably occurs. It may occur deliberately. It may occur with illicit intent. But it may also occur accidentally. The point is that the report has failed to prove that its core theoretical tenet is true.

   - As for conclusion 1, that primary commodities dominate exports of the countries in the study, this is another example of circularity in the argument. The very reason why the countries included in the UNCTAD study were selected is because they are large commodity exporters. This circularity brings into further question the scientific quality of the report.

9. The UNCTAD study's policy recommendations are partly invalidated by the report's limitations, if not in principles at least in significance:

   - Recommendation 1: governments should investigate trade misinvoicing by scrutinising exports. In principle this is an acceptable recommendation. But, considering the likely extent of the misdiagnosis of the report, this recommendation, if implemented without the kind of empirical work conducted in the present report, would undoubtedly lead to wastage of scarce resources pursuing either non-existent trade misinvoicing or trade misinvoicing occurring at a much smaller scale than found in the UNCTAD study.

   - Recommendation 2: trade statistics should be substantially improved. This recommendation too is broadly acceptable. It is in line with the UNStats recommendations. However, the scale of improvements needed may not be as large as the UNCTAD study entails. As shown in the South Africa limited counterfactual, data may exist. What is required is better research.

   - Recommendation 3: transnationals and jurisdictions involved in misinvoicing should be investigated. Again, this is an acceptable recommendation. The key issue here is for an appropriate determination of the scope, scale and direction of trade misinvoicing. The UNCTAD study does not provide solid theoretical and empirical determination of the issue.

10. Following the many reactions to the report, UNCTAD sought to dispel the notion that the report is accusatory or assigns blame in a follow-up article entitled, 'UNCTAD welcomes discussion, transparency on commodities and misinvoicing.'[46] There, UNCTAD claimed that the report "identified clear and consistent patterns of misinvoicing, a term we use without attributing blame or making any specific accusations." However, given the rhetoric and direct mention of gold exporters in the report shown above, the present report disputes this position. Despite the very substantial challenges to its findings, the follow-up article still claims, "In summary, these challenges do little to reassure about the lack of transparency in the trade of commodities from developing countries. As we have highlighted, this misinvoicing – a word that we use in its most technical sense, without attaching value or even accusation – means that some countries may be losing as much as 67 percent of their commodity exports."[47] The present report clearly shows that the UNCTAD study is in fact accusatory. Furthermore, the present report has dispelled the notion that the term misinvoicing is purely a technical word to describe and

[46] "UNCTAD welcomes discussion, transparency on commodities and misinvoicing." http://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1309. Accessed on November 1, 2016.

[47]

quantify an objective reality. Misinvoicing implies illegal intent. The UNCTAD study makes this implication explicit, and makes policy recommendations to that effect.

While the South African gold case study may be the proverbial exception that confirms the rule, the present report doubts this. Conclusive refutation of the UNCTAD study, however, necessitate a generalisation of the counterfactuals.

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8. Appendices

8.1. Appendix 1: SA gold exports by trade partner

Table 11: South Africa: Gold exports and export misinvoicing (Millions of constant 2014 dollars) and partners' share in South Africa's total exports (Per cent), 2000-2014

	Gold exports (by volume) and export misinvoicing (Millions of constant 2014 dollars)			Shares of partner's (per cent)		
Country	Exports (SA data)	Exports (Partner data)	Export misinvoicing	Exports (SA data)	Exports (Partner data)	Mis-invoicing
Australia	0.0	102.9	102.8	0.0	0.1	0.1
Belgium	36.3	109.9	70.0	0.1	0.1	0.1
Germany	606.8	1 244.3	576.9	1.8	1.1	0.7
Hong Kong (China)	1 579.0	20 150.0	18 413.2	4.6	17.3	23.5
India	202.3	40 248.9	40 026.4	0.6	34.6	51.2
Italy	17.5	15 541.8	15 522.5	0.1	13.4	19.8
Saudi Arabia	0.0	1 466.9	1 466.9	0.0	1.3	1.9
Switzerland	386.0	2 949.5	2 524.9	1.1	2.5	3.2
Thailand	0.0	4 748.5	4 748.5	0.0	4.1	6.1
Turkey	42.9	10 033.7	9 986.5	0.1	8.6	12.8
United States	8.4	584.3	575.1	0.0	0.5	0.7
United Arab Emirates	37.5	2 930.2	2 889.0	0.1	2.5	3.7
United Kingdom	251.3	14 019.5	13 743.1	0.7	12.1	17.6
Zimbabwe	0.0	2 991.4	2 991.3	0.0	2.6	3.8
Partners	3 167.9	117 121.7	113 637.0	9.2	100.8	145.2
World	34 507.5	116 197.7	78 239.5	100	100	100

Source: Author's computation using UN Comtrade data.

8.2. Appendix 2: UN COMTRADE Disclaimer

Coverage

The United Nations Commodity Trade Statistics Database (UN Comtrade) contains detailed imports and exports statistics reported by statistical authorities of close to 200 countries or areas. It concerns annual trade data from 1962 to the most recent year. UN Comtrade is considered the most comprehensive trade database available with more than 1 billion records. A typical record is – for instance – the exports of cars from Germany to the United States in 2004 in terms of value (US dollars), weight and supplementary quantity (number of cars). The database is continuously updated. Whenever trade data are received from the national authorities, they are standardized by the UN Statistics Division and then added to UN Comtrade.

Limitations

UN Comtrade is available to the general public and should be used with good knowledge of its limitations. Please read the following points very carefully before extracting and using data:

1. The values of the reported detailed commodity data do not necessarily sum up to the total trade value for a given country dataset. Due to confidentiality, countries may not report some of its detailed trade. This trade will - however - be included at the higher commodity level and in the total trade value. For instance, trade data not reported for a specific 6-digit HS code will be included in the total trade and may be included in the 2-digit HS chapter. Similar situations could occur for other commodity classifications. Detailed data processed after 1. January 2006 and published in HS will sum up to the respective totals due to the introduction of adjustment items with commodity code 9999 and 999999.
2. Countries (or areas) do not necessarily report their trade statistics for each and every year. This means that aggregations of data into groups of countries may involve countries with no reported data for a specific year. UN Comtrade does not contain estimates for missing data. Therefore, trade of a country group could be understated due to unavailability of some country data.
3. Data are made available in several commodity classifications, but not all countries necessarily report in the most recent commodity classification. Again, UN Comtrade does not contain estimates for data of countries which do not report in the most recent classification.
4. When data are converted from a more recent to an older classification it may occur that some of the converted commodity codes contain more (or less) products than what is implied by the official commodity heading. No adjustments are made for these cases.
5. Imports reported by one country do not coincide with exports reported by its trading partner. Differences are due to various factors including valuation (imports CIF, exports FOB), differences in inclusions/ exclusions of particular commodities, timing etc. The recommendations for international merchandise trade statistics can be found in the International Merchandise Trade Statistics: Compilers Manual). Additional methodological information can be found on the same web page.
6. Almost all countries report as partner country for imports the country of origin (see Metadata & References > Explanatory Notes) which is determined by the rules of origin established by each country (see International Merchandise Trade Statistics, Concepts and Definitions, Rev.2, para. 139 and 140). Hence, the term 'partner country' in the case of imports does not necessarily imply any direct trading relationship.

8.3. Appendix 3: UNCTAD note on statistical errors

"It may be argued that trade misinvoicing is merely a reflection of imperfections in export and import data arising from incorrect recording, delays in reporting and/or differences in pricing mechanisms. However, existing empirical evidence demonstrates that the estimated levels of trade misinvoicing do not reflect mere statistical noise in the data. While it is possible that recorded import and export data might be affected by statistical errors, these errors would not persist and have a trend over time. The series of the errors would be zero-mean-reverting. Empirical evidence shows not only large values, but also persistent, and in some cases upward trending levels of trade misinvoicing. A number of recent studies (e.g., Ndikumana et al. (2015), and Baker et al. (2014)) have provided evidence of large and persistent trade misinvoicing in African countries. And a recent study for India shows a clear upward trend in trade misinvoicing since 2000 (Jha and Truong, 2014). A similar phenomenon is found in other Asian countries (Beja, 2006, 2007; Kar, 2010).

Moreover, delays in reporting of trade statistics would not be so systematic as to generate persistent trade misinvoicing, particularly given that most studies have used annual data. The impact of periodic recording delays is likely to be minimal on annual series; and the estimated effect of these delays on cumulative trade misinvoicing over a long time period is likely to be even smaller.

It is nonetheless important to recognize that there is an unavoidable degree of imperfection in trade statistics, as for any macroeconomic data. These imperfections are likely to be more pronounced in developing countries than in developed countries. Therefore, statistical discrepancies may be amplified in trade among developing countries (for evidence on intra-Asian trade, see Naya and Morgan (1969)). It is for these reasons that the estimation of trade misinvoicing typically considers trade with developed countries as a benchmark, based on the assumption that developed countries' data are less prone to substantial measurement and recording errors. Thus total misinvoicing is obtained by scaling up the volume of trade misinvoicing with developed countries with the inverse of the share of this group in the particular developing country's total trade. (See Ndikumana and Boyce (2010), for an elaborate description of the methodology).

This study focuses on trade between the selected commodity-exporting countries and their developed-country trading partners. As will become evident, these partners account for the bulk of trade of the developing countries under consideration in this study. However, given the increasing volume of trade of these commodity-exporting countries with some emerging countries, especially Brazil, the Russian Federation, India and China (BRICs), some of these countries are also included in the sample of trading partners, as appropriate. This is especially the case for China, India and the Republic of Korea."

8.4. Appendix 4: Bibliographical summary

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"Accounting for Discrepancies in Bilateral Trade: The Case of China, Hong Kong, and the United States"

https://www.usitc.gov/publications/332/ec200704a_001.pdf

- Discrepancy of USD 46 billion in exports from China to the US vs US-reported imports from China in 2005
- Comparisons of detailed customs records from China, Hong, Kong, and the United States shows that direct exports from Chinese ports and Chinese exports through third countries account for much of the discrepancy
- Some robust correlations for the discrepancy relate to valuation issues, U.S. tariffs, and re-exporting through the United States itself.
- Generally, theoretical discrepancies in trade data could be due to timing, shipping and insurance costs, general vs. special trade, goods in transit, re-export, partner country attribution and treatment of processing trade, smuggling, misinvoicing, transfer pricing, or mis-attribution

UN Comtrade website

"Limitations"

http://comtrade.un.org/db/help/uReadMeFirst.aspx

- "Imports reported by one country do not coincide with exports reported by its trading partner. Differences are due to various factors including valuation (imports CIF, exports FOB), differences in inclusions/ exclusions of particular commodities, timing etc.)"

United Nations. 2004.

"International Merchandise Trade Statistics: Compilers Manual"

- "Objectives of reconciliation and basic procedures: A short-term aim may be limited to the identification of major differences in the statistics of the two countries. That process may reveal systematic measurement errors and gaps, which should be corrected immediately."
- "Reasons for differences in data: Even where both partners comply with United Nations guidelines for trade statistics, there can be differences between partner data. In fact, some of the discrepancies are a direct result of following those guidelines (see footnote 134 to para. 271 above for an example). In order to identify conceptual reasons for discrepancies the following areas should be reviewed: (a) coverage; (b) trade system applied; (c) time of recording; (d) interpretation and application of the commodity classification; (e) valuation; (f) partner country attribution; and (g) other sources of discrepancy."

Ajayi, S. Ibi. Adjusting for International "Trade-Faking". 1998.

in "Trade Reform and Regional Integration in Africa." eds. Iqbal, Z. and Khan, S.

https://books.google.co.za/books?id=VHjOx9aQEjQC&pg=RA1-PA98&lpg=RA1-PA98&dq=are+trade+discrepancies+caused+by+misinvoicing&source=bl&ots=GDn-hTPma0&sig=O5tcW0TQn7dqUC5FbqFhhUkGIsI&hl=en&sa=X&ved=0ahUKEwi7iMG2n_jPAhULLMAKHUceDJEQ6AEISTAI#v=onepage&q=are%20trade%20discrepancies%20caused%20by%20misinvoicing&f=false

- Other reasons than misinvoicing:
  - diversion en route to the final destination
  - re-exports of goods
  - differential lags in reporting

- potential discrepancies arising from the conversion from one currency to another and then to a common currency (usually USD)
- variations in exchange rates (De Wulf, 1981)

- In Sub-Saharan Africa, one of the basic causes of trade discrepancy stems from the routing process for trade transactions. The problem occurs when goods are routed through several countries bordering the exporting or importing country before the final destination is reached.
- The incentive to get involved in misinvoicing also depends on the structure of tariffs and subsidies. Given such situations, there may not only be the underinvoicing of exports and overinvoicing of imports, but other combinations as well.

Hangzhou, P.R.C. 2009. Report on the Statistical Discrepancy of Merchandise Trade between the United States and China.

https://www.census.gov/foreign-trade/aip/recon_china_000406.pdf

- Unusually large and growing statistical discrepancies in the bilateral trade officially published by both countries
- Reasons for discrepancies:
  - Conceptual and methodological differences in the collection and processing of trade data
  - Differences in statistical territory definitions
  - Differences in timing of recording
  - Inclusion of re-exports in export statistics
- More significantly:
  - **Attribution of imports to country of origin:** Discrepancies may occur when goods enter the commerce of the intermediary country or region. New values may be added due to further processing, re-packing, or a simple price markup when the goods are re-sold.
  - **Attribution of exports to country of last known destination:** Goods are recorded to the intermediary country or region by Chinese customs while recorded as imports from China by the US based on the principle of Country of Origin.
  - **Differences in values declared to customs:** China values imports on a basis of cost, insurance, and freight, while the US values exports on a free alongside ship basis

Kar, D. 2009. Are Bilateral Trade Statistics Unreliable? Global Financial Integrity.

http://www.gfintegrity.org/are-bilateral-trade-statistics-unreliable/

- Researchers have questioned the use of the trade mispricing model to capture illicit flows. They argue that data issues underlying the recording of partner country exports and imports introduce enough "noise" so that the trade mispricing model is unable to capture illicit flows.
- Reasons why most economists reject such arguments for not studying trade mispricing as a conduit for illicit financial flows from developing countries:
  - If discrepancies between the exports and imports of all trading countries grossed up to the world are supposed to be zero in a perfect statistical world, it stands to reason that deviations away from zero would largely capture underlying statistical issues in measurement. The goods balance (the discrepancies between exports and imports grossed up on a global scale) as a percent of "gross goods transactions" (meaning exports plus imports) fluctuated between 0.2 to 0.6 percent for the period 2002 to 2006 covered in our study. This is not an unacceptably high error term. The global discrepancies simply indicate that there are no systematically large discrepancies between exports and imports that can cast suspicions on the data capturing trade flows between the world's major trading blocs involving developed and developing countries. Large, systematic discrepancies between these major trading blocs would show up in the global discrepancies and there is just no evidence of that.

  - There is no reason to believe that data on international trade are any more problematic than say estimates of national accounts (used in numerous country studies and policy formulations), fiscal stocks and flows, or consumer and producer prices to name a few.
- Efforts to improve transparency require improving data availability and quality in specific data sets, which can be overseen, managed, prioritized, and assisted by relevant international organizations, which are well placed for this task.

Martin, M. 2016. What's the Difference?—Comparing U.S. and Chinese Trade Data. Congressional Research Service.

https://www.fas.org/sgp/crs/row/RS22640.pdf

- Technical explanations for discrepancies
  - Official Definitions of Exports and Imports
  - Definition of Territory
  - Timing
  - Declaration of Country of Origin
  - Exchange Rates
- Non-technical explanations
  - Declaration of Country of Origin
  - Underinvoicing ("phantom goods" shipments from China to the United States)
  - Intermediation: The joint China-U.S. study of discrepancies in merchandise trade statistics determined that value differences account for about half of the differences between Chinese and U.S. trade statistics

Buehn, A. and Eichler, S. 2010. Uncovering Smuggling: Worldwide Evidence for Four Types of Trade Misinvoicing.

http://www.freit.org/WorkingPapers/Papers/Other/FREIT176.pdf

- Hypothesized determinants of misinvoicing are tested using data on discrepancies in bilateral trade with the US
- Black market premium and tariffs motivate illegal trading activities
- Higher financial penalties act as a deterrent to this crime
- Assumption that trade discrepancies automatically represent misinvoicing and assumption that US authorities report their trade figures honestly while the authorities in other countries do not
- Misinvoicing defined as the difference between reported US exports/imports and other country exports/imports

Bhagwati, Jagdish N., and Bent Hansen. 1973. A theoretical analysis of smuggling.

- Assumption that illegal trade exists; theoretical model of the ways in which illegal trade arises
- Assumption that legal and illegal trade is conducted at the same world market price
- Illegal trade does not improve welfare due to real costs incurred by smuggling

McDonald, Donogh C. 1985. Trade data discrepancies and the incentive to smuggle. IMF Staff paper

- Trade data can have many sources, including poor quality of data
- Methodology: Dependent variable: trade data discrepancy ratio between developing and industrial countries; independent variables: black market premium and export taxes
- Main findings: If discrepancies in trade data are in large part the result of illegal trade, a causal relationship could be expected between the incentive to smuggle and these discrepancies. However, there is mediocre statistical evidence that smuggling incentives, i.e. the black market

premium and export taxes, explain variations in trade discrepancies. It is thus unlikely that the discrepancies are explained by illegal trade. The results are also quite sensitive to the time period chosen for analysis. They therefore suggest that great caution should be exercised in using trade data discrepancies to infer the scale of smuggling activity.

Yeats, J. 1990. On the Accuracy of Economic Observations: Do Sub-Saharan Trade Statistics Mean Anything? World Bank Economic Review

http://documents.worldbank.org/curated/en/644121468767677708/pdf/multi-page.pdf

- Descriptive analysis of trade data among African countries and between African and non-African trade partners
- Underreporting of petroleum, coffee, and cocoa to circumvent international quotas; import overinvoicing for high-value and low-volume products (like pearls, precious stones); export underinvoicing for oilseeds and iron ore
- false invoicing and smuggling "apparently" responsible for much of the difference
- "The fact that reported 'free on board' exports frequently exceed matched reported 'cost, insurance, and freight' imports suggests that smuggling is wide-spread in trade among African countries or that importers are intentionally underinvoicing to avoid high tariffs or quotas."
- "For high-value, low-volume products like pearls and precious stones, reported imports greatly exceed reported exports, suggesting that smuggling is occurring on a large scale"
- "Large differences in the reported unit values for some products, particularly oilseeds and iron ore, suggest that exporters are purposefully underinvoicing (possibly to avoid government foreign exchange controls or restrictions on foreign asset holdings), or are not receiving full value for these items."Because export subsidies and similar incentives are not widely used in the subject countries, the excess of reported exports over imports is consistent with underinvoicing by importers or smuggling on a fairly massive scale."
- Without further analysis it would be difficult to estimate the magnitude of smuggling in African trade from data drawn from partner countries because there is no way to determine quantities and values that are not reported by either the exporter or importer as opposed to (smuggled) trade that is recorded by one of the countries involved.

Fisman, Raymond, and Shang-Jin Wei. 2004. Tax Rates and Tax Evasion: Evidence from "Missing Imports" in China. Journal of Political Economy.

- "Tax evasion, by its very nature, is difficult to observe"
- Analysis of trade discrepancies between Hong Kong and China for 2,043 product categories at the six-digit level; dependent variable: trade discrepancy measures; independent variables: tax rate, tax on similar products, tariff exemption, interaction terms
- Difference in reported exports/imports negatively correlated with tax rates on closely related products, suggesting that evasion takes place partly through misclassification of imports from higher-taxed categories to lower-taxed ones
- Difference in reported exports/imports higher when measured in values rather than quantities, suggesting that evasion takes the form of underreporting
- Underreporting of import values and mislabelling of higher-taxed products as lower-taxed ones are widespread
- A 1 percent tax rate increase yields 3 percent increase in the gap between reported exports and imports; this gap is positively correlated with tax rates; widespread evidence for underreporting and mislabelling of high- taxed to low-taxed products in trade between Hong Kong and China

Fisman, Raymond, and Shang-Jin Wei. 2007. The smuggling of art, and the art of smuggling: Uncovering the illicit trade in cultural property and antiques. NBER Working Paper

- Unbalanced panel for 1996-2005; dependent variable: discrepancies in trade with cultural object and antiques; independent variables: corruption, GDP per capita, dummies
- Highly positive correlation between trade discrepancies and corruption, i.e. more corrupt countries are more likely to misreport their data

Beja, Edsel L. 2008. Estimating trade misinvoicing from China: 2000 – 2005. China & World Economy

- Descriptive analysis of trade discrepancies in the official trade sector
- Also uses discrepancies as proof for trade misinvoicing
- Bulk of Chinese misinvoicing occurs in trade with Hong Kong and the U.S.
- Amount of China's unreported trade between 2000 and 2005 at USD 1.4 trillion

Berger, Helge, and Volker Nitsch. 2008. Gotcha! A profile of smuggling in international trade.

- OLS regressions for imports to the U.S., Germany, China, United Kingdom, Japan; dependent variable: trade discrepancies; independent variables: corruption, GDP per capita, distance measure, dummy variables
- Product-specific trade discrepancies differ widely across importers; export underinvoicing is prevalent in antiques and bulky products; strong association of trade discrepancies with the level of corruption in the source country

Farzanegan, Mohammad R. 2008. Illegal trade in the Iranian economy: Evidence from a structural model

- MIMIC approach, i.e. illicit trade is treated as an unobservable variable; causes: fines, BMP, tariffs, GDP per capita, openness, education; indicators: government revenues, import price index, gasoline consumption
- Illicit trade is positively related to tariffs and negatively to fines and the unemployment rate; illicit trade adversely affects government revenues and the import price index and varies between 6 and 25% of total trade

Pitt, Mark M. 1981. Smuggling and price disparity. Journal of International Economics

- Institutional framework methodology
- Coexistence of legal and illegal trade is a fact
- Firms use legal trade to camouflage illegal trade and the welfare consequences are ambiguous
- Illegal trade responds to the price disparity, defined as the difference between the actual domestic price and the tariff-inclusive world market price. If, for example, the world market price of an exportable good is below its domestic price most of the actual export value is traded illegally because legal export would produce a loss. Consequently, the incentive to underinvoice exports is the higher the higher the price disparity.

Barnett, R. 2003. Smuggling, non-fundamental uncertainty, and parallel market exchange rate volatility. Canadian Journal of Economics

- Smuggling as a means by which the home country can acquire or sell foreign currency as currency restrictions – such as inconvertibility of home currency and portfolio restrictions – prevent them from doing the same at the official exchange rate
- Black market premium as a key incentive

Biswas, Amit K., and Sugata Marjit. 2007. Preferential trade and misinvoicing: Some analytical implications. International Review of Economics & Finance

- Using the well-established concept of partner trade statistics they find a positive (negative) correlation between the 'black market premium' and export (import) underinvoicing since illegal traders sell (buy) the foreign exchange of unreported transactions on the black market

Bahmani-Oskooee, Mohsen and Gour G. Goswami. 2003. Smuggling as another cause of failure of the PPP. Journal of Economic Development

- Smuggling as another source of deviations of the exchange rate from purchasing power parity

"Phantom Goods Disguise Billions in China Illicit Money Flows." ***Bloomberg*****. March 9, 2016**

http://www.bloomberg.com/news/articles/2016-03-08/phantom-goods-disguise-billions-in-china-illicit-money-outflows

- "There has been a huge increase in payments," said Andrew Collier, an independent China analyst in Hong Kong and former president of the Bank of China International USA. "The well-connected Chinese in state and private firms are using any tool in the shed to inflate overseas payments."
- Economists have said they suspect China's December and January trade numbers were also skewed by this activity.
- "Data distortions from hidden capital flows remain a problem," Bloomberg Intelligence economists Tom Orlik and Fielding Chen wrote in a note, adding that the reported $880 million in imports from Hong Kong in January were "implausible."
- Over-reporting imports is likely the most important illicit channel, according to the Deutsche Bank research, which cited official banking statistics that recorded China paying $2.2 trillion for goods imported in 2015, while China Customs data only records $1.7 trillion of imports.
- China has acknowledged the problem with fake invoicing in the past. In 2013, the government said export and import figures were overstated due to phony trade in order to bring money into the mainland.

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