

# Applying ‘mirror statistics’ in cross-border trade administration: case of general department of Vietnam customs

*Phan Thi Thu Hien and Nguyen Viet Hung*

## Abstract

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International merchandise trade statistics plays a substantial role in governing cross-border trade in goods at both global and national levels. In relation to one flow of goods crossing borders, there are two trade data compilations—in the exporting and importing countries—which are to be made in compliance with various regulations and standards. This paper analyses Vietnam’s mirror statistics, focusing on the significant disparities of cross-border trade statistics in 2013–2016 between Vietnam—the reporting country—and its trade partners. The paper investigates the major reasons for the large discrepancies between Vietnam and its partners in cross-border trade documentation and suggest an operational model of mirror statistics to support cross-border trade administration by Vietnam Customs in future years. Cross-border statistics were collected from the General Department of Vietnam Customs and from the United Nations (UN) Comtrade database.

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## 1. Introduction

Globally, mirror statistics have been used as a tool to assess the quality of cross-border trade statistics and the enforcement capacity of trade policies and regulations of one country with their trading partners. There are normally disparities in the trade statistics of a pair of countries as there are numerous modes of trade statistics compilation and technical practices, such as commodity classification, rules of origin, value of exported and imported goods, compiling time, foreign trade exchange rates and terms of delivery. Mirror statistics help to investigate illegal trade, commercial fraud and weak enforcement capacity of national customs authorities. This is more challenging in the context of trade liberalisation and globalisation due to increasing cross-border trade flows with a huge variety of country partners and commodities; modes of transactions and transportation; supply chains stakeholders; laws and regulations; and technologies.

Significantly, we have seen discrepancies in cross-border merchandise trade data between Vietnam and China, with a peak of nearly 30 billion US dollars in 2014. In 2015, the reports of bilateral trade total value and trade balance by the National Bureau Statistics of China were 83.636 billion and 43.830 billion US dollars, which is much higher than the 58.773 billion and 28.963 billion US dollars reported by the General Statistics Office of Vietnam (National Bureau Statistics of China, 2015; General Statistics Office of Vietnam, 2015).

This research fundamentally applies mirror statistics, with many statistical standards and practices of international organisations like the United Nations (UN), World Trade Organization (WTO), World Customs Organization (WCO), and the General Department of Vietnam Customs, in order to answer two questions:

(1) What are the main reasons for statistical discrepancies in the cross-border trade data of Vietnam during 2010–2016?

(2) How can an operational model of mirror statistics be developed to support the cross-border trade administration of Vietnam?

Our paper is organised as follows: section 2 presents a theoretical explanation of mirror statistics in cross-border trade administration; section 3 describes the data and the methodology of mirror statistics; section 4 reports and discusses results of the mirror statistics analysis in Vietnam's exports and imports; and section 5 concludes and delivers recommendations to apply mirror statistics in Vietnam's cross-border administration.

## **2. Literature review**

*International merchandise trade statistics: concepts and definitions 2010* (UNDESA, 2011) has provided a comprehensive overview of methodologies for cross-border trade statistics. Cross-border trade statistics for international trade transactions vary according to factors such as countries, commodities classifications, and trade value in exports and imports. Commonly, the country of origin and the last destination and are compiled as the exporting and importing partner of the reporting country. Free on Board (FOB) and Costs, Insurance and Freight (CIF) values are used for recording trade values in exports from and imports into the reporting country.

### **2.1 Bilateral merchandise trade statistics and CIF–FOB ratios**

Bilateral merchandise trade statistics is concerned with records from both countries but there is only one flow of trade. In principle, the value of exports and imports is at FOB and CIF prices respectively, and the CIF–FOB discrepancy reflects the shipping and insurance costs from the export country to the importing country.

There are CIF–FOB differences because export value is mostly reported on an FOB basis, while import value is on a CIF basis. The CIF–FOB differences result in a higher import value than export value. The International Monetary Fund (IMF) estimates that, on average, the CIF price is greater than the FOB price by 10 per cent. However, the CIF–FOB ratio becomes greater as the distance between trade parties increases and the weight of the traded goods becomes heavier (Pomfret & Sourdin, 2009). Similarly, research about CIF–FOB ratios of CEPII (Center d'Etudes Prospectives et d'informations Internationales) covering more than 200 countries and 5000 products between 1994 and 2007 reveals that there is a stable gap of 10 per cent in terms of value of trade for exports, and of 5 per cent for imports. Normally, the means that the CIF–FOB ratios are in the range of 1.05 to 1.1 (Gaulier & Zignago, 2010).

Gehlhar (1996) indicated that the CIF–FOB ratio in bilateral trade substantially depends on sectors and the nature of trading commodities; in particular, for manufacturers with a wide range of commodities, there is considerable difference between those with a high unit value, such as precious stones, metals and jewellery, and products with a low unit value, such as toys and sporting goods.

### **2.2 Mirrors statistics study and cross-border trade administration**

(Hamanaka, 2013) explained the general view on the accuracy of data collected by customs offices that import data are more reliable than export data because governments are more serious about recording imported goods for the purposes of tariff revenue collection, taxes and other regulatory controls. This also indicates that discrepancies from mirror statistics comparison is caused by various trade data miscomputations and misclassifications, such as transaction directions, commodity codes, origin of imports and under-reported value of imported goods.

Various factors can lead to discrepancies in mirror statistics (Yeats, 1995; Makhoul & Otterstrom, 1998; Ferrantino & Wang, 2007; Eurostat 2009). These studies mainly focus on both misclassifications associated with commodities and the direction of trade and statistical practices and performance of customs officers (of either the exporting or importing country). A short description of these findings is presented below.

In terms of international trade transactions, the goods transition starts from the exporting country and concludes with the destination in the importing country. Costs of importation include not only value of the trading goods but also freight, insurance and other cross-border charges. This leads to a discrepancy among the trade statistics of one reporting country with their partners, which explains why the value of the CIF–FOB ratio ranges from 1.05 to 1.1 (as mentioned above).

Exchange rates used for trade statistics is a periodical average value, which differs from the rates at the time of trading and reporting in both the reporting country and their partners. This contributes to the disparity in trade statistics of two trading partners whose bilateral trade is substantially high.

The difference in time of reporting can be a cause of discrepancy in some instances when the transaction occurs in different periods of statistical compilation in two related countries.

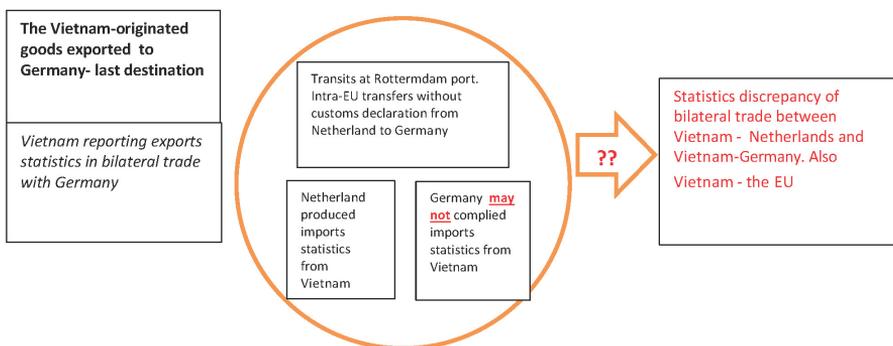
In terms of international transportation for re-exports and transshipments, the information about the country of origin and last destination are usually misreported and compiled in the customs database of the trading countries. This leads to a significant gap in bilateral trade statistics because there are many rules and understandings about the country of origin and destination in global trade (Hamanaka, 2013).

It is much more complicated when a country completes sales of goods with members of an economic-integrated region such as the European Union (EU). For example, if goods originating from Vietnam pass through the port of Rotterdam, Netherlands, before reaching their final destination (Germany), the origin country (Vietnam) may record goods as exports to either the Netherlands or Germany. Where there is such a discrepancy, it is difficult to determine which country’s customs office has the correct records.

The Rotterdam effect is used to illustrate trade map and statistics scenarios among the relevant countries as below.

In some situations, that goods are recorded as exports but returned to the exporting country for any reason will not be recorded by the intended importing country but may continue to be recorded in the export statistics of the exporting country.

Figure 1: Rotterdam effect in international merchandise statistics



Hamanaka (2013) analysed a variety of commercial frauds and misdeclarations about the transacted value, HS codes, origin, transportation and transaction chains in order to take advantage of duty free arrangements; duty reductions or duty drawback schemes. For instance, almost all countries apply GATT Article 7 (the WTO valuation agreement) for determining customs value, but traders may manipulate values to benefit from unfair market competition and duty exemption.

Mirror statistics is widely developed in many countries to enhance the quality of trade statistics compilation and the effectiveness of cross-border trade administration by taking advantage of data-driven border control methods, advanced informatics technologies and international cooperation between customs administrations. This is strongly facilitated and promoted by many international organisations, such as the World Bank, IMF, WTO and WCO (Roger-Claver Victorien Gnogoue, 2017).

### **3. Data and research methodology**

In this paper, Vietnam is selected as the reporting country for both exports and imports. Vietnam's customs data is collected from the international merchandise trade database of the General Department of Vietnam Customs, while the data of Vietnam's trade partners is collected from the Comtrade database.

This study uses basic statistical technique to explain mirror statistics and causal factors of unreasonable disparities in the bilateral trade data of Vietnam. This is based on the hypothesis that mirror statistics indicate the normal ratio of CIF-imported value and FOB-exported value in a range from 1.05 to 1.1. This ratio may be differentiated by trade costs and international transport routes between Vietnam and its partners. Otherwise, it reflects the weak performance of the national customs administration in cross-border trade management and statistics.

### **4. Analysis of mirror statistics for Vietnam, 2013–2016**

#### **4.1 Vietnam's international merchandise trade, 2013–2016**

In the slowdown of the world economy, Vietnam was facing many difficulties and challenges to achieve the growth of GDP at 6.21 per cent and international trade in merchandise goods of nearly \$310 billion US dollars in 2016. It was a remarkable year for Vietnam's international merchandise trade, with a trade surplus of \$1.78 billion, compared to \$3.54 billion deficit of 2015 (General Department of Vietnam Customs, 2016).

Vietnam has a wide variety of major export commodities with high comparative advantages in the world market, such as textile and garments, computers, fishery products and footwear. Vietnam is also an important importing partners of many leading economies in the world and region, such as China, EU, USA and ASEAN.

In general, Vietnam's trade in goods has increased around four times from 85 billion US dollars since Vietnam became a WTO member in 2007. Numerous markets in the world have reached trade records over 1 billion US dollars, including the top 28 export partners and 22 import partners. In 2016, China continued to be the largest supplier with total value of about 50 billion US dollars, which accounted for 28.2 per cent of total imports. The USA, on the other hand, has been the biggest export market of Vietnam, reaching over 38 billion US dollars and 21.8 per cent of total exports in 2016.

#### **4.2 Analyses of mirror statistics in Vietnam's international merchandise trade**

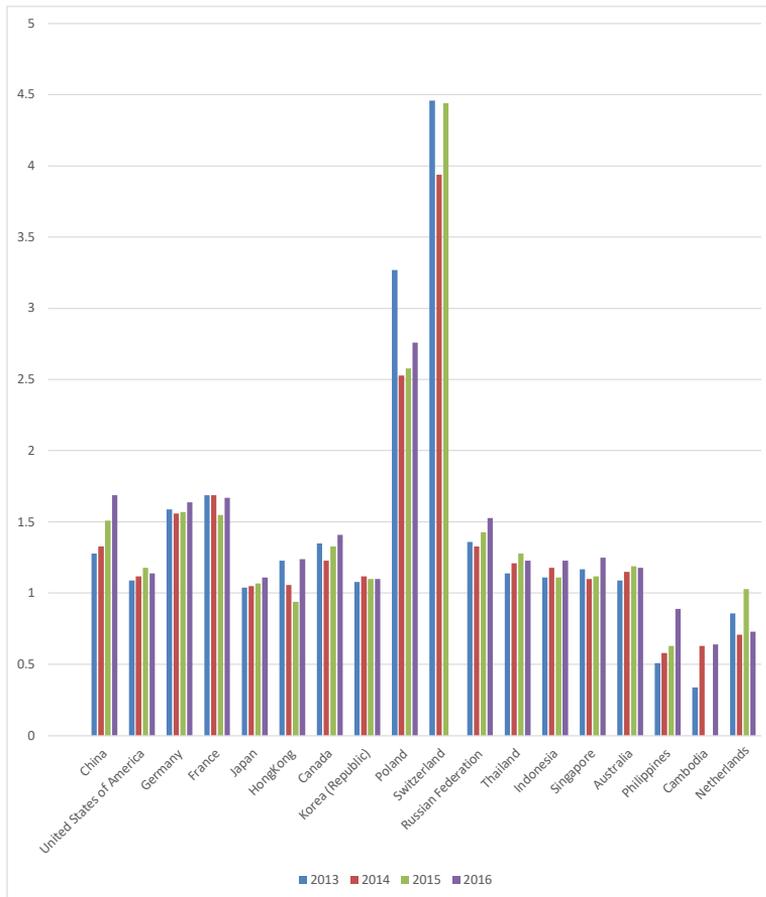
##### **4.2.1 Mirror statistics analysis: Vietnam as the reporting country of exports**

Table 1. Bilateral trade statistics discrepancy in Vietnam's exports data

STT	Nation	Year 2013			Year 2014			Year 2015			Year 2016		
		Import Value (ITC)	Export Value (GDVC)	Ratio CIF/FOB	Import Value (ITC)	Export Value (GDVC)	Ratio CIF/FOB	Import Value (ITC)	Export Value (GDVC)	Ratio CIF/FOB	Import Value (ITC)	Export Value (GDVC)	Ratio CIF/FOB
1	China	16,892	13,186	1.28	19,900	14,931	1.33	25,128	16,604	1.51	37,172	21,944	1.69
2	United States of America	25,904	23,841	1.09	32,011	28,644	1.12	39,665	33,480	1.18	43,773	38,450	1.14
3	Germany	7,541	4,737	1.59	8,097	5,178	1.56	8,968	5,705	1.57	9,777	5,961	1.64
4	France	3,732	2,204	1.69	4,041	2,398	1.69	4,587	2,953	1.55	4,994	2,983	1.67
5	Japan	14,233	13,631	1.04	15,417	14,693	1.05	15,125	14,137	1.07	16,238	14,671	1.11
6	Hong Kong	5,060	4,108	1.23	5,490	5,202	1.06	6,553	6,965	0.94	7,527	6,088	1.24
7	Canada	2,080	1,545	1.35	2,561	2,079	1.23	3,200	2,411	1.33	3,745	2,653	1.41
8	Korea (Republic)	7,175	6,618	1.08	7,989	7,144	1.12	9,803	8,932	1.10	12,495	11,406	1.10
9	Poland	1,142	349	3.27	1,288	509	2.53	1,510	585	2.58	1,650	598	2.76
10	Switzerland	1,287	289	4.46	1,044	265	3.94	1,022	230	4.44	1,500	593	2.53
11	Russian Federation	2,597	1,903	1.36	2,296	1,725	1.33	2,055	1,439	1.43	2,465	1,616	1.53
12	Thailand	3,269	2,858	1.14	3,938	3,255	1.21	4,034	3,146	1.28	4,450	3,615	1.23
13	Indonesia	2,723	2,451	1.11	3,418	2,891	1.18	3,162	2,852	1.11	3,228	2,618	1.23
14	Singapore	3,057	2,607	1.17	3,200	2,910	1.10	3,604	3,215	1.12	3,009	2,407	1.25
15	Australia	3,656	3,347	1.09	4,478	3,894	1.15	3,359	2,829	1.19	3,328	2,827	1.18
16	Philippines	871	1,694	0.51	1,348	2,311	0.58	1,273	2,020	0.63	1,982	2,220	0.89
17	Cambodia	988	2,921	0.34	1,693	2,688	0.63	0	2,410	0.00	1,416	2,199	0.64
18	Netherlands	2,509	2,934	0.86	2,675	3,764	0.71	4,893	4,762	1.03	4,364	6,012	0.73

Note: Unit million US dollars

Figure 2: Ratio CIF–FOB: Vietnam’s reporting exportation



In general, most of the ratios between the import value and export value are higher than ‘1’, except for Cambodia, the Netherlands and the Philippines. This result reflects the standard methodology and quality of export statistics reported to Vietnam Customs. The main points from the mirror statistics analysis of Vietnam’s exports are as follows:

1. In cases of the top import partners of Vietnam, such as USA, Japan, Korea and Hong Kong (but not China), the CIF–FOB ratio of the import value and export value ranges from 1.04 to 1.1.
2. The CIF–FOB ratio in case of the Philippines, Cambodia and the Netherlands is less than ‘1’ in 2013–2017 (see Table 1). These huge discrepancies reflect the differences between Vietnam and trade-related countries in compiling international merchandise statistics reports due to special transactions, such as imports for re-export, intermediary and transits.

Due to a greater advantage in sea transportation than Cambodia, most flows of goods imported to the last destination of Cambodia are shipped via Vietnam by transit or imported for re-export to Cambodia. In these situations, Vietnam compiled export data for the imports into Cambodia, but these are not reported in Cambodia’s import statistics because Vietnam is not the country of origin. A similar situation occurs in the case of the Philippines, which is a transit hub in the international route from Vietnam to other Pacific countries.

The geographical positions of Vietnam, the Philippines and Cambodia is seen as the main factor of international trade operations among these countries (see Figure 3).

Figure 3: International trade routes of Vietnam and countries in ASEAN



- ◆ Hub of international transitions
- ➔ International routes of transportation

In case of the Netherlands, as per the Rotterdam effect mentioned above, many shipments from Vietnam to the EU are reported as exports to the Netherlands as the last destination port of Rotterdam. However, the goods are not consumed in Netherlands but in other European countries such as Germany and France.

This also explains why the CIF–FOB ratio between Vietnam and some European countries (e.g. Germany and France) is higher at 1.59; 1.56; 1.57; 1.64 (Germany) and 1.69; 1.69, 1.55 and 1.67 (France) in 2013, 2014, 2015 and 2016 respectively. In these cases, Vietnam’s exports statistics may not include Germany and France, but these countries’ reported imports would show Vietnam as the country of export.

Next, huge discrepancies and high CIF–FOB ratios (up to 2.5) are seen in the case of some countries located centrally in Europe (e.g. Switzerland, Poland). International transportation and the Rotterdam effect are considered as the most important contributing factors to such phenomena.

3. We analysed the discrepancy between Vietnam’s reporting export statistics and China’s compiled import data. The CIF–FOB ratio is significantly higher than the normal rate and indicates data missing from the exports compilation of Vietnam are reported in China. It is challenging for the Vietnamese authorities to control exportation from Vietnam to China due to the geographical proximity between the two countries, with various non-commercial routes such as forests and fields, over mountains and by river.

4.2.2 Mirror statistics analysis where Vietnam is the reporting country of imports

Analysing mirror statistics in the case of Vietnam being the reporting country of imports, there are some key conclusion as follows:

1. Most of CIF–FOB ratios fall below ‘1’, except for Japan, Taiwan, USA, France and Italy. These countries are known to have advanced international merchandise statistics systems. The CIF–FOB ratios are in the normal range from 1.05 to 1.1, which suggests Vietnam’s trade statistics data for these countries.
2. In the cases of Hong Kong and Singapore, the CIF–FOB ratios are extremely low: 0.11 (2013), 0.12 (2014), 0.13 (2015) and 0.16 (2016) for Hong Kong and 0.52 (2013), 0.53 (2014), 0.51 (2015) and 0.42 (2016) for Singapore. International transit in goods through these hubs before leaving for the final destination of Vietnam is the most likely contributing factor for these discrepancies, as Vietnam does not report such imports as originating from Hong Kong or Singapore.  
In contrast to the cases of Hong Kong and Singapore, discrepancies in cross-border trade statistics between Vietnam’s import values and Cambodia’s export values are large at 5.52 (2014), 3.36 (2015) and 4.13 (2016). It raises questions about the methodology and quality of Cambodia’s international trade statistics, which causes many differences in goods classifications, valuations and methods of producing statistics reports (Hamanaka, 2011). However, the reason for the very high CIF–FOB ratios in the case of Cambodia is that many shipments of the Cambodia-originated goods are transited in Vietnam before departing to the last destination and reported as imports declaration into Vietnam from Cambodia.
3. Due to high import tariff barriers, smuggling and commercial fraud involving misdeclaration of origin, classification and customs valuation are also major concerns of cross-border administration and control in Vietnam, which in turn contribute to discrepancies in Vietnam’s statistics.

Figure 4: Ratio CIF/FOB in case of Vietnam’s reporting importation

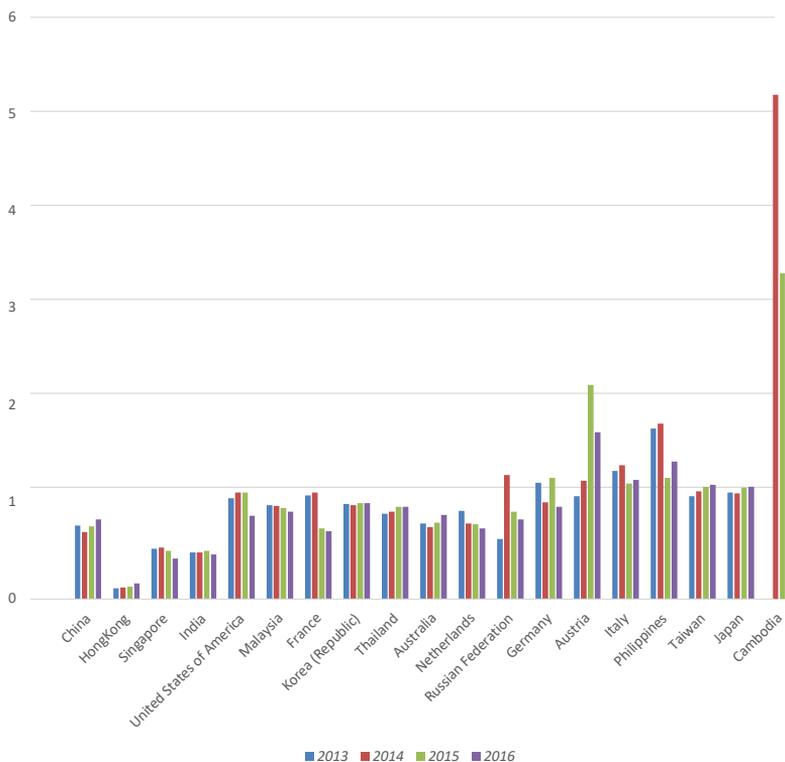


Table 2. Bilateral trade statistics discrepancy in the Vietnam's imports database

	Country	Year 2013			Year 2014			Year 2015			Year 2016		
		Export Value (ITC)	Import Value (GDVC)	Ratio CIF/FOB	Export Value (ITC)	Import Value (GDVC)	Ratio CIF/FOB	Export Value (ITC)	Import Value (GDVC)	Ratio CIF/FOB	Export Value (ITC)	Import Value (GDVC)	Ratio CIF/FOB
1	China	48,586	36,938	0.76	63,731	43,713	0.69	66,381	49,521	0.75	61,094	50,019	0.82
2	Hong Kong	9,436	1,050	0.11	8,676	1,038	0.12	9,832	1,321	0.13	9,356	1,498	0.16
3	Singapore	10,870	5,689	0.52	12,904	6,839	0.53	12,131	6,038	0.50	11,354	4,763	0.42
4	India	5,988	2,881	0.48	6,527	3,113	0.48	5,357	2,657	0.50	5,958	2,746	0.46
5	United States of America	5,036	5,233	1.04	5,734	6,297	1.10	7,072	7,796	1.10	10,151	8,702	0.86
6	Malaysia	4,227	4,099	0.97	4,384	4,207	0.96	4,466	4,201	0.94	5,730	5,171	0.90
7	France	934	997	1.07	1,015	1,116	1.10	1,719	1,261	0.73	1,645	1,144	0.70
8	Korea (Republic)	21,088	20,705	0.98	22,333	21,763	0.97	27,773	27,614	0.99	32,651	32,163	0.99
9	Thailand	7,182	6,318	0.88	7,888	7,093	0.90	8,764	8,284	0.95	9,337	8,849	0.95
10	Australia	2,040	1,587	0.78	2,764	2,056	0.74	2,559	2,023	0.79	2,798	2,425	0.87
11	Netherlands	744	678	0.91	710	552	0.78	897	691	0.77	923	677	0.73
12	Russian Federation	1,373	855	0.62	645	827	1.28	824	746	0.90	1,373	1,131	0.82
13	Germany	2,463	2,965	1.20	2,633	2,620	1.00	2,565	3,213	1.25	2,990	2,850	0.95
14	Austria	186	197	1.06	186	226	1.22	187	412	2.21	204	351	1.72
15	Italy	893	1,177	1.32	971	1,337	1.38	1,218	1,453	1.19	1,158	1,427	1.23
16	Philippines	541	953	1.76	375	677	1.81	727	906	1.25	747	1,060	1.42
17	Taiwan	8,919	9,416	1.06	9,965	11,079	1.11	9,460	10,993	1.16	9,551	11,235	1.18
18	Japan	10,550	11,615	1.10	11,830	12,926	1.09	12,543	14,367	1.15	12,990	15,064	1.16
19	Cambodia				96,801	503,649	5.20	185,645	623,405	3.36	229,059	945,967	4.13

Unit million US dollars

## 5. Conclusions and recommendations

### 5.1 Conclusions

The mirror statistics study reveals some major issues. First, the majority of statistical discrepancies for Vietnam's imports fall outside the normal range. The reason for this significant number of the Vietnam's reported imports statistics include shipments in transit and imports for re-export via Vietnam to the neighbouring countries like China, Cambodia and Laos.

Second, high increases of trade facilitation and market liberalisation and the growth of e-commerce are enabling smuggling and commercial fraud, which are major causes of discrepancies in Vietnam's trade data, stemming from misdeclarations in origin, customs valuation, commodity classification and fraudulent documentation.

Third, a lack of international cooperation in the compilation of trade statistics and information-sharing networks between Vietnam and its trade partners where there are abnormal and unrealistic mirror statistics findings makes it difficult to investigate the drivers or solutions to improve the quality and credibility of these bilateral trade statistics.

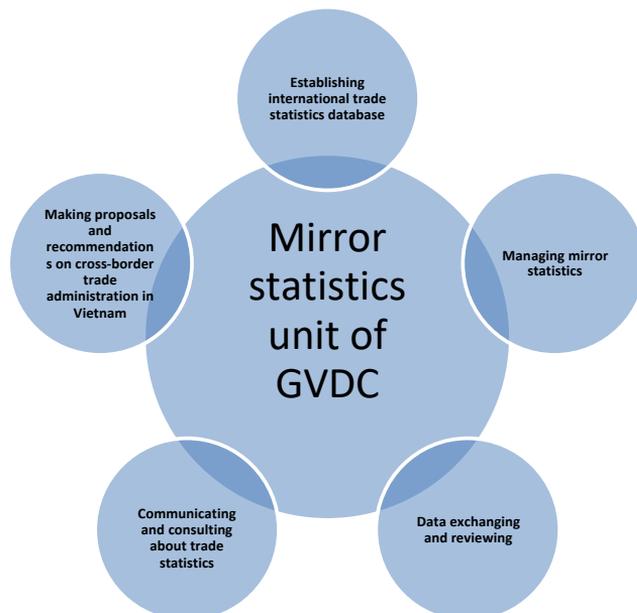
Fourth, the technique of mirror statistics needs to be developed as an effective tool for making trade statistics more standard and accurate and enhance Vietnam's cross-border trade controls and laws enforcement.

### 5.2 Applying mirror statistics in Vietnam

#### 5.2.1 Mirror statistics analysis protocol in Vietnam

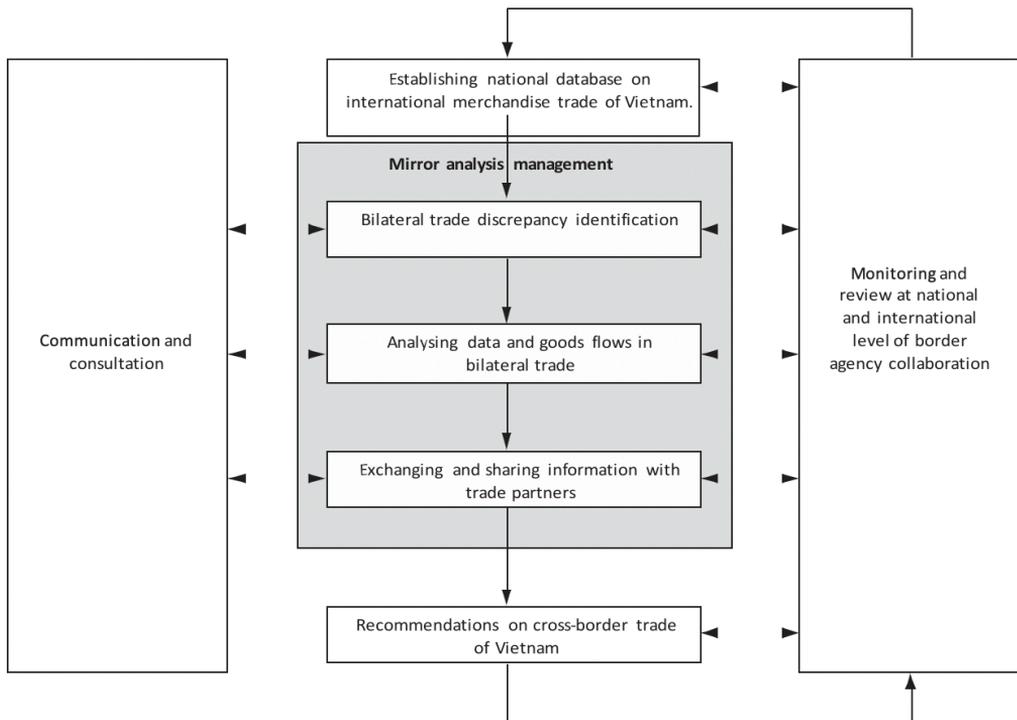
The General Department of Vietnam Customs plays a vital role in international merchandise trade statistics and has established a functional unit for analysing mirror statistics. This unit operates as a hub for merchandise trade data transmission and management at national and international levels, and its mission should be stipulated officially in goals, tasks and the vision of Vietnam Customs (see Figure 5).

Figure 5: Functions and tasks of the Customs mirror statistics unit



A formal process and legal framework of mirror statistics analysis is needed to ensure that Vietnam meets international trade statistics standards, norms and practices and the operating capacity of Vietnam Customs (see Figure 6). This is an important function of Vietnam Customs that commits to the stated aims of the national customs, including professionalism, efficiency, transparency, effectiveness and modernisation

Figure 6: Mirror statistics management process of Vietnam Customs



### 5.2.2 Standardising Vietnam Customs' database of international merchandise trade

Vietnamese import and export enterprises play an important role in providing creditable international merchandise trade data as well as contributing to the effectiveness and efficiency of cross-border trade administration in Vietnam. In term of legal compliance and trade facilitation, Vietnam Customs should enhance its cooperative relationship with the business community, aiming for a higher quality of trade information and statistics.

Standardising trade statistics methods and techniques that adapt to new trends in international business and globalisation are top priorities for Vietnam Customs. Initiatives taken by Canada, Mexico and USA could provide useful guidance for Vietnam.

Furthermore, Vietnam Customs should foster collaboration with neighbouring countries and major trading partners in relation to international trade statistics and cross-border trade management. This could help to produce joint masterplans and legal frameworks to moderate the discrepancies in international merchandise trade statistics and promote efficiency and efficiency of cross-border trade administration.

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### Phan Thi Thu Hien



Dr Thi Thu Hien Phan is a lecturer of international business at the Vietnam Foreign Trade University. She had worked as a specialist in international business in the automobile industry in Vietnam before her academic career. In 2012, she defended successfully the PhD dissertation on the issue of establishing an efficient linkage between trade and industry policies for the industrialisation and global participation of Vietnam. She is known as an expert on international trade transactions and customs affairs not only lecturing at her University but also training and supervising Vietnam's business community and customs officers. She is an active researcher about cross-border trade in Vietnam with several projects including illicit trade, informal trade and customs in Vietnam; trade costs of Vietnamese enterprises; timber value chains in Vietnam, so forth. Now she is an associate researcher of Cross-border Research Association in Switzerland – focusing on a study on global trade facilitation and supply chain security.

### Nguyen Viet Hung



Nguyen Viet Hung is Vietnamese, head of division and General Department of Viet Nam Customs (GDVC), having 24 years of service in customs. His main responsibility is to compile the Vietnam's trade-in-goods statistics (from collection to dissemination) with depth knowledge in customs revenue statistics. Mr. Nguyen Viet Hung is experienced in customs and trade related matters (customs/trade procedures, HS/AHTN tariff classification, custom valuation, rule of origin, FTAs, ..). His current interests are inclusive of Big data, Data analysis and BI. He participated in ASEAN, APEC and UNSD activities (trade statistics, mirror statistics, AHTN review, trade data exchange, TiVA). Currently, he is members of the ASEAN Working Group on International Merchandise Trade Statistics (WGIMTS) and WCO Virtual Working Group on Future of Customs. Mr. Nguyen Viet Hung held Master of Public Finance by the National Graduate Institute for Policy Studies (GRIPS) in Tokyo-Japan with full scholarship from Japan Government and WCO; Bachelor of Economics (major in statistics) of Hanoi National Economics University (NEU) and received certificates from offline and online training workshops/courses offered by UNCTAD, UNSD, WTO, WCO, EDX, Coursera. His languages: Vietnamese (native), English (command), French (basic) and German (basic). He is proficient in MS office tools.

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