TOOLS FOR REDUCING REVENUE RISKS AND THE REVENUE GAP:
(I) MIRROR ANALYSIS GUIDE, INCLUDING CASE STUDY (CAMEROON)
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PART 1 : MIRROR ANALYSIS - APPLICATION IN COMBATING REVENUE FRAUD

1. Introduction

Mirror analysis (or mirror data) refers to the comparison between the import (or export) data of a country X and the data for imports to (or exports from) country X by one or more countries.

This document has been drawn up after several tests of the method in certain member countries. In particular, the WCO Secretariat has worked with Cameroon and Ecuador and the School of Economics of Clermont-Ferrand University (France) who have provided valuable assistance in trialling this methodology. It provides initial feedback on experiences with the use of this method of combating revenue fraud.

From the point of view of Customs, mirror analysis is relevant to the following issues. Customs services know:

(i) how to select cargoes on the basis of risk criteria or fraud profiles (Customs administrations have Customs computer systems with a selectivity module1),

(ii) how to work out risk criteria or fraud profiles from analyses (an increasing number of administrations have teams specializing in risk analysis, targeting and investigation planning more generally).

The question that arises is to know how to carry out risk analyses in practice, or more precisely to decide to carry out an analysis in one area rather than another. The decision is based on a combination of (i) criteria that are subjective or external to the administration (political requirements, intuition and experience of Customs officials, (ii) intelligence and (iii) more objective approaches. In the case of the “objective” methods, the WCO risk analysis recommendations provide a general intellectual framework which, for the deciding party in particular, is based mainly on analysis of the frauds identified (nationally and internationally) and an exchange of information with other enforcement administrations. Other methods are available, based on statistical methods for automating the process and assigning a “risk coefficient” to each Customs declaration (Geourjon et al., 2013).

All those methods are effective. However, three questions remain:

1. What happens in an environment where corruption is proving a challenge? How can it be ensured that (i) action is taken against all the frauds detected and they are reported to the administration for inclusion in the risk analysis and (ii) the instructions for scrutiny resulting from the risk analysis are followed in the field?

2. How can new frauds be identified “objectively”? On what grounds can a risk analysis be undertaken in one area rather than another? Intuition, experience, intelligence and chance are effective methods, but can they be supplemented by an objective method?

1 Whether or not those selectivity modules are operational, Customs is aware of their function and use. Their operational nature depends on the capacity of Customs to define its risk policy, for example.
3. How can risks be classified, given that some risks are “classifiable” or “quantifiable”? For example, the risk involved in the importation of drugs is not quantifiable. All drug seizures are socially and politically significant, and it is difficult to predict the impact if drugs are not seized. With commercial fraud, on the other hand, a quantitative relationship can be established between frauds: a fraud is measured quantitatively by its impact on revenue, which means that some frauds have more impact on revenue collection than others and the comparison among frauds is quantifiable and evaluable. How can optimum use be made of the resources available in order to focus the analysis?

Mirror analysis offers answers to those questions. It does not replace the experience of fraud control officers or other statistical methods; it is an adjunct to them.

This document is arranged as follows. The first section describes several theoretical aspects of the use of mirror data by economists, mainly to explain the background to mirror analyses and the methodological debate on the subject. The second section is a general discussion of what mirror analysis can and, above all, cannot do. Experience has shown that the response to mirror analysis is highly enthusiastic, but it may also be somewhat misunderstood. The third section describes the data preparation phase, how to find the data and how to organize them to make them easy to use. Many errors can be made in this crucial phase, distorting the whole analysis, and they cannot always be detected easily and quickly. The fourth section describes the possible stages of the analysis but this section does not propose any fixed methodology as, in combating fraud, it is necessary to be highly flexible in the conduct of any analysis. The fifth section explains the potential practical applications of mirror analysis.

2. Theoretical aspects of mirror analysis

Mirror analyses have been used by economists for three main problems or purposes.

The first is the accuracy of international trade data. Economists have used mirror analyses to determine the opportunity criteria for the use of the data and the reasons for inaccuracies (Allen, 1960, 2012; Makhoul and Otterstrom, 1998; Barbieri et al., 2009; Guo, 2009; Hamanaka and Tafgar, 2010; Hamanaka, 2011). Mirror analysis has thus been used to challenge the validity of the data for certain countries where these deviate too far from the statistical data of other countries which are considered reliable (Yeats, 1990). Gaulier and Zignago (2010) have suggested a method and created a database for harmonization of international trade data by reconciling the country data.

The second use of mirror data is the replacement of missing data. When the data for a country is not available or is considered wrong or unreliable, they are calculated from the import and export data of the countries that are its economic partners (Yeats, 1995; Choo, 2008; Barbieri et al., 2009).

The third use of mirror analyses may be the most relevant for the reflection on the use of mirror data by Customs administrations: the approximation of fraud. The difference measured between the data for a country X and those for its economic partners is considered – sometimes with a few adjustments – as an approximation of fraud. The wide availability of international trade data has been a major advance in the investigation of commercial fraud. Bhagwati (1967) has pointed out that one method used by economists in 1967 was to assess fraud through talks with people working in the field, but that had considerable and obvious limitations. Mirror analysis for the approximation of fraud has been used in many research contexts: for general “informal trade” assessments (Carrère and Grigoriou, 2014), to determine how monetary, fiscal or Customs policies encourage fraud.
(Bhagwati, 1964; McDonald, 1985; Fisman and Wei, 2004; De Boyrie et al., 2005a, Mishra et al., 2008; Kubo, 2012), to model the various types of fraud and their statistical detection (Bhagwati, 1981), to evaluate capital flight through international trade (Boyce and Ndikumana, 2001; De Boyrie et al., 2005b).

Finally, some work combines mirror analysis with other statistical methods: mirror analysis and reports on obstacles to trade (for example Doing Business) to evaluate commercial costs per type of goods (Hamanak and Domingo, 2012); mirror analysis and consumption data for heavily taxed goods such as cigarettes (Nguyen et al., 2014); comparison between national data and international averages to identify abnormal figures suggesting laundering (Zdanowicz, 2009).

Mirror analyses and the use of mirror data have been criticized for different reasons: their approximations, the lack of data, the fact that researchers sometimes tend to interpret the differences measured too quickly and too restrictively, when these could partly be explained by a number of factors (Nitsch, 2012), and, lastly, criticism of the fact that it cannot necessarily be assumed that the data provided by partner countries is correct (Hamanaka, 2012).

In fact, the difference measured by mirror analysis might be due to reasons other than fraud:

- incorrect tariff classification, but this can be detected if it is systematic (Bhagwati, 1964);
- a time lag, with exports from country Y for one year arriving in country X the following year, but that time lag will most probably have the inverse effect on the current year (Bhagwati, 1964);
- a mistake in provenance, an import to country X is ascribed to exporting country Y when it was actually exported from Z, but that error is only significant for the analysis of bilateral flows; in the case of a mirror analysis for fraud in imports to country X, provenance is merely a secondary aspect, to be used as a basis for more detailed analyses;
- an error in declarations of exports to country X;
- currency conversion errors and the effects of devaluation (De Wulf, 1981);
- entry of transport and insurance costs in the accounts if the comparison is between CIF and FOB figures;
- different recording by the reporting countries of data for transit or transhipment or for trade via third countries more generally (Ferrantino and Wang, 2008; Barbieri et al., 2009).

This economic literature provides many examples of the use of mirror data, but its main value for Customs lies in the methodological and theoretical discussion of the possible use

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2 When those methods were first used in the 1960s and 1970s, foreign trade figures were not publicly available, or at least only for the OECD countries (Bhagwati, 1967). With the UN-COMTRADE database, that is no longer the case.

3 Nonetheless, this error should not exceed a small percentage of the value.
of international trade data. Apart from giving possible explanations for differences between mirror data, the criticism by economists shows that it is not possible to determine the exact amount of the fraud by mirror analysis or any other method. On the other hand, the whole advantage of mirror analysis, since it is quantitative, empirical and not speculative as a risk analysis based solely on total individual experience might be, is that it enables the presumed scale of the fraud to be classified. In focusing inspections, not being able to assess the amount of fraud precisely as an absolute value is less important than being able to assess the relative amount of fraud per type of trade flow and between potential frauds.

3. What mirror analysis can (and cannot) do

Generally speaking, any fraud relating to type, quantity, value and origin can potentially be detected by mirror analysis, provided that the data is available and correct.

Mirror analysis cannot, on the other hand:

(i) compare data between declarations or undertakings; the public data available are aggregated for each product and country (HS 6-digit level for the Harmonized System);

(ii) be carried out for the current year, since data for year N are usually available in year N+1. However, it is recommended that changes in the COMTRADE database are monitored. One of the developments announced is the supply of monthly figures by certain countries.

4. Data preparation

Mirror analysis requires data preparation: the collection and organization of external and local data in the same system to allow them to be compared and processed. This is a delicate phase, on which the accuracy of the analyses will depend. The body of data is large (for local data several gigabytes), and the analysis processing is automated, which exacerbates the effects of wrong collection or errors in the initial organization of the data.

Downloading data for partner countries

Foreign trade data for partner countries are available on the UNSD (United Nations Statistics Division) COMTRADE database. The UNSD collects the data from member countries annually. Access to the data is open and free of charge.

N.B. With free access, data downloads are limited to 50,000 lines. It is possible to take out a special subscription, or the download can be broken down (for instance by years or groups of tariff headings).

The COMTRADE database is available on two websites:


The WITS website has been developed by the World Bank, UNCTAD, UNSD and the WTO. The raw data is the same as on the UN’s COMTRADE website. WITS provides visualization tools, databases of national tariffs and international trade agreements, and macro-economic simulation tools. These may be downloaded from the website with an individual account. This account is free of charge and obtainable simply by sending an e-mail request to the WITS administrator.
The fields for interrogation of the database are identical for both websites.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Choice of HS nomenclature</th>
<th>Reporter</th>
<th>Country reporting its data to the UN's COMTRADE database (not to be confused with “Partner”)</th>
<th>With mirror analysis of imports, “Reporters” are the countries exporting to the country concerned.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>Country to which mirror analysis relates</td>
<td>Partner</td>
<td>Country to which mirror analysis relates</td>
<td>Partner</td>
</tr>
<tr>
<td>Periods (years)</td>
<td>Years examined</td>
<td>Available data must be checked first. Often complete data for the year before the current year are not available until the first half of the current year. It might be worth checking the information on the availability of data for years and partner countries. It is possible that not all countries will have reported their data at the time of the study, but some countries might not be regular or major partners of the country concerned. In that case, the incompleteness of the data is not a serious obstacle.</td>
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<tr>
<td>Products/</td>
<td>Products according to tariff nomenclature</td>
<td>Products/</td>
<td>Products according to tariff nomenclature</td>
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</tbody>
</table>

Example of use in WITS:

- select Advanced Query-Trade Data (UNCOMTRADE);
- choose new query for a new request and enter a request name (that request will be protected and may be re-used, with different parameters if necessary);
- choose reporters, countries that are partners of the country concerned, and preferably select all countries;
- choose products: choose the nomenclature used then, for example for the HS, choose in “clusters” the level of precision (chapter, heading, subheading, ALL1, ALL2, ALL3);
- choose the country in question as partner country, the year or years examined and the flow (of exports for a mirror analysis of imports, of imports for a mirror analysis of exports);
- request download of results from the request;

http://comtrade.un.org/db/mr/daReportersResults.aspx
– choose the export format (usually CSV) and the fields to be exported (which will be in columns in the result file): fields for reporters, products and years and fields for values and quantities (quantities are available both in units and in weight, sometimes the two fields are identical when the unit is a unit of weight). The values are shown in thousands of US dollars (USD) and the weights in kilograms (kg);

– download. N.B. check the last field “total rows” in the download display. If it shows the number of lines downloaded as 50,000, the limit has most probably been reached and the number of lines in the result exceeds that limit. It is then necessary to re-start the request and break it down (e.g. by year or group of products).

**Downloading local data**

Local data is the data available from Customs declarations that are lodged into the IT Customs clearance system. When this local data is downloaded, obviously the same fields are needed for the analysis: exporting country, date of importation, HS code for goods, value (if possible with details of invoice value of goods and value of transport and insurance costs), net mass quantity, additional units.

Special attention must be paid to the various Customs regimes, in order not to enter the same goods more than once. The principle is to obtain a table showing everything that has entered the territory in a given period (and not, for example, only what has been released for free circulation or home consumption).

In addition to the specifically mirror data from COMTRADE, other local data may be downloaded for further analysis: for example the office of entry, information as to whether the declaration has been adjusted, exporter and importer references, declarants, the Customs regime, declaration processing dates, etc. However, some data should not be downloaded, in particular the text fields describing the goods. It is preferable to download a large number of fields to facilitate analysis, whilst bearing in mind that the size of the table obtained will add to the processing time. If the file is too large, the computer processing will take longer. It is therefore necessary to find a balance between the fields that might be relevant to the analyses, the computer processing capacity available and the size of the final data table.

**Creating a database**

Thus two files have been created after those two downloads:

– one from COMTRADE with the aggregated data (partner country, HS 6-digit product, value in USD, quantities in units, net weight);

– one from Customs declarations with data for each clearance, which will need to be aggregated in order to be comparable with the COMTRADE data, but also preserved in their original form for further analysis.

It must be possible to process the two files in the same system. It is initially recommended that two tables be set up in the same system, one for importation of the partner countries data file and one for importation of the local data file. It is recommended that all data (external and local) be kept in the same system, even if expurgated tables have to be created for fast processing.
There are two possible solutions, to use either statistical software\textsuperscript{4} or database management software\textsuperscript{5}.

It is strongly advised that spreadsheets are not used, since these require extensive pre-processing for each analysis.

No particular recommendations can be made for the choice between statistical and database software. Powerful software of both types is available free of charge. The choice depends on the skills and knowledge of the processing staff. The advantage of statistical software is that it facilitates mathematical treatment and can even be used as a basis for subsequent econometric analysis. Some statistical software has the disadvantage that the speed of data handling is lower than with database management software.

Importing the two original files (partner countries data file and local data file) is an extremely delicate operation. To avoid wasting time, prior testing with small files is strongly recommended, for instance by importing only one month’s local data.

Three points in particular must be checked, since they result in importation errors without impeding the importation process, making them difficult to detect unless they are examined specifically:

- adherence to local data date formats;
- missing data and how they are imported to be taken into account in the mathematical operations (missing data are not zero quantities);
- the decimal symbol varies from one geographical region to another, and in some systems a symbol might be added for thousands.

After the original files have been imported, it is recommended that sets of aggregated data be created to expedite processing. For instance, to compare HS 6-digit exports directly with HS 6-digit imports, it is necessary to work on the local data table: aggregate the data based on the basis of the HS 6-digit subheading (and the year if several years are involved) to obtain a table comparable to the COMTRADE export table (HS 6-digit, year, exporting country, FOB value, quantity, weight). The field values are to be expressed in the same units: USD, kg and tonnes.

5. Possible stages in a mirror analysis

The purpose of a mirror analysis is to provide a quantitative classification of products or flows at risk. Hence these are estimates of fraud and there is therefore no specific methodology which, if followed step by step, would give a typical and reliable result. Mirror analysis can only be an empirical process, sometimes intuitive and involving Customs know-how and knowledge of the field to guide the analyst in the body of data. It would be dangerous and unproductive if one were confined to a system of analysis that was applicable to all situations. However it is possible to identify a few approaches that have produced results in the field.

\textsuperscript{4} For example, R is free downloadable software on http://www.r-project.org/.

\textsuperscript{5} For example MySQL Community Edition is free and downloadable on http://www.mysql.com/.
General analysis of data

- number and proportion of HS 6-digit products in the two data subsets (partner countries data and local data),
- number and proportion of couples (HS 6-digit products, partner country) in the two data subsets (partner country data and local data),
- classification by chapter or type of product or by tariff heading or subheading according to value, number of transactions or relative proportion of the value of the product to the total imported value (using local and COMTRADE data or local data alone),
- an identical classification for partner countries to identify major partners.

This initial analysis is necessary for several reasons:

(i) to detect errors (for example a large number of products appearing in only one corpus; proportion for a partner country known to be a major partner not shown or too small) due to the collection process (no data in the COMTRADE database) or organization of the data (errors in the importation of local data);

(ii) to detect anomalies that might provide an early indication of where enquiries should be focused (for example when a trade flow appears in the COMTRADE data and not in the local data);

(iii) in particular, for familiarization with the main characteristics of the trade flows (main products, main partner countries) in order to be aware of anomalies immediately on progressing to a more specific level of flow analysis.

Calculating differences between local and COMTRADE data

The mirror analysis as such involves evaluating the differences between local and COMTRADE data.

What is the basis for calculation of those differences?

- values, net mass, quantities, value density by mass and quantity (value by weight, value by unit).

How are the differences expressed?

- as absolute values (USD, weight, number, USD/kg, USD/unit),
- as relative values, e.g. percentage of difference in FOB value compared with imported FOB value.

At what aggregation levels are the differences calculated?

- partner country x year/period,
- HS 6-digit (or HS 2-digit or HS 4-digit) x year/period,
- HS 6-digit (or HS 2-digit or HS 4-digit) x partner country x year/period.
It is recommended that the various analysis levels are planned in advance.

Finally, it is recommended that products for which the differences are negative (COMTRADE data > local data) are separated beforehand from products for which the differences are positive (COMTRADE data < local data). In the event of tariff slippage at HS 6-digit level, for example, calculation of the difference at HS 4-digit or HS 2-digit level might show the difference as zero. It is therefore important to start working at the most disaggregated level possible (HS 6-digit even couple (HS 6-digit, partner country)) to detect all differences and identify separately all negative differences and positive differences before progressing to more aggregated levels.

**Detailed case studies**

At the previous two stages, it has been possible to detect the most significant differences in value, quantity, mass, value density, overall or by partner country. That provides an initial classification of the scale of potential fraud. It is then necessary to select specific cases (products or couples (products, countries)) from the main differences noted in the light of knowledge of the field and the tariff and regulatory data (minimum values, tax pressure, sector subject to exemptions or restrictions on quantity or special licences). The individual case study should lead to the development of a hypothesis of fraud or rejection of the hypothesis if there are other possible explanations for the difference.

It is complicated to establish a case typology, and even if one were to exist it would not help the analysts, who have to examine each specific case in detail in any event. The following is not an exhaustive list of the situations encountered:

i. **A significant negative difference in quantity and value for an HS 6-digit product (more declared quantities exported to the country concerned than quantities declared for import by that country).** It is then worth looking for tariff slippage: products similar to the targeted product but taxed less than that product (for instance in the same heading or chapter), with an equivalent but positive difference (the quantity of the product declared for importation is greater than the total quantities declared for export by the partner countries). The typical case is that of vehicles of all types supposedly imported as spare parts. If no tariff slippage is noted, these might be contraband. An indication might be retention of the negative difference when the difference is calculated for the chapter. If the difference for the chapter is equivalent to the negative difference found, there has probably been no tariff slippage. If, on the other hand, the difference for the chapter is zero, the negative difference for the product has probably been offset by a positive difference for another product.

ii. **A negative difference in value but no significant difference in quantities.** In such cases, it might be worth going back to the level of local declarations and calculating the import value density for each importer to detect any significant differences that might point to undervaluation by some importers. If all import value densities are close or identical, certain major importers might have formed a cartel for the undervaluations. The same calculation can be made for each Customs office used as a point of entry, in order to identify bad local practices aimed at attracting traffic.

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6 See Raballand *et al.* (2012) for a published case study.

7 This merely illustrates a research method. Each case is distinct, but this method, which varies aggregation levels between HS 6-digits, HS 4-digits and HS 2-digits, has produced positive results.
same calculation can also be made for each partner country – some importers have special links to certain exporters operating in particular countries – to examine the possibility that the imported products of are very different quality.

iii. **A positive difference in value (the value declared on importation into the country concerned is higher than the total values declared on exportation by the partner countries).** Such cases might be linked to the manipulation of transfer prices, as a cover for tax fraud laundering. That might be explored by comparing value densities per importer in order to identify a major importer importing at very high values.

iv. **A positive difference in quantities.** There might be numerous explanations for this: transit, regulations in the importing country which do not allow any exemption for resident travellers or use of the product to cover up contraband offences.

v. **A strong link between transport and insurance costs and the value of the goods.** Since the COMTRADE data is FOB, they can be used to evaluate the proportion of values declared for importation represented by transport and insurance costs, when the local data on such costs is not or is no longer available or is suspect.

It is not possible to discuss every case in detail; the interpretation depends on the local context (Customs regimes, specific laws on values, quotas and exemptions). The analysis must be flexible and it is therefore necessary for the source data to be preserved and the processing to be done on separate tables.

**Providing an assessment of potential revenue losses**

Finally, the potential revenue losses are estimated for each case. This is an important stage, since the biggest differences in values or quantities do not necessarily generate the biggest revenue losses.

It is recommended that intervals be applied for revenue losses, taking the limit values for the COMTRADE and the local data. For instance, with a negative difference of quantity X on a product P, a value and a tax pressure applicable to it must be reconstituted:

- minimum, average, median and maximum value densities can be applied to the missing quantity X,
- similarly, an average, median, minimal or maximum tax pressure on product P can be calculated from the local data.

In the event of tariff slippage, the revenue generated by the product to which the missing quantities have been carried over, which is revenue actually collected, is to be deducted from the estimated losses of revenue.

**6. Uses of mirror analysis**

The purpose of mirror analysis is not to produce a document but to combat fraud. It must therefore be part of the enforcement framework. That can take several forms:

i. mirror analysis is used in discussions between Customs, the private sector and government, to provide a quantitative assessment of fraud in one or more sectors;

ii. mirror analysis provides the main focus of an annual fraud control plan;
iii. mirror analysis is used directly to define primary risk criteria that will be implemented in the IT Customs clearance system or to guide investigations and *ex post* inspection;

iv. mirror analysis is brought in to restrict bad practice by investigators. Managers in the investigation branches may require their investigating officers to carry out a simple mirror analysis prior to the opening of investigations. The analysis should show the potential estimated revenue losses. That has two advantages for managers: before the investigation, the manager of the enforcement officer can assess whether the investigation that has been suggested is appropriate in the light of other possible potential fraud cases and after the investigation, the manager can evaluate the effectiveness of the investigation by comparing the adjustments made to the potential adjustments reported by the investigating officer.

v. mirror analysis can lead to an experimental fraud control system, focusing on the major cases identified, whose effectiveness is measured over time. Such an experimental system can be useful in evaluating or orienting the work of frontline offices. After discussion of the cases described with frontline officers, supplemented by further cases they suggest, certain trade flows (products or products-countries) are selected for closer inspection for a limited period (a few months). In that period, the mirror analysis team continues to measure values, quantities and, in particular, value densities for the goods cleared through Customs, as well as any disputes. At the end of that period, a report can be drawn up on the relevance of the fraud hypotheses, the effectiveness of the frontline inspection services (at least in carrying out inspections of the target products) and any changes of importers’ behaviors and practices (importers might, for example, have increased their values or reduced their frauds following disputes or their realization of the stricter controls).

In all cases, once the cases and hypotheses have been drawn up, it is important to compare them with the experience of frontline inspectors and investigators. It might be tempting to take their experience into account from the start of the mirror analysis and to focus the enquiries on the basis of their information. That is not recommended, for two reasons. Firstly, the mirror analysis and experience in the field can always be compared at any point in the analysis; the two approaches are not mutually exclusive. Secondly, mirror analysis is specifically an objective counterpart to human experience in fraud control. On the other hand, it is absolutely essential to compare the case studies and fraud hypotheses with the experience of officers in the field at the end of the analysis.

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8 Thus investigators might either have made an incorrect analysis, knowingly or otherwise, or have erred in their inspection. In either case, mirror analysis provides a basis for evaluation of the work and practices of investigating officers prior to and during the investigations.
PART 2

Mirror Trade Statistics:
A Tool to Help Identify Customs Fraud

by Gael Raballand, Thomas Cantens, Guillermo Arenas

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A Cameroon Case Study

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1. Introduction and overview

This paper analyzes detailed data and information on Cameroon’s imports to identify sectors where the likelihood of customs undervaluation (or overvaluation) is the highest in order to be an additional tool for customs officers to better develop their risk management policy and implement cargo selectivity.

Mirror statistics is the use of partner trade statistics to assess trade patterns of country X. This method has been used quite extensively in international economics for several decades and has regularly demonstrated that high taxes are an incentive to increase tariff evasion and misclassification.\(^\text{11}\)

One of the seminal articles was Bhagwati (1964), who explained that, in the case of Turkey, the categories of goods which showed the most important “perverse discrepancies” had tariff rates ranging up to 30 per cent and rarely below 10 per cent.

Bhagwati (1967) also used mirror statistics to demonstrate the impact of undervaluation and overvaluation of trade statistics on balance of payments data.

Pritchett and Sethi (1994) used data from three developing countries-Jamaica, Kenya, and Pakistan-on items in the tariff code to examine the relation between tariff revenues and tariff rates. They demonstrated that collected and official tariff rates are only weakly related and even more interestingly the variance of collected rates increases strongly with the level of the official rate. Finally, they found a weak evidence that, beyond a limit, further increases in the official tariff rate produce no increase (and perhaps a decrease) in the collected rate.

Using mirror statistics, Fisman and Wei (2004) quantified the effects of tax rates on tax evasion in China by examining the relationship between the tariff schedule and the “evasion gap,” which they defined as the difference between Hong Kong’s reported exports to China at the product level and China’s reported imports from Hong Kong. They found that a one-percentage-point increase in the tax rate is associated with a 3 percent increase in evasion and that evasion takes place partly through misclassification of imports from higher-taxed categories to lower-taxed ones, in addition to underreporting the value of imports.

Focusing more on Central and Eastern European countries, Javorcik and Narciso (2007) found that differentiated products may be subject to greater tariff evasion due to the difficulties associated with assessing their quality and price and greater tariff evasion observed for differentiated products tends to take place through misrepresentation of the import prices (and not through quantity or undervaluation).

Mirror statistics have also been used by trade economists to demonstrate the reliability problems of trade data. In this regard, Yeats (1978) pointed out the problems of trade statistics especially at disaggregated level. He explained that discrepancies in lower level trade statistics are often considerable and suggested the desirability of more fully assessing the trade-off between level of disaggregating and reliability of the underlying data.

\(^{11}\) In peculiar cases, such as North Korea, mirror statistics were used due to an absence of published statistics. This use is, however, marginal. Most articles focus on statistics discrepancies and try to explain them.
This has been more recently that mirror statistics are increasingly used at a detailed level for customs use. Taking the example of Kyrgyzstan, based on information on the ground on bazaars development, Kaminski and Raballand (2009) used mirror statistics to demonstrate how Kyrgyzstan had become a re-export platform of Chinese consumer goods for Central Asia.

In the same vein, Raballand and Mjekiqi (2010) used mirror statistics (and port traffic data to evaluate the extent of smuggling to Nigeria (through Benin) due to import prohibitions.

Despite their interest, most of these papers have not been used primarily to help customs officers to reduce fraud. That is where this paper is different since it was designed to be used for customs and is a tool, which helps Cameroon customs to better monitor fraud practices. It is worth having in mind that tariff evasion proof is difficult but mirror statistics appears to help:

- to understand a fraud mechanism,
- to evaluate the impact of Customs controls and management when new measures are undertaken to fight fraud (in one case, the gap strongly decreased when a new head of a customs bureau was appointed),
- to unveil the “bargaining” process of some customs officers with traders and importers,
- to evaluate revenue losses,
- to generate political will from Customs management.

This experiment is ongoing in Cameroon but preliminary results and lessons can be shared at this stage. It was designed in two steps: mirror statistics and then consultations with customs in charge of risk analysis and operational offices to improve revenue collection and decrease fraud. This paper demonstrates how useful can be mirror statistics for customs field-officers.

This paper compares, in value and weight, exports to Cameroon from the UN COMTRADE database and imports reported in the Cameroon database from 2007 to 2010. This first step made systematic comparisons and identified the largest discrepancies with the highest potential fraud and impact on revenues. Some of the discrepancies were ignored by customs officers, others were known but the extent of fraud was not known. The second step has been to investigate some specific flows in order to unveil how fraud is organized and provide information to improve controls on the ground.

The second section presents databases characteristics as well as the limits to this type of exercise. Then are presented some products examples in the case of Cameroon. Lessons to take into account for low-governance countries are described and a final section concludes and presents the areas for further research.

2. Data accuracy and methodological issues

Data accuracy issues

Limits to the accuracy of mirror statistics are well-known for several decades. In this regard, Bhagwati (1964) points out the three main explanations of discrepancies (but also
demonstrates that they can be ruled out when discrepancies are above 20-30%), which is our case for Cameroon.

The first plausible explanation of the discrepancy is just an error of commodity classification. This case is considered as marginal.

The second explanation is a time lag between exports and imports declarations. This may be an issue but overtime, this should be compensated (if there is no underinvoicing or overinvoicing). From China, it takes 45 days to arrive to Douala and from EU, it usually takes 2 weeks and the lag is therefore rather limited and can not explain important differences. Moreover, any gap detected for 2010 were computed on the former years to control this problem.

The third explanation is obviously transport costs but gaps for some commodities are so important that they cannot explain such differences. That is also why we have computed gaps for weights over several years to have a second factor, which could explain or not discrepancies.

The fourth explanation is what Bhagwati (1964) called “misallocation” of imports: imports can be wrongly attributed to Belgium as imports when they were manufactured in France and only traded via a Belgian port. To limit this problem, EU countries were aggregated and the same was done for China and Hong-Kong. Moreover, we aggregate transit and import declarations since one exporter can declare that the destination country is Cameroon when the real one is Chad. Nevertheless, ASYCUDA makes a distinction between origin and provenance and we mixed both to avoid this problem.

The fifth explanation would be exchange rates volatility since data are converted on a yearly average. Therefore, substantial exchange rate appreciation or depreciation could possibly bias some trade data.

The final issue would be the undervaluation from the export country and a simultaneous undervaluation of imports. In this case, nothing could be detected but in this study has already identified several major discrepancies. We just need to keep in mind that i), for operational purposes, the existence of discrepancies is more important than the accuracy of the discrepancies themselves when they are important and ii) the measured gaps are minimal and are probably beyond what was identified.

**UN-COMTRADE Database**

Mirror analysis compares export data extracted from UNCOMTRADE and import data extracted from ASYCUDA Cameroon. Using UNCOMTRADE allows several kinds of comparison, different levels of aggregation: export data of all countries to Cameroon, export data of one country to Cameroon, by HS6/4/2. Concerning Cameroon and considering its major import flows, most UNCOMTRADE data we have used are provided by China, EU and US. Mirror data were compiled from the UN-COMTRADE database using WITS. Each product is defined at the HS 6-digit level using the HS 2007 nomenclature. Values are recorded in US$ millions and quantities are presented in several units depending on the reporting country (kilograms, number of items, squared meters, liters, among others). Unlike the customs database, the mirror database does not provide information on quantities for a

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12 It confirms what Yeats found out: “normal c.i.f.-f.o.b. ratios do not approximate transport costs in spite of the assumption often made in gravity flow and related trade models”.

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UN-COMTRADE Database

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relatively significant share of imports\textsuperscript{13}. The mirror database contains 56,469 entries that represent imports by Cameroon of 4,042 products from 109 countries for the period 2007-2010.

It is not possible to match all import flows in the customs database due to non-reporting by some of Cameroon’s partners to the UN-COMTRADE database\textsuperscript{14}. The total import values in both databases are significantly different and do not follow the same trends. In this case, differences had more to with how many countries are reporting for a particular year than other factors. Particularly, the smaller difference observed after 2009 is due in part to Nigeria reporting data to UN-COMTRADE in 2009 and 2010 but not in 2007 and 2008.

Comparison of imports at the country level seems more promising but some discrepancies remain. In some countries, namely the EU-27\textsuperscript{15} and China, customs and mirror follow each other and differences are relatively small. In other countries, some important differences remain and trends are not similar (Japan, the US, Thailand). Imports from Thailand and Japan show the highest difference in relative terms. The fact that the global gap between one partner and Cameroon is small does not necessarily give any information on the fiscal dimension since gaps in a chapter may partly compensate.

**Cameroon Customs Database**

Cameroon customs database has information on import values and quantities by product and country of origin from 2007 to 2010\textsuperscript{16}. Each product is defined at the HS 11-digit level using the HS 2007 nomenclature. Values are recorded in FCFA millions and quantities are presented in both kilograms and number of items for each product. Each of the 147,728 entries in the customs database represents an imported product from a country in a particular year. The entries in the customs database represent imports of 4,988 products from 203 countries for the period 2007-2010.

The maximum detailed level at which international comparisons of trade flows can be conducted is the HS 6-digit level. More detailed disaggregation (e.g. 11-digit level) is based on country-specific HS lines and may not be comparable between countries. Thus, the original customs data was re-coded at the HS 6-digit level. After collapsing values and quantities at the HS 6-digit level the customs database has 116,610 entries representing imports of 4,600 products and 176 countries for the period 2007-2010.\textsuperscript{17}

**Comparison of Reported Quantities in the Customs and Mirror Databases**

Comparing imported quantities between the customs and mirror databases is more troublesome. Although the customs database provides quantity data in kilograms for all products, this is not the case with the mirror database. Reporting quantity units to the UN-

\textsuperscript{13} The units and extent of reporting depends on individual countries. Overall, quantity information in kilograms is provided for products that represent about 70 percent of value in the customs database.

\textsuperscript{14} Database coverage is not universal. Some countries do not report to UN-COMTRADE (e.g. Syria, Algeria, Iran, Iraq) and other countries report to UN-COMTRADE but their reporting is incomplete (e.g. United Arab Emirates only reported data in 2009 and Nigeria in 2009 and 2010) or report with some delays (data from Brazil for 2007 and from the Netherlands for 2010 is not available)\textsuperscript{14}. As a result, matching total import flows for all countries is not possible because different country coverage (with the customs database being more comprehensive). Even when imports from one country can be matched, gaps in some years may remain (as in the case of Brazil and the Netherlands).

\textsuperscript{15} There are significant individual differences for some of the countries that belong to the EU-27 that may arise due to goods being shipped from a country different than the one from which they originated. In the remainder of the note, we would treat the EU-27 as a group. For a detailed breakdown of EU-27 imports see Annex 1.

\textsuperscript{16} The original customs database contains information on imports for 2011. However, these observations were dropped from the analysis.

\textsuperscript{17} The number of countries drops from 203 to 176 after cleaning the list of wrong entries and dropping entries from small islands and territories that do not belong to the World Bank’s country classification.
COMTRADE database is not homogeneous and the reporting units depend on the country -- and can vary from year to year for the same country. Some countries report quantities in units other than kilograms, namely, number of items, squared meters, liters, among others, or simply do not report quantity units for some items.

Thus, only products for which a particular country reported quantities in kilograms to UN-COMTRADE would be matched with customs quantities. Matching other products would require transformation ratios from other measures to kilograms. The following table shows the percentage of import values that are reported in kilograms for the top ten countries in the mirror database.

**Table 1. Percentage of import value reported in kilograms in mirror database**

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>70</td>
<td>72</td>
<td>69</td>
<td>71</td>
</tr>
<tr>
<td>China</td>
<td>44</td>
<td>50</td>
<td>56</td>
<td>55</td>
</tr>
<tr>
<td>United States</td>
<td>21</td>
<td>32</td>
<td>74</td>
<td>69</td>
</tr>
<tr>
<td>Germany</td>
<td>50</td>
<td>54</td>
<td>55</td>
<td>44</td>
</tr>
<tr>
<td>Belgium</td>
<td>67</td>
<td>62</td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>Japan</td>
<td>24</td>
<td>25</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>Thailand</td>
<td>91</td>
<td>90</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>Italy</td>
<td>60</td>
<td>62</td>
<td>63</td>
<td>64</td>
</tr>
<tr>
<td>Brazil</td>
<td>N.A.</td>
<td>98</td>
<td>92</td>
<td>94</td>
</tr>
<tr>
<td>Netherlands</td>
<td>77</td>
<td>76</td>
<td>65</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

N.A. = No mirror data available

Quantity reporting in kilograms may be complemented by “supplementary units” reporting, which are units. It is especially important for motorcycles or spare parts.

The customs and mirror databases were merged after cleaning the data following the steps described above. Import values are originally recorded in US$ in the mirror database and were converted to FCFA using the exchange rate from the World Bank’s World Development Indicators.

### 3. The main findings of the Cameroon case study

The differences are calculated as customs minus mirror values. Several examples are presented, illustrating various probable fraud mechanisms.

It is worth noting that more cases were detected but for some of them, suspicions were not necessarily confirmed with discussions with operational customs officers.

For confidentiality reasons, the HS headings and subheadings of the commodities are kept anonymous.

**Case 1: Attractive subheadings in a chapter which capture subheadings which are more taxed and have a threshold value.**

The first example is the subheading X1 (manufactured goods), heavily taxed (30%, highest tariff rate), with a minimum value imposed by the administration, imported mostly from one country.
In UN-COMTRADE, China export flows are prevalent: China exports represent 89% of total exports.

**Table 2 : Quantity/value and value density for the product from China**

<table>
<thead>
<tr>
<th></th>
<th>Quantity (tonnes)</th>
<th>Value (millions CFA)</th>
<th>Value density (FCFA/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN COMTRADE data</td>
<td>2,360</td>
<td>7,253</td>
<td>3,072</td>
</tr>
<tr>
<td>Cameroonian import data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(origin or China provenance)</td>
<td>90</td>
<td>380</td>
<td>4,217 (equal to the minimal value)</td>
</tr>
</tbody>
</table>

The threshold value (set by Cameroonian customs) is higher than the declared value for exports (134% of exports value, which could be explained by transportation costs).

The main issue concerns large differences in quantities and values. Moreover, this trend has increased every year since 2007: between 1000 and 2000 tonnes “disappear” between declared exports and declared imports in Cameroon.

By applying the Chinese declared quantity and the threshold value, imported values in 2010 should have been 9,952 million CFA, which represents potential additional duties and taxes of 5,473 billion CFA (or over 50% of total declared values).

This analysis has been conducted on the subheading (HS6) and can be extended to the whole chapter (HS2). Two subheadings within the chapter, Y1 and Z1, are taxed at 20% (instead of 30%) and have large imported volumes and may raise questions since they are subject to large exemptions (and are taxed at a lower rate).

According to Cameroon data in 2010, 30% of Cameroon's imports of goods for the chapter come from Y1, imported from Benin, meanwhile this good is not manufactured in Benin. This one is taxed at 20%, has no threshold and the average value of imports is 672 CFA/kg (against over 3,000 CFA/kg for 520852). Benin export data does not appear in COMTRADE for the years 2009 and 2010. Moreover, virtually no country in the world seems to export to Benin, Cameroon and Nigeria in 2009 and 2010 this good. In addition, four import operations for this tariff position were subject to exemptions.

Moreover, based on Cameroonian data in 2010, 34% of Cameroon's imported goods in the chapter come from China in the tariff line Z1. This position is taxed at 20%, has no threshold and the average value of imports is 281 CFA/kg. China declared exports were 254 tons in 2010 but according to Cameroonian data, 999 tonnes were imported. In addition, 6 import transactions of this subheading have given rise to exemptions.

In conclusion, two assumptions are likely and not mutually exclusive of one another:

- X1 is smuggled, undeclared, which cause a potential loss of revenues of 5.5 billion CFA (or approximately 11 million out of 14 million declared for exports);
- X1 is imported under false declarations under the subheadings with lower tariff rates (Y1 and Z1) and are subject to exemptions from duties and taxes but for quantities that remain lower than the observed deviation of subheading X1.

The second example are food products (O1 to O18) with similar appearance, same packaging and sometimes same use, which are classified within the same chapter.
including subheadings taxed from 10% to 30% with some minimum values set by the administration (see Annex 1 for details).

Based on data extracted from annex 1, we can conclude the following:

- Minimal threshold values are all much higher than declared export prices.
- All low taxed goods record a positive gap, which means they are probably destination of misclassification.
- A loss is recorded for two positions subject to minimal prices (O8 and O16), with a gap of 8,000 tons. This is likely that the 8,000 tons are declared under the subheading O7, which is taxed at 30% but with a density value at 480 CFA/kg (instead of the 1500 CFA/kg). The shortfall is therefore approximately 6,684 billion CFA for 2010 to which we need to subtract 2,143 billion paid for duties and taxes paid under the position O7. The real loss would then be approximately 4.5 billion USD (or almost 10 million USD) if the misclassification would be complete between O8 and O16 to O7.

The third example is a raw commodity M1 to M3. It is possible to review the position of goods taxed differently, and no minimum value set out in sub tariff.

The subheadings of M1 are taxed differently and record significant differences in export quantity from some countries.

Table 3 : Quantity/value and value density for M1 to M3

<table>
<thead>
<tr>
<th>HS6</th>
<th>Duties percentage</th>
<th>UN COMTRADE</th>
<th>Cameroon data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>UN COMTRADE</td>
<td>Cameroon data</td>
</tr>
<tr>
<td>M1</td>
<td>5%</td>
<td>7,746 million 2,491 tonnes 3,109 CFA/kg</td>
<td>7,985 millions 2,700 tonnes 2,944 CFA/kg</td>
</tr>
<tr>
<td>M2</td>
<td>30%</td>
<td>166 million 123 tonnes 1,351 CFA/kg</td>
<td>17 million 13 tonnes 1,355 CFA/kg</td>
</tr>
<tr>
<td>M3</td>
<td>10% or ou 30%</td>
<td>4,705 million 11,713 tonnes 402 CFA/kg</td>
<td>3,290 million 8,256 tonnes 398 CFA/kg</td>
</tr>
</tbody>
</table>

For M3, a specific analysis is conducted for each export country and unveils that a significant fraud may have been developed from the United States since the United States reported 1,017 million CFA for exports to Cameroon for M3 whereas Cameroon declares 1 to 2 million CFA of M3 from the United States.

Case 2: misclassification with attractive sub-positions (spare parts) of another sub-position taxed at a higher rate.

The fourth example, X2, is a manufactured good, heavily taxed and imported mostly from one country.

In UN COMTRADE, China exports about 30 million per year to Cameroon, representing 94% of total exports to Cameroon and the second largest exporter is India with 0.9 million USD.
Table 4: Quantity/value and value density for X2 from China

<table>
<thead>
<tr>
<th></th>
<th>Quantity (tons)</th>
<th>Value (millions CFA)</th>
<th>Value density (FCFA/unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese data (COMTRADE)</td>
<td>1658 (80,144 units)</td>
<td>14,460</td>
<td>180,436</td>
</tr>
<tr>
<td>Cameroon data For home consumption and international transit(^{18})</td>
<td>5885 (70,287 units)</td>
<td>9,143</td>
<td>130,081</td>
</tr>
<tr>
<td>Cameroon data For home consumption only</td>
<td>5417 (60,250 units)</td>
<td>8,078</td>
<td>134,091</td>
</tr>
</tbody>
</table>

Chinese data on quantities are expressed in weight estimates from standard values.

This subheading has two main problems:

The first is the unit value to import which is about 30% lower than the value declared for export. By applying a threshold value of 185,000 FCFA per unit and keeping the number of units declared for import in Cameroon similar, the value would be 11.1 bn FCFA, a surplus of 3 billion FCFA from what is declared, which would lead to a surplus of rights and taxes of 1.671 billion CFA francs (or over 3 million USD).

The second problem is quantity. In terms of units, the declared gap is 30%, which represents a potential loss of 1.3 billion CFA francs of taxes and duties (or almost 3 million USD).

By combining all these computations, the declared value should be around 14 billion instead of 8 billion and the additional duties and taxes should be of 3.3 billion CFA in 2010.

The analysis can be refined by taking into account Y2, spare parts of X2. There is most probably a misclassification of X2 to Y2, which are taxed at 20% instead of 30%.

According to information from the field, it is likely that some X2 units are imported disassembled. Indeed, exported values to Cameroon are at 610 million FCFA while imported values declared in Cameroon are at 4,195 million FCFA.

If there is a misclassification, the overall taxes loss is then: the shortfall on X2 - duties and taxes paid for Y2. It would then be equal to 2,485 million in 2010 (or almost 5 million USD).

Table 5: Value and total duties and taxes for spare parts Y2 from China

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Duties and taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon data (with partial exemption)</td>
<td>2,900 million</td>
<td>788 million</td>
</tr>
<tr>
<td>Cameroon data (without exemption)</td>
<td>674 million</td>
<td>289 million</td>
</tr>
<tr>
<td>Chinese data for exports</td>
<td>610 million</td>
<td>262 million</td>
</tr>
<tr>
<td>Duties and taxes subject to misclassification</td>
<td>= 788+289 -262 =815 million</td>
<td></td>
</tr>
</tbody>
</table>

\(^{18}\) As described in section 1, transit and home consumption and international transit have been merged to be sure that the discrepancy is not due to mistakes in the declaration of destination in the export country. In the present case, even when merged, the import flows are still undervalued.
Case 3 : Overvaluation

This fifth example is raw material used for the beverages industry. The analysis has been conducted at HS4 level because subheadings goods are taxed identically and there is no minimum value. The analysis found a positive gap.

The subheadings are all taxed at 10%. Imports mostly concern few economic operators who are important contributors to customs revenues. Interestingly, mirror statistics reveal an overvaluation with a positive gap in favor of Cameroon (see Table 6).

<table>
<thead>
<tr>
<th>Table 6 : Quantity/value and value density for a raw material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Belgium</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Moving to the whole chapter, we identify a gap equal to 16 billion CFA (or over 30 million USD), which is quite the same gap as the one formerly detected for the heading HS4. In such a case, it was worth to examine each importer imports to detect whether overvaluation was systemic. Only 195 import operations were done in 2010 and undertaken by 5 importers, the first one representing 81% of total import volumes (for a density value of around 400 CFA/kg). Therefore, a question could be raise on possibility of transfer pricing to evade taxes on profits in Cameroon since the quantity seems to be rather similar.

4. The main lessons of the case study

This paper has presented the first step of an experiment of risk analysis design. Most of these cases will be connected to a specific control, either ex-post or on the ground.

Based on this case study, it would be important to take the following lessons for future studies in this area for developing countries:

1. Ensure that the tariff is compliant with the valid version of the Harmonized Commodity Description and Coding System, which is not easy. Rozansky and Yeats (1994) explained that while the shift toward the harmonized system was intended to impart a greater degree of data precision, two difficulties may have produced an opposite effect. First, some developing countries were not adequately prepared for the new compilation procedures, and their national statistics could not be matched satisfactorily with the new SITC classifications when the transition began. Second, some governments were not fully aware of disclosure problems associated with the shift to the harmonized system. Once they surfaced, some transactions were intentionally not reported to preserve confidentiality. HS coding system is therefore sometimes problematic in some countries.

2. Aggregate export data for all countries exporting to the destination country for any product where a gap seems to be important. Given a lack of supplier diversification, it is important to capture all of them since there may be misallocation of imports.
3. **Aggregate export data of the European Union countries and more generally for regional trading blocs.** Import declarations can sometimes make a confusion between origin and provenance. The consequence is that, for the same product, a positive gap can be identified with one EU country and a negative with another. This is often the case of goods originating in the EU and exported through Belgium. This problem is simple to avoid since there is an aggregation in the COMTRADE database for EU countries. It might also be true for supply chains that are linked to Middle East countries, especially U.A.E. There is evidence that some Cameroonian traders buy goods from East Asia via Dubai suppliers.

3. **Compute gaps in goods density value (value/weight or more units) in addition to differences in absolute weight and quantity.** This is particularly useful for tariff headings which have minimal values set by customs. It is due to the fact that the minimal value may be respected but not the weight.

4. **Compute separately the largest positive and negative gaps since in the case of misclassification of goods, a commodity is fraudulently declared on several subheadings, which leads to positive and negative gaps for the same product.**

5. **Be flexible on the analysis:** fraud mechanisms vary from one product to another therefore there is no clear-cut methodology (fraud can take place within a same HS chapter or between chapters).

6. **This analysis guides operational controls priorities by classifying the importance of revenue losses, which is impossible with non-quantified methodologies** since interviewed officers tend to focus on fraud cases for which one single case was important rather than rampant fraud applied to a lot of imports. However, in most cases, rampant fraud is of a larger amount than non-rampant one.

**5. Conclusion and areas for further research**

This paper demonstrates that by identifying around 10 targeted products, fraud could be estimated to the magnitude to 10-20% of current collected revenues in Cameroon (or equivalent to over 50 million USD).

As mentioned previously, because of statistical issues, the amount should not be taken as face value and a second step, more operational, has been undertaken to further investigate and control. From our point of view, the existence of a gap is more important than its accuracy.

A preliminary stage of systematic comparison is essential to identify patterns of fraud and not based solely on empirical knowledge. The second stage is to investigate specific cases to explain the discrepancies by unveiling precise fraud processes or enlighten potential import flows which may hide fraud. Maybe surprisingly, operational units may seem to find extremely useful such type of analysis, especially in the case of minimal threshold values since they may have been fooled by importers, who declares a higher value per kg but “forget” to declare tons and therefore customs face huge revenue losses.

In conclusion, this tool, even though should be taken with cautious, seems to have a bright future when used with operational customs units to better quantify and identify customs fraud systems.
ANNEX I
Part 1

1. List of acronyms

HS: Harmonized Commodity Description and Coding System
OECD: Organisation for Economic Co-operation and Development
UNCTAD: United Nations Conference on Trade and Development
UNSD: United Nations Statistics Division
WCO: World Customs Organization
WITS: World Integrated Trade Solution
WTO: World Trade Organization

2. References


ANNEX II

Part 2

1. References


## 2. Quantity/value, value density, tariff duties percentage and existence of a threshold for oils

<table>
<thead>
<tr>
<th>Subheading (HS6)</th>
<th>Value (in CFA)</th>
<th>Quantity (in kg)</th>
<th>Value density (in CFA/kg)</th>
<th>Duties percentage</th>
<th>Threshold value</th>
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<tr>
<td>O1</td>
<td>203,847,479</td>
<td>514,810</td>
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