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Abstract

This paper assesses the quality of Cambodia's export and import statistics by comparing them with the statistics of its trade partners. The paper identifies inaccuracies in trade statistics caused by two types of misclassifications: commodity misclassification and direction misclassification. We will thoroughly examine products that are misclassified as different (but similar) products as well as goods to or from a particular country that are misclassified as goods to or from another country. A single bilateral mirror comparison, which is common in the existing literature, does not tell us much about the manner in which misclassifications are committed. Even if we observe a large discrepancy in certain traded commodities between two sides, we cannot immediately conclude which side has generated the inaccurate statistic. In order to overcome this problem, the paper will use the multiple mirror comparison technique. By comparing the results of various bilateral mirror analyses of trade statistics, we can identify which direction and commodity misclassifications have been committed by Cambodia.

Keywords: quality of trade statistics; misclassification; smuggling; multiple mirror technique; c.i.f./f.o.b. ratio

JEL Classification: F13, C46

1. Introduction

Ideally, statistics on the goods traded between two countries should be captured by each side's respective customs office. Country A's recorded exports to Country B should be identical to Country B's recorded imports from Country A (mirror statistics). While there may be some discrepancies caused by errors and statistical methodology differences between the two authorities, we should expect that the two sides of the mirror statistics are more or less similar.

However, in reality the two sides of the mirror statistics are often very different; at best, like a reflection on the surface of a puddle. This is especially true for trade statistics compiled by developing countries. Various factors cause discrepancies in both the value and quantity of trade recorded. The first possibility is that the customs offices of the two sides record the same quantity but at different values. In this case, the difference is limited to price. The second possibility is that the two customs offices record different quantities as well. Differences in quantity can be caused by transshipment. There is also the possibility of customs offices committing human errors leading to misclassification, as well as the effects of smuggling by traders.

The general view on the accuracy of data collected by customs offices is that import data are more reliable than export data because governments are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls. This could also be the case with regard to direction classification as customs officers carefully examine the origin of imports because the relevant amount of tariffs they need to collect is determined based on the good's origin, while they are generally less interested in the recipient country of exported goods. At the same time, however, traders may have an incentive to under-report the value of imported goods to avoid paying tariffs.[1]

This paper assesses the quality of Cambodian trade statistics by utilizing the mirror technique and studies the magnitude of the misclassification problem.[2] It focuses specifically on the inaccuracy of trade statistics caused by two types of misclassification: commodity misclassification and direction misclassification. We will thoroughly examine products that are misclassified as different (but similar) products and products to or from a particular country that are misclassified as products to or from another country. In doing so, we will move beyond a simple comparison between import and export data at the aggregated or disaggregated level in existing research.

The structure of the paper is as follows. The next section reviews existing empirical studies on sources of discrepancy between mirror data, as well as literature on the comparison of mirror statistics. Bearing in mind the methodological weakness of existing studies, the third section explains the methodology used in this paper, "multiple mirror technique," which is suitable to assess the quality of trade statistics. The fourth and fifth sections analyze the quality of export and import statistics of Cambodia, respectively.

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1 The value of exports can also be manipulated (in this case through over-invoicing) as a way to misuse duty drawbacks.

2 For the quality assessment of trade statistics of Lao PDR, see Hamanaka (2011).

The final section summarizes the empirical findings of this paper and considers the implications for other transitional economies.

2. Literature on Discrepancies in Mirror Data and the Accuracy of Trade Data

2.1. Source of Discrepancies in Mirror Data

Various factors can lead to discrepancies in mirror statistics (Yeats 1995, Makhoul and Otterstorm 1998, Ferrantino and Wang 2008, Eurostat 2009). While the focus of this paper is on misclassifications associated with commodities and the direction of trade, which are mainly incurred by customs offices (of either the exporting or importing country),[3] it is important to understand factors aside from misclassifications that cause discrepancies among mirror statistics (Table 1).

First, differences in reporting costs cause discrepancies because exports are mostly reported on a free on board (FOB) basis,[4] while imports are reported on a costs, insurance, and freight (CIF) basis. The CIF–FOB differences may result in a higher import value than export value. The International Monetary Fund (IMF) estimates that on average, the CIF price is larger than the FOB price by 10%.[5] However, the CIF–FOB ratio becomes larger as the distance between trade partners increases and the weight of the traded goods becomes heavier (Pomfret and Sourdin 2009).

Second, the exchange rate is another contributing factor to differences in cost reporting, making it difficult to predict which side of the mirror data will have a higher value. The customs office may set its own exchange rate for conversion purposes, such as the monthly average rate, which may not necessarily coincide with the market rate at the time the goods are actually traded. Moreover, the exchange rates used by the two customs offices may differ.

Third, the difference in timing is presumed to be a cause of discrepancy in some instances when exports leave the port of origin during the last month of the year and arrive at the port of destination the next year. Although this factor is prominent when we analyze monthly data, it becomes marginal when we use annual data. If trade has a growing trend and the time lag between export and import timing is significant, the export value will be larger than the import value for that period.

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3 While traders are considered the immediate party that commits errors (e.g., misreporting traded goods), we regard this as a misclassification committed on the part of the customs office since it is responsible for ensuring that data submitted by traders are accurate.

4 Exports are sometimes reported on a free alongside ship (FAS) basis, which equals FOB minus the cost of loading the ship.

5 To estimate a mirror export, the partner country's import value is divided by 1.1. The detailed estimation procedure is discussed on the IMF's Direction of Trade Statistics website at http://www2.imfstatistics.org/DOT/DOTEstim.htm

Fourth, the coverage of goods recorded by customs offices in the importing and the exporting country is not always the same; there are structural differences between the two that can lead to discrepancies in trade statistics. Even if neither party commits any errors in recording the origin or destination of the goods, the discrepancy may occur because the trade partners' customs offices subscribe to different rules of origin since there is no universal rule on specifying the origin and destination of goods. The determination of the origin of re-exports[6] or transshipped goods[7] is particularly important in this regard. In addition, trade to and from free trade zones is another issue that produces differences in coverage. Countries with different trading systems, whether general or special, will have different coverage of recorded transactions because the former includes all transactions in the free trade zone while the latter does not include such transactions.[8] Finally, goods that are already recorded as imports but are returned to the exporting country for any reason will not be recorded by the intended importing country but will continue to be in the record of the exporting country.

Fifth, traders sometimes deliberately make false declarations of the value of the goods or the origin and/or destination of goods in order to take advantage of duty reductions or the duty drawback scheme. For example, traders might declare an inflated value for exports (over-invoicing) in order to take advantage of the duty drawback program.[9] When this happens, the value of the export side of the reporting country becomes larger than that of the import side of the partner country. [10] Another common practice is tariff evasion by under-reporting the import value. Transfer pricing is also a common practice to avoid various tariffs and duties (e.g., domestic taxes) that is engaged in by related parties in different countries, such as different branches of a multinational corporation. This practice shifts profits from high-tax countries to low-tax countries (Ferrantino and Wang 2008).

Finally, misclassification by customs offices, which is the focus of this paper, is also a critical factor in determining discrepancies observed among mirror data. There are two kinds of trade misclassification. Commodity misclassification is the faulty recording of the same good under different commodity codes by either the exporting or importing country's customs office. The presumption is that misclassification may occur among

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6 Re-export takes place when goods enter a customs territory from one country and are shipped to another country without being modified.

7 Transshipment, or "goods in transit," includes merchandise that passes through ports but is not unloaded from the ship or aircraft.

8 The general trade system is in use when the statistical territory of a country coincides with its economic territory. The special trade system (strict definition) is in use when the statistical territory comprises only the free circulation area, that is, the area within which goods "may be disposed of without customs restriction." The special trade system (relaxed definition) is in use when (i) goods that enter a country for or leave it after inward processing and (ii) goods that enter or leave an industrial free zone are also recorded and included in international merchandise trade statistics based on the *International Merchandise Trade Statistics Concepts and Definitions.* United Nations. Series M, No. 52, Revision 2. See Eurostat (2009).

9 Using mirror trade data, Mahmood and Azhar (2001) hypothesized the presence of over-invoicing of exports in Pakistan due to the duty drawback incentive scheme. The study found that there is a strong presence of over-invoicing across various trade partners and products.

10 Javorcik and Narciso (2007) found that the discrepancy between the value of exports reported by Germany and the value of imports reported by Germany's trade partners is positively related to the level of tariffs in 8 out of 10 countries surveyed.

traded goods whose commodity descriptions or names are somewhat similar. Oftentimes, it is difficult to trace which side, importer or exporter, commits the error in misclassification, thereby making the discrepancies in trade statistics immeasurable and unpredictable.

Direction misclassification is associated with attributing the origin of traded goods to the wrong country. This problem is prominent in the case of re-exports or transshipments. For example, suppose that goods originating from Country A pass through Country B before reaching the final destination, Country C. The origin country (Country A) may record goods as exports to either Country B or C. Country C may record the goods as imports from either Country B or A. And the transit country (Country B) may record the goods as imports from Country A and exports to Country C, re-exports to Country C, or perhaps the transit country does not record anything at all. Again, even if there is a discrepancy, it is difficult to determine which country's customs office (A, B, or C) has the correct record.

Table 1: Causes of Discrepancies between Mirror Data

Factors	Causes	Change in Price and/or Quantity
Unavoidable factors	FOB–CIF difference • freight cost • insurance costs	Price
Structural differences between two customs offices	Coverage • differences in rules of origin (especially in the cases of re-export) • processing zone • returned goods	Quantity
	Time lag	Quantity
	Exchange rate	Price
Deliberate misreporting by traders and errors committed by customs offices	False declaration of value by traders	Quantity and Price
	False declaration of origin by traders	Quantity
	Commodity misclassification by customs	Quantity
	Direction misclassification by customs	Quantity

Source: Author's compilation.

Federico and Tena (1991) classified these factors into three groups—unavoidable factors, structural differences, and human errors and deliberate misreporting (Table 1). The CIF–FOB difference is classified as an unavoidable factor because the inclusion of freight costs in the import price, but not in the export price, is a factor in causing discrepancies. Second, structural differences include differences in coverage between the two customs offices, a time lag factor, and exchange rate fluctuations since these are associated with differences in the policy decisions of each customs office. Finally, human factors are also critical determinants of the discrepancy in mirror statistics. Deliberate misreporting by traders includes false declaration of both price and quantity

(and thus value). Traders face the incentive to manipulate goods classification as well as classification of origin and destination in order to avoid duties. Errors committed by customs offices are also critical and these fall under both direction misclassification and commodity misclassification.

2.2. Literature on the Comparison of Mirrors

The existing literature on the comparison of mirror statistics can be classified into two groups based on the type of data used. The first group of literature directly compares County X's CIF import from (FOB export to) Country Y against Country Y's FOB export to (CIF import from) Country X, both at the aggregate and bilateral levels. Using pre-World War II data of the major trading countries, Federico and Tena (1991) find that the total of a country's exports (imports) basically matches the total of its trade partners' imports from (exports to) that country.

However, the assessment of the total sum employed by Federico and Tena (1991) may disguise various discrepancies at the disaggregated level in terms of both directions and commodities (over-estimation and under-estimation) that cancel each other out at the aggregate level. Thus, there is a possibility that the discrepancy at the total level would be small even when there are large discrepancies observable at the disaggregated level. Accordingly, Makhoul and Otterstorm (1998) calculated the discrepancies of an over-estimation group and that of an under-estimation group separately, and checked if the satisfactory result at the aggregated level is due to canceling out effects. Their conclusion is that these effects are large and the discrepancy between mirrors is significant at the disaggregated level.

Meanwhile, Yeats (1995) compared developing countries' total export–import values against the sum of the rest of the world's import–export values through trade with them. He finds that the mirror method is inadequate in estimating the missing trade data of developing countries; this is especially true at the disaggregated level. This finding is important because the discrepancy is large even at the aggregate level (of all trade partners), where we can otherwise ignore direction factors, implying that a miscoding of data is persistent.

The weakness of the first group of literature is that it is difficult to separate discrepancies caused by reasonable factors such as transport costs from the so-called noise, which includes discrepancies associated with human errors such as misclassifications. Accordingly, this group of literature tends to focus on whether the discrepancy is large or small. It simply measures the size of discrepancies and then lists down possible factors to explain the discrepancies without analyzing the impact of each factor. The literature seldom discusses whether the discrepancy is caused by reasonable CIF–FOB factors or other reasons, despite the fact that the discrepancy between the two sides of the mirror data stems not only from price factors, including the CIF–FOB difference, but also because quantities are different. So long as we compare only CIF import values and FOB export values compiled by different customs offices, separating the two (CIF–FOB factor and other factors) will remain extremely difficult.

Several customs offices collect, compile, and release import data on a FOB basis in addition to a CIF basis.[11] The FOB import data is said to be a more accurate partner of CIF import data, as opposed to the mirror data, because they originate from the same customs office. Using FOB import data, we can conduct a better analysis on the quality of a trade partner's FOB export data. The fundamental problem of the first group of literature (reasonable price factor versus others) can thus be solved to a degree because the difference between CIF and FOB import values from one customs office approximates transport costs.[12]

Employing matched US and partner country trade data, Yeats (1978) attempted to separate the observed variations in FOB export–CIF import statistics into freight costs and discrepancies caused by other factors (residual) using FOB import data.[13] He finds that the residual becomes larger and the discrepancy of the mirror becomes significant when we use lower digit commodity-level data. This implies that commodity misclassification is a serious problem in customs offices in developing countries.

Hummels and Lugovskyy (2006) compare the two kinds of discrepancies: (i) the discrepancy between CIF-based bilateral imports and FOB-based bilateral imports, and (ii) the discrepancy between CIF-based bilateral imports collected by the import side and FOB-based bilateral exports collected by the exporting side. Their conclusion is that the discrepancy between matched partner trade statistics (a certain country's CIF-based imports and its partner's FOB-based exports) is significant and includes not only trade or transport costs but also various noises associated with structural factors as well as human factors.

The fundamental methodological problem common to both groups of literature is that based on a single bilateral mirror comparison, we cannot conclude which customs office, whether the exporting or the importing side, is the source of the discrepancy. Ultimately, it is difficult to assert which side of the statistics is inaccurate. Even if some studies were able to establish that a discrepancy that is not caused by reasonable factors, such as transport costs, is significant, we cannot conclude which side produced such a discrepancy. This is because the existing literature's focus is limited to bilateral comparisons. A method to overcome this problem will be explained in the next section.

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11 These include the US, Australia, New Zealand, Brazil, and Chile.

12 Using FOB and CIF import data released by the same customs office, researchers can concentrate on the FOB–CIF difference and examine trade or transport costs, and ignore quantity discrepancies when using data from one source only. However, this type of study may no longer be called mirror analysis because the trade data being used is compiled by only one customs office. It has been stated that the FOB–CIF difference becomes large when the goods being traded are heavy and when the distance between the two trade partners is great. Nevertheless, a large portion of the difference still remains insufficiently explained (Pomfret and Sourdin 2009).

13 Freight costs can be calculated as the difference between FOB-based export data and CIF-based import data (both data are collected by the US). The difference between the FOB export–CIF import variation and the calculated freight cost is the residual.

3. Methodology of Multiple Mirror Comparison

This paper assesses the quality of trade statistics by comparing a test country's trade data against its trade partners' data. Countries that publish FOB-based import data do not necessarily provide us with an ideal benchmark to test the quality of Cambodian trade statistics for several reasons.[14] This study belongs to the first group of literature explained in the previous section. Accordingly, it has an inherent methodological problem. That is, the discrepancy between the mirrors also includes the variation caused by reasonable factors, such as the CIF–FOB gap. In order to avoid this problem, the study focuses on commodity groups that have *significantly* large discrepancies that cannot be attributed solely to price factors.

As we have seen, we cannot conclude which side's statistics (importer or exporter) are inaccurate, even if we are able to establish that the discrepancy is large, so long as the analysis is limited to a single bilateral mirror comparison. A single bilateral mirror comparison, which is common in the existing literature, does not tell us much about the manner in which misclassifications are committed. In order to overcome this, we need to compare the results of various bilateral mirror analyses of trade statistics (multiple mirrors comparison).

This section first explains the definition of the import–export ratio and two concepts of asymmetric commodity groups. It then discusses methodologies to assess direction and commodity misclassifications through the multiple mirror technique.

3.1. Definition of Discrepancy and Asymmetric Commodity Groups

3.1.1. Measurement of Discrepancy: Import–Export Ratio

In order to assess the size of the discrepancy between the two sides of the mirror, we will use the import–export ratio as defined below.

> Import–Export Ratio (aggregate level) = Aggregate import-side data/Aggregate export- side data
>
> Import–Export Ratio of tariff line α (2-digit) = Import-side data in digit α/Export-side data in digit α

The term "positive discrepancy" refers to the case where the import-side data is larger than the export-side data by more than 10%. "Negative discrepancy" refers to the case where the import-side data is smaller than export-side data, or the import-side exceeds the export-side by less than 10%. In other words, positive (negative) discrepancy is used when the import–export ratio is higher (lower) than 1.10, which represents the CIF–FOB gap.

[14] One reason is that the accuracy of data on trade between Cambodia and its trade partners as reported in those partners' statistics is questionable due to geographic location.

3.1.2. Two Types of Asymmetric Commodity Groups

The analysis at the 2-digit level focuses on asymmetric commodity groups wherein the export–import data compiled by the customs office of one side is significantly different from the import–export data compiled by the customs office of the other side. There are two types of asymmetric commodity groups: "no reported data on one side" and "extremely large discrepancy," which can either be positive or negative.

No reported data on one side of the mirror. We consider this an important indicator of misclassification regardless of the size of the figure on the other side because "no data" implies that the customs office either did not record the trade transaction or recorded the transaction but under a different commodity classification than that of the partner. The lack of reported export (import) on only one side of the mirror reflects possible misclassification. That is, the goods could have been accounted for by the customs office but were possibly classified under commodity codes different from the commodity codes under which the partner recorded such goods.

Extremely large discrepancy. Tariff lines or commodities that satisfy the two conditions detailed below are regarded as asymmetric tariff lines with an extremely large discrepancy. First, the 2-digit level discrepancy ratio (see formula above) should either be higher than 2.0 or lower than 0.5. Taking into account the acceptable level of discrepancy attributed to the CIF–FOB factor discussed above (imports exceed exports by 10% or more), a ratio of more than 2.0 and less than 0.5 can be considered significant. Second, we introduce the concept of the absolute size of discrepancy and regard the tariff line as asymmetric between the two sides of the mirror when the discrepancy is greater than a certain threshold, which changes depending on the size of trade. In order to calculate the threshold for each 2-digit commodity code, we first calculate the average aggregate bilateral trade value using both sides of the mirror data.[15] Based on this averaged aggregate bilateral trade value, we compute a theoretically reasonable value of trade at each 2-digit level, which is 1% of aggregate bilateral trade.[16] The threshold employed is 10% of this theoretically reasonable amount of each 2-digit commodity.[17] In short, when the import–export ratio is higher than 2.0 or lower than 0.5, and the absolute difference is larger than the threshold mentioned above, we regard that such a commodity group has an extremely large discrepancy.

Averaged bilateral trade at the aggregate level
= A test country's aggregate trade with a partner + the partner's aggregate trade with a test country / 2

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15 For example, when Country A's imports from Country B are USD45 trillion (Country A's data) and Country B's exports to Country A are USD55 trillion (Country B data), the average value of the aggregate bilateral trade becomes USD50 trillion.

16 1% is used because there are roughly 100 2-digit commodity groups. While there are actually 97 groups and 1 group that includes goods not classified elsewhere (No. 99), 1% is used for ease of calculation. In the above example, the theoretically reasonable amount of each 2-digit trade volume is USD500 million.

17 10% is used because the discrepancy within 10% should be considered normal given the CIF–FOB factor. In the above mentioned example, the 2-digit tariff line with a discrepancy of over USD50 million is caught by this threshold.

Threshold = (Average bilateral trade at the aggregate level) * (.01) * (0.10)

Absolute Difference = import-side data in digit α – export-side data in digit α

3.2. Methodology to Assess Direction Misclassifications

The multiple mirror comparison is especially helpful in examining direction misclassification committed by the customs office of one side. For example, if a test country's export data to Country A for Commodity X is much larger than its mirror, we cannot make a definitive argument on which side is inaccurate. However, when a test country's export data to Country A for Commodity X is much larger than its mirror, and at the same time, a test country's export data to Country B for Commodity X is much smaller than its mirror, there is a strong possibility that the test country erroneously recorded its Commodity X exports to Country B (the actual destination) as exports to Country A instead.

In short, we first need to identify Country A and Country B, and then identify Commodity X. Accordingly, the assessment of direction misclassification by the multiple mirror technique involves two steps.

Step 1. Compare a test country's bilateral trade data with its major partners' bilateral trade statistics at the aggregate level and identify a seeming set of false and actual destination countries whose trade with the test country generates discrepancies in opposing directions (positive and negative discrepancies).

Step 2. Compare a test country's bilateral trade with a possible false-origin destination and a test country's bilateral trade with a possible actual origin or destination at the 2-digit commodity level and examine whether there are common asymmetric commodity groups with discrepancies in different directions.[18]

3.3. Methodology to Assess Commodity Misclassifications

The multiple mirror comparison is also useful to examine commodity misclassification. If a test country has a record of Commodity X export but not Commodity X' export to Country A, while country A has a record of Commodity X' import but not Commodity X import from the test country, it is difficult to conclude which customs office (the test country's or that of Country A) has committed commodity misclassification. However, if a test country has a record of Commodity X export but not Commodity X' export to both Country A and B, while both Country A and B have a record of Commodity X' import but not Commodity X import from the test country, we can infer that commodity misclassification is likely to be committed by the test country.

[18] If a certain transit country has a negative discrepancy when compared with a test country while the supposed actual destination has a positive discrepancy, it is inferred that the destination of goods are misclassified.

In short, we should first identify Commodity X and X', then examine how trade partners (Country A and Country B) classify Commodity X or X'. Accordingly, the assessment of commodity misclassification by the multiple mirror technique involves two steps.

Step 1. Compare the discrepancy between a test country's exports or imports to or from the rest of the world and the rest of the world's imports or exports from or to a test country at the commodity level. Then, identify asymmetric commodity groups and find a set of similar asymmetric commodity groups with discrepancies in opposing directions (negative vs. positive).

Step 2. Examine if all major trade partners simultaneously classify the concerned traded goods in a different manner than a test country.

3.4. Data Source

The study uses data from the United Nations Commodity Trade Statistics Database (UN Comtrade) because of the database's comprehensiveness. Trade value data in United States (US) dollars at the aggregate and 2-digit levels are used. Although it would be ideal to use trade volume data, given that trade value is influenced by the CIF–FOB factor since exports are reported in FOB while imports are reported in CIF, trade value is the only available data at the aggregate level. HS 2002-based figures are used for 2000–2004 and 2008 because these were the only available data in the UN Comtrade database.

Although all countries have export and import data to and from the rest of the world (total exports and imports), there is no readily available mirror data compiled by a single authority. However, comparing one country's total exports and imports with its mirror is very helpful in understanding the overall quality of that country's trade statistics. Therefore, we use the aggregate import–export data of all countries (other than the concerned country) included in the UN Comtrade database to produce the mirror data for the concerned country.

4. Examination of Cambodia's Export Statistics

The quality of data on Cambodia's total exports to the world appears to be good. The import–export ratios for each year in 2000–2004 and 2008 range around 1.1 **(Table 2)**. This implies that the overall quality of Cambodia's export data is acceptable, while there may be some problems at the disaggregated level.

4.1. Possible Direction Misclassifications among Cambodia's Exports

Cambodia's exports to major trade partners at the aggregate level. Cambodia's important export partners in 2008 are examined in the analysis to investigate the possibility of direction misclassification. Despite the fact that the overall quality of Cambodia's aggregate export data is acceptable, the import–export ratios of Cambodia's

exports for each trade partner are either significantly higher or lower than 1.1 (Table 3). This implies serious direction misclassifications in Cambodia's export statistics.

Table 2: Cambodia's Total Exports, 2000–2004 and 2008 ($ million)

	Partner's Data (Rest of World's Imports) A	Cambodia's Data (Cambodia's Exports) B	Discrepancy (A-B)	Import–Export Ratio (A/B)
2000	1,521	1,390	131	1.09
2001	1,766	1,499	267	1.18
2002	2,006	1,923	83	1.04
2003	2,379	2,118	260	1.12
2004	2,945	2,798	147	1.05
2008	4,916	4,358	558	1.13

Source: UN Comtrade database.

Table 3: Cambodia's Exports to its Major Trade Partners, 2008 ($ million)

Trade Partner	Partners' Imports A	Cambodia's Exports B	Average Data (A+B)/2	Discrepancy (A-B)	Import–Export Ratio (A/B)
US	2,546	1,970	2,258	576	1.29
Hong Kong, China	10	841	425	–831	0.01
Germany	411	138	274	272	2.97
Canada	253	291	272	-39	0.87
UK	275	156	216	119	1.77
Viet Nam	214	171	193	43	1.25
Spain	177	124	151	53	1.43
Singapore	117	114	115	3	1.03
Netherlands	32	152	92	–121	0.21
France	121	34	78	87	3.54
Japan	121	32	77	89	3.77
Belgium	62	51	57	11	1.22
Thailand	90	14	52	77	6.66
PRC	39	13	26	26	3.00

PRC = People's Republic of China, UK = United Kingdom, US = United States.
Source: UN Comtrade database.

Countries with which Cambodia has import–export ratios much lower than 1.1 (i.e., Cambodia's exports to these trade partners are larger than those partners' imports from Cambodia) are Hong Kong, China and the Netherlands, which both have large transit ports. Hong Kong, China has the lowest ratio, which means that Cambodia's exports to Hong Kong, China are significantly larger than Hong Kong, China's imports from Cambodia. This huge discrepancy between Cambodian exports to Hong Kong, China and Hong Kong, China's imports from Cambodia is likely due to the fact that Hong Kong, China is not a transit port for a single destination but is a transit port for a number of destinations such as the People's Republic of China (PRC), Japan, and the US, which all have ratios greater than 1.1 (i.e., Cambodia's exports to these trade partners are smaller than these partners' imports from Cambodia). Similarly, given the fact that the import–export ratios of Cambodia's exports to neighboring countries of the Netherlands—such as France, Germany, and the United Kingdom (UK)—are much higher than 1.1, we can infer that Cambodia possibly misclassifies some exports to France, Germany, and the UK as exports to the Netherlands.

Cambodia's exports to Hong Kong, China and the US, Japan, and the PRC at the 2-digit commodity level. As observed above, there is a possible direction misclassification wherein some Cambodian exports to destinations such as the US, Japan, and the PRC are misclassified as exports to Hong Kong, China, which is a transit port for Cambodia's exports to all three of those destinations.

Table 4 summarizes the asymmetric commodity groups between Cambodia and its major trade partners. While the Cambodian data show that in 2008 there were large amounts of exports to Hong Kong, China in HS 07, 40, 49, 59, 65, and 90, the Hong Kong, China data for the same year show that there were no or few imports from Cambodia in such commodities. However, it is difficult to conclude which side committed direction misclassification if we focus solely on bilateral mirror comparison between Cambodia and Hong Kong, China.

Table 4: Cambodia's Trade with Hong Kong, China; the United States; Japan; and the People's Republic of China

		2000	2001	2002	2003	2004	2008
Asymmetric groups in Cambodia's exports to Hong Kong, China	No Data on One SideCambodia's exports to Hong Kong, China not reported by Hong Kong, China as imports from Cambodia	10, 24, 34, 42, 49, 64, 82	07, 10, 49, 56, 97	07, 42, 49, 63. 74, 78, 82, 90	07, 40, 42, 49, 73, 85, 97	30, 34, 40, 42, 59, 73, 83, 86, 90, 94, 95, 97	07, 40, 59, 65, 90

		2000	2001	2002	2003	2004	2008
	Negative Discrepancy Cambodia's exports to Hong Kong, China are greater than Hong Kong, China's imports from Cambodia	55	55	55	55	49	49
Asymmetric groups in Cambodia's exports to US	No Data on One SideUS imports from Cambodia not reported by Cambodia as exports to the US	12, 17, 34, 53, 58, 66, 67, 68, 71, 74, 90, 91, 95	5, 29, 34, 37, 40, 44, 48, 52, 67, 71, 74, 96	9, 16, 21, 33, 34, 44, 52, 57, 67, 69, 71, 73, 88, 91, 95	16, 20, 33, 34, 52, 54, 67, 68, 69, 71, 73, 95	12, 16, 33, 40, 52, 54, 57, 60, 64, 68, 71, 95	32, 46, 50, 52, 56, 67 91
	Positive Discrepancy Cambodia's exports to the US are smaller than US imports from Cambodia	54, 62, 97, 99	54, 62	62	39, 62	39, 62	39, 62, 63
Asymmetric groups in Cambodia's exports to Japan	No Data on One Side Japan's imports from Cambodia not reported by Cambodia as exports to Japan	06, 16, 18, 42, 49, 63, 68, 95	39, 42, 59, 71	16, 41, 42, 68, 74, 83, 95	71, 50, 65, 68, 55	09, 41, 57, 63, 68, 95	40, 44, 49, 52, 63, 65, 71, 72, 94
	Positive Discrepancy Cambodia's exports to Japan are less than Japan's imports from Cambodia	43, 64, 94, 99	03, 29, 41, 44, 62, 64, 94	03, 44, 62, 64, 99	03, 44, 62, 64, 99	03, 62, 64, 99	62, 64, 99
Asymmetric groups in Cambodia's exports to the PRC	No Data on One Side The PRC's imports from Cambodia not reported by Cambodia as exports to the PRC	08, 12, 46, 49, 50, 54, 56, 61, 62, 73, 74, 91	01, 08, 48, 52, 69	08, 40, 53, 54, 67, 90, 91, 94	03, 14, 33, 67	11, 33, 38, 41, 42, 49, 51, 53, 87, 94	10, 12, 22, 28, 33, 54, 56, 66, 68, 69, 72, 74, 83, 90, 94, 95
	Positive Discrepancy Cambodia's exports to the PRC are smaller than the PRC's imports from Cambodia	01, 40, 44	40, 44	44, 62, 64	40, 44, 52	03, 40, 44, 52, 54, 62	01,03, 40,44, 52,62, 64, 67

PRC = People's Republic of China; UK = United Kingdom; US = United States.
Source: UN Comtrade database.

In 2008, most commodity groups in which Cambodia exported relatively large quantities of to Hong Kong, China, while Hong Kong, China's statistics showed no such imports from Cambodia, were the same commodities that Cambodia had no recorded exports of to the US, Japan, and the PRC. Furthermore, the data from the US, Japan, and the PRC show that there were such imports from Cambodia. For example, while the Cambodian data show that there were no exports of HS 40 and 65 to Japan, the Japanese data show that there were HS 40 and 65 imports from Cambodia. Likewise, while the Cambodian data show that there were no exports of HS 90 to the PRC, the PRC's data show that there were HS 90 imports from Cambodia. Together with the fact that the Cambodian data show that there were HS 40, 65, and 90 exports to Hong Kong, China, but the Hong Kong, China data show that there are no such imports from Cambodia, it is reasonable to infer that Cambodia's direction classification with regard to HS 40, 65, and 90 is inaccurate, rather than considering that Hong Kong, China; the PRC; and Japan all committed similar misclassifications. While the commodity groups indicating direction misclassification were different in 2000–2004, similar patterns can be observed in the data in terms of the countries involved.

4.2. Possible Commodity Misclassifications among Cambodia's Exports

Cambodia's exports by major commodity group at the aggregate level. Despite the fact that the overall quality of Cambodia's total export data is acceptable, misclassifications seem to be prevalent within individual commodity groups. Table 5 presents asymmetric commodity groups in Cambodia's exports to the world against the world's imports from Cambodia. There are several commodity groups that continuously appear as asymmetric (see commodities underlined in Table 5).

At a glance, we cannot confirm any improvement in commodity misclassifications in recent years. The number of asymmetric commodity groups has not changed much. While there were 29 asymmetric commodity groups in 2000 (16 "no data on one side" groups and 13 "large discrepancy" groups), there were 30 asymmetric commodity groups in 2008 (12 "no data on one side" groups and 18 "large discrepancy" groups).

On wood-related items, Cambodia's exports to the rest of the world were consistently smaller than the rest of the world's imports from Cambodia in terms of HS 44 (wood and articles of wood, wood charcoal). On the other hand, in terms of HS 94 (furniture, lighting, signs, prefabricated buildings), Cambodia's exports to the rest of the world were consistently larger than the rest of the world's imports from Cambodia. Given the similarity between the two groups, it can be inferred that Cambodia may have misclassified exports in HS 44 as exports in HS 94. This implies that while Cambodian customs officials considered its exports as final products (HS 94), importing countries regarded them as raw or intermediate products (HS 44).

Table 5: Asymmetric Commodity Groups in Cambodia's Trade with the Rest of the World

		2000	2001	2002	2003	2004	2008
Asymmetric groups where Cambodia's export data appear less than the rest of the world's import data	No Data on One Side *World's imports from Cambodia not reported by Cambodia as exports to the World*	15, 16, 17, 18, 26, 32, 45, 53, 57, 67, 75, 91, 93	16, 18, 20, 36, 51, 75	2, 13, 18, 23, 29, 35, 53, 59, 66, 91	16, 17, 19, 51, 53, 59, 78, 80	05, 06, 13, 31, 36, 43, 45, 51, 53, 81, 92	02, 13, 16, 18, 29, 35, 38, 66, 81, 86
	Positive Discrepancy *Cambodia's exports to the World are smaller than World's imports from Cambodia*	03, 08, 49, 62, 64, 72, 85, 97, 99	03, 41, 44, 52, 54, 62, 64, 72, 85, 89, 99	41, 44, 52, 62, 64	03, 08, 12, 15, 39, 44, 52, 62, 64, 72, 89	08, 16, 27, 44, 52, 62, 64, 72, 89	01, 03, 07, 08, 10, 12, 39, 40, 44, 62, 63, 64, 72, 74, 76
Asymmetric groups where Cambodia's export data appear greater than the rest of the world's import data	No Data on One Side *Cambodian exports to the World not reported by the World as imports from Cambodia*	23, 31, 35	17, 26, 31, 35, 79	05, 31	02, 23, 31, 79, 86	67, 86	26, 53
	Negative Discrepancy *Cambodia's exports are larger than the world's imports from Cambodia*	24, 44, 55, 60,	24, 49, 55, 84	49, 55, 84, 87, 94	49, 55, 84, 87, 90	49, 55, 84, 87, 94, 97	49, 89, 94

Source: UN Comtrade database.

With garment-related items, Cambodia's exports to the rest of the world were consistently smaller than the rest of the world's imports from Cambodia in terms of HS 52 (cotton), HS 62 (articles of apparel and clothing accessories, not knit or crochet), 64 (footwear, gaiters, and parts of such articles). On the other hand, in terms of HS 55 (man-made staple fibers), Cambodia's exports to the rest of the world were consistently larger than the world's imports from Cambodia. Given the similarity between the two groups, it can be inferred that Cambodia may have misclassified exports in HS 52, 62, and 64 as exports in HS 55. Given that Cambodia seems to commit a similar commodity

misclassification on the import side (see Section 5.2 for more detail), there is a high probability that exports in HS 52 were mistaken as exports in HS 55 by Cambodian customs officials. If this was the case, the situation is similar to the wood-related products mentioned above; while Cambodian customs officials considered these exports to be intermediate products (HS 55), importing countries regarded them as raw materials (HS 52).

Cambodia's exports by major commodity groups at the bilateral level. The analysis above, however, does not unambiguously indicate which customs office's commodity classification is inaccurate. If we look at various bilateral mirror analyses, we can have a better idea of which party committed the commodity misclassification. For example, trade statistics from the US, Japan, and the PRC all show that they have a large volume of HS 44 imports from Cambodia (see commodities in shadow in Table 4). It is reasonable to infer that Cambodia's commodity classification was inaccurate—wood-related exports are incorrectly recorded as HS 94 instead of HS 44—rather than considering that the US, Japan, and the PRC simultaneously committed the same commodity misclassification.

In a similar vein, all three countries' trade statistics show that they had a large volume of HS 52 imports from Cambodia. It is also reasonable to infer in this instance that Cambodia's commodity classification was inaccurate (garment-related exports are incorrectly recorded as HS 55 instead of HS 52), rather than considering that the US, Japan, and the PRC simultaneously committed the same commodity misclassification.

5. Examination of Cambodia's Import Statistics

As far as Cambodia's total imports from the world are concerned, the data quality appears to be poor. The import–export ratios fell significantly below 1.1 in 2000–2004 and 2008 (Table 6). There should be concern over the quality of Cambodia's import data, especially since import data are used for purposes of tariff revenue collection, taxes, trade agreements, and other regulatory controls. Thus, the data should be accurate and reliable. Moreover, there is a clear declining trend in the import–export ratios. This implies that over time either the difference between Cambodia's imports and its partners' exports expanded or the mismatch in the data worsened. From the trade and domestic policy perspective, this sketch of data quality calls for improvements in data reporting. A smaller import value compared with a partner's export value implies that some imports were inaccurately recorded due to, for example, issues of corruption.

5.1. Possible Direction Misclassifications among Cambodia's Imports

Cambodia's imports from major trade partners at the aggregate level. Cambodia's major import partners in 2008 were examined to investigate possible direction misclassification. The import–export ratios of Cambodia's import from each partner were lower than 1.1 for all of its trade partners with the exception of the US, which confirms the finding at the aggregate level that Cambodia's import data quality is a cause of concern (Table 7).

Table 6: Cambodia's Total Imports ($ million)

	Cambodia's Imports A	Rest of the World's Exports B	Discrepancy (A-B)	Import–Export Ratio (A/B)
2000	1,439	1,795	–356	0.80
2001	1,507	1,895	–388	0.80
2002	1,667	2,139	–471	0.78
2003	1,775	2,471	–696	0.72
2004	2,063	2,991	–928	0.69
2008	4,417	6,742	–2,325	0.66

Source: UN Comtrade database.

Table 7: Cambodia's Imports from Major Trade Partners, 2008 ($ million)

	Cambodia's Imports A	Trade Partners' Exports B	Average Data (A+B)/2	Discrepancy (A-B)	Import–Export Ratio (A/B)
Thailand	697	2014	1,355	–1317	0.35
PRC	933	1096	1,014	–162	0.85
Viet Nam	472	1532	1,002	–1060	0.31
Hong Kong, China	588	609	599	–20	0.97
Rep. of Korea	229	294	412	–65	0.78
US	220	154	262	–66	1.43
Malaysia	122	165	187	–43	0.74
Singapore	304	520	183	–217	0.58
Indonesia	96	174	149	–78	0.55
Japan	114	184	61	–70	0.62
India	89	54	48	–49	0.09

PRC = People's Republic of China, US = United States.
Source: UN Comtrade database.

The lowest import–export ratios occur with Thailand and Viet Nam. Given that these countries both share a land border with Cambodia, it is probable that the discrepancies were caused not by transit trade but by other reasons such as informal trade. For example, if Cambodian custom officials erroneously recorded goods from a third country as goods from a neighboring transit country, then the import–export ratio with such a transiting country would become much higher than 1.1.

On the other hand, the US has import–export ratios with Cambodia that are greater than 1.1, which means that Cambodia's imports from the US were significantly larger than US exports to Cambodia. Quite possibly, a third country's exports to Cambodia via the US were recorded as imports from the US by Cambodian customs, resulting in a large discrepancy in the import–export ratio. However, in reality, there is no reasonable scenario under which an origin country at a distance from Cambodia greater than that of the US would use US ports for transit purposes. Rather, this high ratio may be due to inaccuracies in the US data. Cambodia's imports from the US did pass through a transit port and the US recorded the goods as exports to the transit port rather than to Cambodia, resulting in Cambodia's imports from the US being larger than US exports to Cambodia. In addition, US exporters may have some incentive to misreport that goods were not exported to Cambodia.

Because the import–export ratio of Cambodia's total imports was very low in 2008 (0.66), we can say that the import–export ratios of almost all its trade partners have a downward bias. If we examine this downward bias, we can see that the ratios of two transit economies, namely, Hong Kong, China and the Republic of Korea, are relatively large. Given the geographical location of the Republic of Korea and the fact that Japan, which has a small import–export ratio even after taking into account the downward bias, we can infer that Cambodia's imports from Japan were in part misclassified as imports from the Republic of Korea.

Cambodia's imports from Japan and the Republic of Korea (Japan–Republic of Korea–Cambodia route) at the 2-digit commodity level. This section analyzes the Japan–Republic of Korea–Cambodia trade route, since the Republic of Korea seems to be a transit country for some of Cambodia's imports from Japan. Table 8 summarizes the asymmetric commodity groups between Cambodia and the Republic of Korea and Japan. While Cambodian data show that in 2000–2004 and 2008 there were imports from the Republic of Korea in HS 04, 10, 15, 18, 23, 40, 43, 55, 57, 66, 67, 76, 83, 89, 90, and 97, the Korean data for the same years show that there were no exports to Cambodia in HS 04, 10, 15, 18, 23, 43, 57, 66, 67, and 97, and only a small amount of exports from the Republic of Korea in HS 40, 55, and 89. Theoretically speaking, however, it is still difficult to conclude which side (Cambodia or the Republic of Korea) committed commodity misclassification if we only conduct a bilateral mirror comparison.

However, if we compare the mirror analysis between Cambodia and the Republic of Korea with the mirror analysis between Cambodia and Japan, more plausible inferences on the direction misclassification can be made. In Table 8, we observe that there are several commodity groups wherein Cambodia's imports from the Republic of Korea appear significantly larger than the Republic of Korea's exports to Cambodia. At the same time, Cambodia's imports of the same commodity groups from Japan appear significantly smaller than Japan's exports to Cambodia (see commodities underlined in Table 8). This implies that these commodity groups may have been misclassified by Cambodia as imports from the Republic of Korea rather than imports from Japan.

In 2008, most commodities that Cambodia's data showed as imported from the Republic of Korea in large quantities and the Republic of Korea's data showed either no or few such commodities being exported to Cambodia were the same commodities for which

Cambodia recorded either no or few imports from Japan while the Japanese data showed large quantities of such exports to Cambodia. More specifically, while the Cambodian data show that there were no or few imports in HS 15, 40, 55, and 89 from Japan, the Japanese data showed that there were larger quantities of these commodities exported to Cambodia. Accordingly, it is reasonable to infer that Cambodia erroneously recorded imports in HS 15, 40, 55, and 89 from Japan as imports from the Republic of Korea, rather than assuming that Japan and the Republic of Korea simultaneously committed misclassification.

Table 8: Japan–Republic of Korea–Cambodia Trade Route, 2000–2004 and 2008

		2000	2001	2002	2003	2004	2008
Asymmetric groups in Cambodia's imports from the Republic of Korea	No Data on One Side *Cambodia's imports from the Republic of Korea not reported by the Republic of Korea as exports to Cambodia*	16, 20, 21, 25, 27, 35, 45, 57, 70, 71, 74, 99	25, 27, 28, 35, 57, 67, 68, 69, 74, 88, 99	04, 07, 09, 11, 12, 20, 21, 25, 27, 35, 36, 42, 57, 64, 66, 69, 82, 86, 97, 99	11, 13, 21, 25, 42, 44, 45, 67, 68, 69, 99	09, 10, 11,12, 21, 31, 43, 57, 69, 78, 81, 99	04, 10, 15, 18, 23, 43, 57, 66, 67, 97
	Positive Discrepancy *Cambodia's imports from the Republic of Korea are greater than the Republic of Korea's exports to Cambodia*	42, 55,	55, 56	55, 96	55, 56	55	40, 55, 76, 83, 89, 90
Asymmetric groups in Cambodia's imports from Japan	No Data on One Side *Japan's exports to Cambodia not reported by Cambodia as imports from Japan*	52, 59, 67	06, 74			31	15, 22, 26, 78
	Negative Discrepancy *Cambodia's imports from Japan are less than Japan's exports to Cambodia*	10, 16, 69, 70, 82, 89, 95, 99	52, 89, 95, 99	16, 30, 52, 54, 59, 89, 99	30, 38, 52, 54, 56, 59, 76, 82, 89, 99	29, 54, 59, 89, 95, 99	29, 40, 54, 55, 84, 89, 95, 96, 99

Source: UN Comtrade database.

Table 9: Republic of Korea–Japan–Cambodia Trade Route, 2000–2004 and 2008

		2000	2001	2002	2003	2004	2008
Asymmetric groups in Cambodia's imports from Japan	No Data on One Side *Cambodia's imports from Japan not reported by Japan as exports to Cambodia*	03, 05, 07, 08, 09, 11, 12, 17, 19, 20, 24, 36, 41, 42, 61, 71, 74, 80, 81, 86, 91, 92	10, 12, 21, 24, 28, 33, 42, 45, 61, 62, 65, 66, 79, 80, 86, 92, 97	07, 12, 15, 19, 20, 21, 22, 24, 25, 26, 28, 31, 45, 46, 48, 58, 62, 65, 66, 67, 68, 71, 76, 86, 88, 91, 92	04, 05, 07, 09, 10, 14, 19, 20, 21, 22, 24, 31, 33, 37, 42, 46, 57, 58, 61, 65, 66, 67, 70, 74, 80, 81, 86, 91, 97	03, 04, 09, 11, 12, 16, 19, 20, 21, 22, 24, 25, 27, 28, 37, 42, 46, 57, 58, 65, 66, 67, 75, 86	04, 08, 10, 17, 19, 21, 24, 31, 33, 57, 61, 64, 66, 97
	Positive Discrepancy *Cambodia's imports from Japan are greater than Japan's exports to Cambodia*	37, 39, 48, 49, 90, 94	37, 38, 70, 82, 87, 90	49, 60, 72, 87, 90	39, 41, 44, 49, 55, 90	10, 55, 87, 96	56
Asymmetric groups in Cambodia's imports from the Republic of Korea	No Data on One Side *Republic of Korea's exports to Cambodia not reported by Cambodia as imports from the Republic of Korea*	24, 51, 89	24, 71, 53, 93	17, 51, 53, 89, 91, 92	50, 51, 89	35, 50, 51, 71, 74, 75, 89, 92	47, 53, 75, 80
	Negative Discrepancy *Cambodia's imports from the Republic of Korea are less than the Republic of Korea's exports to Cambodia*	33, 41, 52, 54, 58, 59, 60, 62, 64, 65, 73, 91	17, 33, 48, 52, 54, 58, 59, 60, 62, 65, 70, 85, 89, 91	41, 52, 54, 58, 59, 60, 62, 65, 72, 85, 90	33, 39, 41, 52, 54, 58, 59, 60, 65, 70, 90, 91,	24, 33, 39, 41, 52, 54, 49, 58, 62, 65, 70, 72, 84, 85, 90	19, 22, 24, 27, 29, 33, 35, 41, 44, 52, 56, 58, 60, 61, 62, 64, 94

Source: UN Comtrade database.

Cambodia's imports from the Republic of Korea and Japan (Republic of Korea–Japan–Cambodia route) at the 2-digit commodity level. The Republic of Korea–Japan–Cambodia route was also tested to determine whether commodity groups may

have been misclassified by Cambodia as imports from Japan rather than from the Republic of Korea. As shown in Table 9, there are a large number of commodity groups in which Cambodia's imports from Japan appear larger than Japan's exports to Cambodia. At the same time, Cambodia's imports from the Republic of Korea of the same commodity groups appear smaller than the Republic of Korea's exports to Cambodia (see commodities underlined).

In 2008, most commodities in which Cambodia had a relatively large amount of imports from Japan, while Japanese statistics showed no such exports to Cambodia, were the same commodities for which Cambodia recorded no imports from the Republic of Korea while the Republic of Korea did record such exports to Cambodia. Specifically, while the Cambodian data for 2008 show that there were no or few imports in HS 19, 24, 33, 56, 61, and 64 from the Republic of Korea, the Korean data show that there were exports of those commodities to Cambodia. Accordingly, it is reasonable to infer that Cambodia erroneously recorded imports in HS 19, 24, 33, 56, 61, and 64 from the Republic of Korea as imports from Japan, rather than considering that Japan and the Republic of Korea simultaneously committed misclassification.

In summary, there are commodity groups among Cambodia's imports from Japan that transit through the Republic of Korea and among its imports from the Republic of Korea that transit through Japan which were misclassified in both cases as imports from the transiting country. With the two effects potentially cancelling each other out, the extent of direction misclassification in Cambodia's imports from the Republic of Korea and Japan is not reflected at the aggregate level. Thus, the 2-digit level analysis in this section reveals that there are many commodity misclassifications that are not observable at the aggregate level.

5.2. Possible Commodity Misclassifications among Cambodia's Imports

Cambodia's imports by major commodity group at the aggregate level. This section examines Cambodia's commodity misclassification of imports from the rest of the world. Table 10 presents asymmetric commodity groups in Cambodia's imports from the rest of the world against the rest of the world's exports to Cambodia. There are several commodity groups that continuously appear as asymmetric (see commodities underlined in Table 10).

At a glance, it appears that the discrepancy at the 2-digit level deteriorated and the number of asymmetric commodity groups increased during the years under review (2000–2004 and 2008). While there were 28 asymmetric commodity groups in 2000 (3 "no data on one side" groups and 25 "large discrepancy" groups), there were 30 asymmetric commodity groups in 2008 (zero "no data on one side" groups and 30 "large discrepancy" groups). Over time, there has been a declining number of matches in terms of the classification of goods. In other words, Cambodia has continued to classify exports under codes that are different than the codes its trade partners use to classify such goods.

Table 10: Asymmetric Commodity Groups in Cambodia's Trade with the Rest of the World, 2000–2004 and 2008

		2000	2001	2002	2003	2004	2008
Asymmetric groups where Cambodia's import data appear greater than the rest of the world's export data	No Data on One Side *Cambodia's imports from the rest of the world not reported by the rest of the world as exports to Cambodia*	81		45	45, 81	47, 53	
	Positive Discrepancy *Cambodia's imports from the rest of the world are larger than the rest of the world's exports to Cambodia*	41, 49, 55, 62, 71	55, 62	55, 62	55, 62	28, 55, 59, 62	28, 49, 55, 59
Asymmetric groups where Cambodia's import data appear less than the rest of the world's export data	No Data on One Side *Rest of the world's exports to Cambodia not reported by Cambodia as imports from the rest of the world*	26, 75	26, 53	51	26, 47, 75		
	Negative Discrepancy *Cambodia's imports from the rest of the world are smaller than the rest of the world's exports to Cambodia*	03, 04, 15, 19, 20, 21, 22, 27, 32, 33, 34, 37, 51, 52, 53, 59, 61, 91, 95, 99	03, 04, 19, 20, 21, 22, 32, 33, 37, 51, 52, 54, 61, 68, 99	03, 04, 08, 12, 16, 19, 20, 21, 22, 31, 32, 33, 34, 37, 49, 52, 54, 59, 61, 64, 68, 71, 72, 89, 99	03, 04, 07, 08, 17, 19, 20, 21, 22, 31, 32, 33, 34, 37, 38, 39, 51, 52, 59, 61, 64, 72, 73, 82, 88, 89, 95, 99	04, 08, 16, 17, 19, 20, 21, 22, 31, 32, 33, 37, 38, 39, 40, 51, 52, 54, 56, 61, 64, 68, 69, 70, 72, 73, 85, 89, 95, 99	01, 03, 04, 08, 15, 16, 17, 19, 20, 21, 22, 27, 29, 31, 32, 33, 34, 39, 40, 52, 53, 54, 56, 61, 72, 73, 82, 83, 95, 99

Source: UN Comtrade database.

Other categories in which Cambodia's imports from the rest of the world were consistently smaller than the world's exports to Cambodia are HS 4 (dairy products, eggs, honey, edible animal products), commodity groups relating to food such as HS 19

(cereal, flour, starch, milk preparations and products), HS 20 (vegetables, fruits, nuts, food preparations), HS 21 (miscellaneous edible preparations), and HS 22 (beverages, spirits, vinegar); and commodity groups relating to chemicals such as HS 32 (tanning, dyeing extracts, tannins, derived pigments), HS 33 (essential oils, perfumes, cosmetics, toiletries), HS 34 (soaps, lubricants, waxes, candles, modeling pastes), HS 37 (photographic or cinematographic goods) and HS 95 (toys, games, sports requisites).

Cambodia's imports by major commodity group at the bilateral level. The analysis above, however, does not unambiguously indicate that the commodity misclassifications were indeed committed by Cambodian customs officials. If we look at various bilateral mirror analyses, we can have a better idea of which party committed commodity misclassification. As we have already stated, HS 51, 52, and 59 are the commodity groups in which Cambodia had no or few imports from the rest of the world in 2000–2004 and 2008, while there were large amounts of exports to Cambodia from the rest of the world in these years. Meanwhile, the lower halves of Tables 8 and 9 display the commodity groups in which the Cambodian data show there are no or few imports from Japan and the Republic of Korea, while the Japanese and Korean data show a high volume of exports to Cambodia (see commodities in shadow in Tables 8 and 9). Interestingly, both the Japanese and Korean data suggest that they exported a large amount of items under HS 52 and 59. Accordingly, it is reasonable to infer that Cambodia's commodity classification was inaccurate, with Cambodia's garment-related imports being incorrectly recorded as HS 55 and 62 instead of HS 51, 52, and 59, rather than considering that Japan and the Republic of Korea simultaneously committed the same commodity misclassification.

6. Conclusion

This study questioned the accuracy of trade statistics and whether the observed discrepancies stem from two types of misclassification: commodity misclassification and direction misclassification. It examined the magnitude of the two misclassification problems in the trade data by using the mirror statistics. The fundamental methodological problem common in the existing literature on mirror analysis is that we cannot conclude which customs office, whether the exporting or the importing side, is the source of a discrepancy, particularly since the analysis is limited to a bilateral comparison of trade partner statistics. In order to overcome this, we need to compare the results of a bilateral mirror comparison with another bilateral mirror comparison's results. By using a multiple mirror technique to compare discrepancies, this paper carefully examined which (i) products were misclassified under similar (but ultimately different) products, and (ii) goods to or from a country were misclassified as goods to or from another country.

While the discrepancies among Cambodia's export data against the sum of all of its trade partners' import data are small at the total level, there are serious misclassifications with regard to both direction and commodity type at the disaggregated level. While Cambodian statistics show that there were large amounts of exports to Hong Kong, China in several commodities in 2000–2004 and 2008, the statistics from Hong Kong, China indicate no such imports. Interestingly, while Cambodia's data do not show

that there were exports of those same commodities to the US, Japan, and the PRC, those countries' statistics indicate that there were imports of those commodities from Cambodia. Thus, it is reasonable to infer that there has been direction misclassification in Cambodia's export data. Cambodia's export data also has commodity misclassifications. While the Cambodian statistics say that there were HS 94 exports (furniture, lighting, signs, prefabricated buildings) but no HS 44 exports (wood and articles of wood, wood charcoal) exports in 2000–2004 and 2008, all of its major training partners' statistics indicate HS 44 imports from Cambodia but no HS 94 imports.

The overall quality of Cambodia's import data is much worse than its export data. The total of Cambodia's imports was only about half the sum of its trade partners' exports to Cambodia in 2000–2004 and 2008, even when considering the CIF–FOB difference. Thus, in addition to misclassifications, there are other factors that contribute to the deterioration of the quality of import statistics such as smuggling. It is reasonable to consider that the quality of import data is worse than export data because the former is directly related to tariff revenue. It is probable that the magnitude of direction misclassification is considerable. In the case of trade from the Republic of Korea and Japan, goods coming from Japan were often classified as imports from the Republic of Korea and vice versa. (The trade statistics of Japan and the Republic of Korea are consistent with each other). Thus, there is substantial direction misclassification, which is not reflected at the aggregate level. Commodity misclassification problems are also present in Cambodia's import data. A number of Cambodia's trade partners' statistics indicate that there were exports to Cambodia in HS 51 (wool, animal hair, horsehair yarn and fabric thereof), 52 (cotton), and 59 (impregnated, coated, or laminated textile fabric), rather than in HS 55 (manmade staple fibers) or 62 (articles of apparel, accessories, not knit or crochet), while the Cambodian data shows the latter is the case.

Finally, improving the quality of trade statistics has practical importance for all countries, especially LDCs such as Cambodia. One potential way to improve data collection and compilation is by engaging in technical assistance from international organizations specializing in customs administration, such as the World Customs Organization (WCO), for the recording of goods using the HS classification system. Cambodia can also consider the quality dimensions set out in the IMF's Data Quality Assessment Framework, which identifies quality-related features of the governance of statistical systems, processes, and products. The quality dimensions include assurance of integrity, methodological soundness, accuracy and reliability, serviceability, and accessibility (IMF 2003).[19] International institutions specializing in economic monitoring such as the Asian Development Bank (ADB) and Association of Southeast Asian Nations (ASEAN) can also assist in the development of data reporting systems.

[19] While Cambodia is not a member, the principles set out in the European Statistics Code of Practice adopted by the Statistical Programme Committee of the European Council in 2005 are also useful in improving the quality of statistics. The Code is a set of guidelines that Cambodia can use to improve the quality of its trade statistics. The principles include professional independence, mandate for data collection, adequacy of resources, quality commitment, statistical confidentiality, impartiality and objectivity, sound methodology, appropriate statistical procedures, non-excessive burden on respondents, cost effectiveness, relevance, accuracy and reliability, timeliness and punctuality, coherence and comparability, and accessibility and clarity (European Statistics Code of Practice 2005).

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Appendix: HS Codes and Commodity Descriptions

01	Live animals	50	Silk
02	Meat and edible meat offal	51	Wool, animal hair, horsehair yarn and fabric thereof
03	Fish, crustaceans, molluscs, aquatic invertebrates nes	52	Cotton
04	Dairy products, eggs, honey, edible animal product nes	53	Vegetable textile fibres nes, paper yarn, woven fabric
05	Products of animal origin, nes	54	Manmade filaments
06	Live trees, plants, bulbs, roots, cut flowers etc	55	Manmade staple fibres
07	Edible vegetables and certain roots and tubers	56	Wadding, felt, nonwovens, yarns, twine, cordage, etc
08	Edible fruit, nuts, peel of citrus fruit, melons	57	Carpets and other textile floor coverings
09	Coffee, tea, mate and spices	58	Special woven or tufted fabric, lace, tapestry etc
10	Cereals	59	Impregnated, coated or laminated textile fabric
11	Milling products, malt, starches, inulin, wheat gluten	60	Knitted or crocheted fabric
12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	61	Articles of apparel, accessories, knit or crochet
13	Lac, gums, resins, vegetable saps and extracts nes	62	Articles of apparel, accessories, not knit or crochet
14	Vegetable plaiting materials, vegetable products nes	63	Other made textile articles, sets, worn clothing etc
15	Animal or vegetable fats and oils, cleavage products, etc	64	Footwear, gaiters and the like, parts thereof
16	Meat, fish and seafood food preparations nes	65	Headgear and parts thereof
17	Sugars and sugar confectionery	66	Umbrellas, walking-sticks, seat-sticks, whips, etc
18	Cocoa and cocoa preparations	67	Bird skin, feathers, artificial flowers, human hair
19	Cereal, flour, starch, milk preparations and products	68	Stone, plaster, cement, asbestos, mica, etc articles
20	Vegetable, fruit, nut, etc food preparations	69	Ceramic products
21	Miscellaneous edible preparations	70	Glass and glassware
22	Beverages, spirits and vinegar	71	Pearls, precious stones, metals, coins, etc
23	Residues, wastes of food industry, animal fodder	72	Iron and steel
24	Tobacco and manufactured tobacco substitutes	73	Articles of iron or steel
25	Salt, sulphur, earth, stone, plaster, lime and cement	74	Copper and articles thereof
26	Ores, slag and ash	75	Nickel and articles thereof

27	Mineral fuels, oils, distillation products, etc	76	Aluminium and articles thereof
28	Inorganic chemicals, precious metal compound, isotopes	78	Lead and articles thereof
29	Organic chemicals	79	Zinc and articles thereof
30	Pharmaceutical products	80	Tin and articles thereof
31	Fertilizers	81	Other base metals, cermets, articles thereof
32	Tanning, dyeing extracts, tannins, derivs, pigments etc	82	Tools, implements, cutlery, etc of base metal
33	Essential oils, perfumes, cosmetics, toiletries	83	Miscellaneous articles of base metal
34	Soaps, lubricants, waxes, candles, modelling pastes	84	Nuclear reactors, boilers, machinery, etc
35	Albuminoids, modified starches, glues, enzymes	85	Electrical, electronic equipment
36	Explosives, pyrotechnics, matches, pyrophorics, etc	86	Railway, tramway locomotives, rolling stock, equipment
37	Photographic or cinematographic goods	87	Vehicles other than railway, tramway
38	Miscellaneous chemical products	88	Aircraft, spacecraft, and parts thereof
39	Plastics and articles thereof	89	Ships, boats and other floating structures
40	Rubber and articles thereof	90	Optical, photo, technical, medical, etc apparatus
41	Raw hides and skins (other than furskins) and leather	91	Clocks and watches and parts thereof
42	Articles of leather, animal gut, harness, travel goods	92	Musical instruments, parts and accessories
43	Furskins and artificial fur, manufactures thereof	93	Arms and ammunition, parts and accessories thereof
44	Wood and articles of wood, wood charcoal	94	Furniture, lighting, signs, prefabricated buildings
45	Cork and articles of cork	95	Toys, games, sports requisites
46	Manufactures of plaiting material, basketwork, etc.	96	Miscellaneous manufactured articles
47	Pulp of wood, fibrous cellulosic material, waste etc	97	Works of art, collectors pieces and antiques
48	Paper & paperboard, articles of pulp, paper and board	99	Commodities not elsewhere specified
49	Printed books, newspapers, pictures etc		

Source: World Customs Organization. HS Nomenclature 2007 Edition.
http://www.wcoomd.org/home_hsoverviewboxes_tools_ and_instruments_hsnomenclaturetable2007.htm

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