



Asymmetries in International Merchandise Trade Statistics: A case study of selected countries in Asia-Pacific

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Abstract

This working paper introduces the concept of bilateral asymmetries in international merchandise trade statistics (IMTS), i.e. the discrepancies that can be seen in reported bilateral trade flows between trading partners. Such discrepancies mean that the value of exports reported by one country does not equal to the value of imports reported by its partner, also called mirror data. These discrepancies impact bilateral trade balances and other economic variables reliant upon trade balance. Asymmetries in bilateral trade statistics are a serious concern for the quality of statistics, especially from the perspective of consistency. They may also lead to misconceptions about trade balances among policy-makers, businesses and the general public. This paper provides an overview of the main concepts in IMTS and defines asymmetries in bilateral trade statistics. It outlines how to measure the discrepancies in bilateral trade statistics and provides a case study for 10 countries in Asia-Pacific. The paper also provides an overview of the sources of bilateral trade asymmetries and suggests some basic actions that can be taken to improve the quality of IMTS and reduce bilateral asymmetries, or at least, allow researchers to balance bilateral trade flows for analytical purposes.

Keywords: international merchandise trade statistics, bilateral trade asymmetries, trade balance, valuation, discrepancies in mirror trade data, Asia and the Pacific.

JEL classification: C82, F13, F14, F15, F23, O19, O24

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1. Introduction

International trade is regarded as a major driver of economic growth and its importance is recognized in many goals and targets of the 2030 Agenda for Sustainable Development.¹ Statistics are crucial to allow for evidence-based formulation and evaluation of policies, which means also that sustainable development is impossible without better data.² International trade statistics form part of this crucial set of data to inform policy-makers in their policy decisions and trade negotiations. Data to measure development challenges of countries need to be available. But, that is not enough, for data to be useful they need to satisfy certain quality standards, including being consistent between countries and over time.

International trade statistics suffer consistency challenges. Reported trade flows are not consistent between countries, creating discrepancies in international trade statistics, which can result in ill-informed policy. This paper discusses these discrepancies – called asymmetries in bilateral trade statistics, defines their measurement and illustrates their importance for the countries in Asia-Pacific. It also outlines the reasons for existence of the asymmetries and provides ideas for a further research agenda.

2. Definition of basic concepts

Trade statistics have a history dating back to the League of Nations in the 1920s, when the first international regulations were developed. These regulations have evolved substantially since then, most recently due to the increased globalization of production and distribution processes and the resulting increase in demand for more timely and accurate data on trade.

2.1 International Merchandise Trade Statistics (IMTS)

International merchandise trade statistics (IMTS) are concerned with data on physical movements of goods between countries, which are defined by the “International Merchandise Trade Statistics: Concepts and Definitions 2010” (UNDESA, 2011), referred to as the IMTS Manual in this paper. The Manual provides the basic framework of definitions and guidance to produce merchandise trade statistics,³ and acknowledges that IMTS can be both the merchandise trade statistics compiled by the national agencies, as well as the consolidated and standardized trade statistics presented by international agencies. It also specifies that the terms ‘goods,’ ‘merchandise’ and ‘commodities’ can be used interchangeably for the purpose of trade statistics.

IMTS has traditionally measured the physical movements of goods across international borders or through special economic territories. The recording of IMTS depends on national legislation, mainly the customs regulations. As a result, customs records are traditionally the main source of IMTS for both imports and exports. However, some countries with more advanced statistical systems exploit other data sources, such as enterprise surveys and administrative records associated with taxation. This dissimilarity in data sources could lead to some discrepancies in definition of trade, trade partners and in the valuation of goods traded between countries concerned.

The IMTS Manual establishes the important links between trade statistics and the broader frameworks governing economic statistics, such as the 2008 SNA and the BPM6, as well as the trade

¹ See A/RES/70/1.

² For a more detailed discussion see SDG 17 in Statistical Yearbook for Asia and the Pacific 2015 (UNESCAP, 2016).

³ For detailed definitions see IMTS Manual (UNDESA, 2011) and IMTS Compilers Manual (UNDESA, 2013).

in services statistics, defined by the “Manual on Statistics of International Trade in Services 2010.”⁴ Trade in services is increasing in amount and importance; however, it is also much more challenging to measure than trade in merchandise. In this paper deals with trade in merchandise only.

It is important to note that some of the conceptual frameworks outlined in the 2008 SNA and the BPM6 differ with the concepts stipulated by the IMTS Manual.⁵ The requirements for IMTS are to reflect the physical movement of goods across country borders, whereas national accounts and balance of payments compilation is more concerned with the change of ownership⁶ of those goods. The former will include goods that enter and leave the territory of one country, but the latter will only include transactions that involve change of ownership between residents and non-residents.

Hence, trade statistics compiled on the basis of IMTS Manual will need to be adjusted to satisfy the needs of balance of payments compilation. One of the notable differences is in respect of goods for processing. In IMTS goods sent for processing to a different country are recorded irrespectively of the change of ownership. Whereas, goods that are sent abroad for processing without change of ownership and returned back after processing, are not recorded in the balance of payments.

2.2 Bilateral trade statistics and asymmetries

Bilateral trade statistics show bilateral merchandise flows between two countries, where one of the countries is the exporter of goods to the other, which is the importer of the goods. For each transaction there is a ‘reporting country’ – the country that reports the merchandise flow (can be either export or import), and a ‘partner country’ – the trading partner of the reporting country. As a result, a trade flow reported by country A can take two forms: (1) export of goods from country A to country B; or (2) import of goods to country A from country B. Where in both cases country A is the reporting country and country B is the partner country.

There are several global and regional databases recording bilateral trade flows, such as the United Nations Comtrade,⁷ the World Bank’s World Integrated Trade Solution (WITS),⁸ and the OECD’s Bilateral Trade in Goods by Industry and End-use Category.⁹ These databases are compiled by international organizations that collect the data from national statistical organizations or other agencies in the national statistical system, such as customs agencies or central banks.

Since exports of country A need to be imports of another country, for example country B among others, the value of the trade flow reported by A as exports to B should be the equal to the imports reported by B from A. This is referred to as mirror statistics. However, in many cases one can observe discrepancies in mirror statistics, which is referred to as bilateral trade asymmetries. These asymmetries arise due to many reasons and some will be discussed later.

Due to the asymmetries in bilateral trade statistics reported by countries, IMTS databases lack quality and internal consistency. Since international organizations cannot know which of the two countries (if any) is reporting the correct value of the goods traded, the asymmetries are hard to deal with by the collecting agencies and improve consistency of the databases. These inconsistencies are, in turn, a big problem also for analysts and researchers that need bilateral trade flows to feed into their

⁴ UNDESA, 2012, see http://unstats.un.org/unsd/publication/Seriesm/seriesM_86Rev1e.pdf

⁵ For detailed discussion on conceptual differences between ITMS 2010 and BPM6 see Annex F of the IMTS Manual (UNDESA, 2011).

⁶ SNA 2008 (UN and others, 2009, para. 3.26) defines economic ownership in as: “The economic owner of entities such as goods and services, natural resources, financial assets and liabilities is the institutional unit entitled to claim the benefits associated with the use of the entity in question in the course of an economic activity by virtue of accepting the associated risks.”

⁷ <http://comtrade.un.org/>

⁸ <http://wits.worldbank.org/>

⁹ <http://www.oecd.org/trade/bilateraltradeingoodsbyindustryandend-usecategory.htm>

analytical work. For example, researchers wanting to construct international input-output tables (IOTs)¹⁰ and perform analysis of Trade in Value Added (TiVA) need balanced bilateral trade statistics.¹¹ Furthermore, trade asymmetries are also a problem for national policy formulation, since reported bilateral deficits or surpluses may motivate ill-conceived policies, for example, introduction of protective trade policies to address these deficits.

If IMTS data are not available for a particular country, it would in principle be possible to derive their bilateral trade statistics from mirror data reported by its trade partners. However, due to asymmetries in bilateral trade data, deriving a country's IMTS from mirror data is not ideal. Nevertheless, UN Statistics Division (UNSD) uses mirror data to estimate IMTS for countries that do not report their bilateral trade statistics to UN Comtrade or data are not received on time.¹²

2.3 Global efforts to overcome the issues with bilateral trade asymmetries

The international statistical community has been discussing and striving to improve the quality of IMTS for a long time. The United Nations Statistical Commission (UNSC), the highest global decision making body in the field of statistics, has been discussing IMTS for years and noted the existence of inconsistencies in the data due to asymmetries. This became even more prominent in the recent years with the advent of global value chains (GVCs) and efforts to estimate trade in value added (TiVA). GVCs and TiVA have, in addition, pointed to a different issue with traditional IMTS – double counting, which has been estimated to amount up to 28% of total global trade in 2010 (UNCTAD, 2013).

As a result, in 2015 the UNSC listed asymmetries in bilateral trade statistics as one of the priorities of the work programme for the measurement of international trade and globalization.¹³ A newly established inter-secretariat working group has been so mandated with the coordination of this programme of work, and in January 2016 an expert group meeting was held in New York¹⁴ that discussed the preparation of a Handbook on a System of Extended International and Global Accounts, which will dedicate a whole chapter on trade asymmetries.

The global statistical community aims to tackle the issue of bilateral trade asymmetries on a case-by-case basis. In order to reconcile some of the asymmetries, they first need to be identified and then a group of the parties concerned will look into the root causes and underlying issues. One of the first such attempts is looking into the discrepancies in bilateral trade flows for Costa Rica, in particular with China, Mexico and the United States. UNSD has started this process and formed a group of concerned parties that will look into the details of the large bilateral trade asymmetries and try to come up with solutions for balancing them during the first half of 2016 (UNDESA, 2015).

3. Measurement of the degree of trade asymmetry

Mirror data, as introduced above, should in principle mean that the value of a country's reported exports should be equal to the value of its partner's reported imports, and vice versa. However, as mentioned these are not necessarily equal, causing discrepancies – asymmetries. In order to understand the scale of these discrepancies and analyse their potential impact a measure needs to be identified. The size and proportion of differences between the reported values of mirror data can, in addition, be an indicator of the quality of IMTS.

¹⁰ For more information see Santoro, Javorsek, and Orhun Girard (2015).

¹¹ For more information see Javorsek and Camacho (2015).

¹² United Nations International Trade Statistics Knowledgebase,

<http://unstats.un.org/unsd/trade/b/Knowledgebase/Mirrors-statistics>, accessed on 30 December 2015.

¹³ See E/CN.3/2015/12.

¹⁴ For more information see <http://unstats.un.org/unsd/trade/events/2016/newyork-egm/default.asp>

3.1 Bilateral trade discrepancy index

The discrepancies in mirror data between countries A and B can be quantified as an index that expresses the discrepancy in value as a percentage of the reported value of imports (Guo, 2010). The “*bilateral trade discrepancy index*” between A and B is expressed as,

$$DIF^{AB} = \frac{M^{AB} - E^{AB}}{M^{AB}}$$

Where M^{AB} is the value of imports reported by B from A (country B is the reporting country and A is the partner country) and E^{AB} represents the value of exports reported by A to B (country A is the reporting country and B is the partner country). For the purposes of this paper, the merchandise flow is always represented as being from the country mentioned first (in this case A) to the country mentioned second (in this case B).

Due to this characteristic of bilateral trade flows the above index can be looked at in two variations depending on which of the two countries involved as the importer and the exporter of the goods (Guo, 2010):

- (1) *Country A as importer - $DIF(I)^A$ / country B as exporter - $DIF(E)^B$* : this variation expresses the difference between the imports reported by A from B (M^{BA}) and the exports reported by B to A (E^{BA}) as a proportion of imports reported by A from B (goods flow from B to A)

$$DIF(I)^A = DIF(E)^B = \frac{M^{BA} - E^{BA}}{M^{BA}}$$

- (2) *Country A as exporter - $DIF(E)^A$ / country B as importer - $DIF(I)^B$* : this variation expresses the difference between the imports reported by B from A (M^{AB}) and the exports reported by A to B (E^{AB}) as a proportion of imports reported by B from A (goods flow from A to B)

$$DIF(E)^A = DIF(I)^B = \frac{M^{AB} - E^{AB}}{M^{AB}}$$

An alternative index was proposed by Ferrantino and Wang (2008), which expresses the discrepancy in terms of the average asymmetry reported by the two countries. This index has the same numerator as above (the difference in reported mirror data), but uses the mean of the two partners reported data as the denominator instead of expressing it as percentage of the import flows:

$$ER^{AB} = \frac{M^{AB} - E^{AB}}{(M^{AB} + E^{AB})/2}$$

3.2 Interpretation of the discrepancy index

Table 1 introduces some high-level interpretation guidelines for the bilateral trade discrepancy indexes for countries as importers or as exporters. The discrepancy index may give a general understanding for the direction of under- or over-reporting of international trade values of a country. However, these are only general deductions that can be made based on the size and sign of the discrepancy indexes, which might help one to uncover the problematic areas with consistent trade asymmetries. For more detailed understanding of the underlying issues one needs to look at country pairs and analyse the discrepancies together with other knowledge about a particular trade relationships.

Table 1: Possible interpretations of the bilateral trade discrepancy indexes for Country A

Flow of goods	Country A → Country B	Country B → Country A
Value of index	$DIF(E)^A$	$DIF(I)^A$
Positive (+)	<p>reported exports < reported imports</p> <ul style="list-style-type: none"> • A is under-reporting exports to B • B is over-reporting imports from A 	<p>reported exports < reported imports</p> <ul style="list-style-type: none"> • A is over-reporting imports from B • B is under-reporting exports to A
Negative (-)	<p>reported exports > reported imports</p> <ul style="list-style-type: none"> • A is over-reporting exports to B • B is under-reporting imports from A 	<p>reported exports > reported imports</p> <ul style="list-style-type: none"> • A is under-reporting imports from B • B is over-reporting exports to A

In addition, the size and magnitude of the discrepancy can indicate the ‘severity’ of the issue and hence the potential benefits of deeper investigation into the particular trade relationship. Some authors, for example, Gehlhar (1996), have proposed that a discrepancy smaller than 20% is small enough to be considered an accurate match. This criterion was thus used to balance the bilateral trade flows for construction of the Global Trade Analysis Project (GTAP) database.

3.3 Presentation of data

Due to the complexities of bilateral trade data – each data point comes in a pair and needs a reporting and a partner country – it is important to present them in a clear and concise manner. Table 2: Suggested presentation of bilateral trade statistics and associated discrepancies shows a suggested presentation of bilateral trade data and the associated bilateral trade discrepancy indexes. This presentation can equally well be used for aggregate data or any disaggregation thereof either in monetary values or physical measurement units.

The basic principle adopted in the table is that goods flow from the country in rows (first column) to countries in columns (first row), i.e. row starting with Country A shows the physical flow of goods from country A to other countries listed in columns (country B in this case). The first value at the intersection of row Country A and column Country B shows the exports reported by A to B (E^{AB}) and second entry is the value of imports reported by B from A (M^{AB}) – the mirror data. Below the values of the bilateral trade flows one can find their value difference ($M^{AB} - E^{AB}$), followed by the bilateral trade discrepancy index ($DIF(E)^A = DIF(I)^B$).

Similarly, at the intersection between row Country B and column Country A, one can find the value of exports reported by B to A (E^{BA}), the value of imports reported by A from B (M^{BA}), the difference between the reported bilateral trade values ($M^{BA} - E^{BA}$), and the bilateral trade discrepancy index ($DIF(I)^A = DIF(E)^B$). This presentation can be extended to any number of countries and their bilateral flows.

Table 2: Suggested presentation of bilateral trade statistics and associated discrepancies

	Country A		Country B	
Country A			E^{AB}	M^{AB}
			$M^{AB} - E^{AB}$	
			$DIF(E)^A$ $DIF(I)^B$	
Country B	E^{BA}	M^{BA}		
	$M^{BA} - E^{BA}$			
	$DIF(I)^A$ $DIF(E)^B$			

For a multi-country case, the bilateral trade discrepancy indexes in the table can be read by rows, which present the indexes for that country as *exporter*, or by columns, which show indexes for that country as *importer*. This is useful for understanding the overall trade reporting practices of countries analysed.

4. Case studies

This section presents some initial findings for a selection of ESCAP regional members – Cambodia, China, India, Indonesia, Japan, Malaysia, the Philippines, Republic of Korea, Singapore, and Thailand. These 10 countries together represent approximately 71% of total exports and imports of the ESCAP region.¹⁵ The analysis is based on values of bilateral trade obtained from the United Nations Comtrade database,¹⁶ for 2013 year, in US dollars (\$) and for total HS commodities (as reported).

4.1 Regional case study

The overall presentation of the data for the 10 countries analysed is shown in Table 3 in Annex on page 16. This table shows the bilateral trade values, discrepancies between the mirror data, and the bilateral trade discrepancy indexes for the selected 10 countries, as per the proposed presentation model in Table 2: Suggested presentation of bilateral trade statistics and associated discrepancies above.

Relatively low bilateral trade discrepancy indexes exist between certain trading partners, such as Republic of Korea and Indonesia (0.2%), Thailand and Japan (-0.9%), and Thailand and Indonesia (-1.6%), where the first country is the exporter of merchandise. For the same trading partners with reversed trading relationship, where the first country is the importer, the discrepancy index increases, Republic of Korea and Indonesia (13.4%), Thailand and Japan (12.5%), or Thailand and Indonesia (24.9%). On the other hand, some trading partners exhibit very large discrepancy indexes, especially Cambodia and Singapore (-337.0%), Thailand and Cambodia (-288.5%), and Singapore and Cambodia (-217.4%), where the first country is the exporter.

This analysis comprises 90 trading relationships in total, as each country can be analysed as importer and as exporter of goods. Out of the total possible combinations, less than half (42.2%) have

¹⁵ Based on the ESCAP Online Statistical Database, available from:
<http://www.unescap.org/stat/data/statdb/DataExplorer.aspx>

¹⁶ <http://comtrade.un.org/>

discrepancy indexes lower than 20% in absolute value, about two-thirds (65.5%) have a discrepancy index smaller than 30%, and 78.9% of the total trading pairs have discrepancy indexes lower than 50% in absolute value. The total value of discrepancies – sum of absolute values of the individual discrepancies – amounted to \$390.25 billion for the 10 countries analysed, which is approximately 8.0% of the total value of exports or imports for the 10 countries.

To simplify the regional analysis and to give some indication of causes for these discrepancies the reported differences are separated into two cases: reported exports are higher than reported imports; and reported imported imports are higher than reported exports. In Table 3 on page 16 the former corresponds to a negative discrepancy index and the latter to a positive one.

(1) *Possible explanations for the case when reported exports are higher than reported imports (negative DIF):*

- Country of origin allocation by the importing country versus the country of destination by the exporter: For example, in the case of discrepancy between Singapore and Cambodia (-217.4%), Singapore might report exports to Cambodia, but Cambodia attributes these goods to a different partner on a country of origin basis, as Singapore was only a trading intermediary country. Re-exports fall under this case.
- Different trade systems. For example, trade into processing zones is not reported by the importing country but the exporting country has reported it.
- Treatment of reporting of *transshipments*. Based on the IMTS Manual countries are encouraged to identify such transactions and they should be excluded from trade statistics. However, many exporters may not know transshipment is happening and so attribute the export to the country where these goods are only in transit.
- In the case of product-level analysis, the discrepancy can arise due to the use of different classifications of products between imports and exports.

(2) *Possible explanations for the case when reported exports are lower than reported imports (positive DIF):*

- This could be due CIF / FOB differences. In general, such difference should be modest, but it is in line with expectations that the exports valued at FOB would be smaller than imports valued at CIF.
- The analysis might want to check for a mark-up (trade margin) if the exporting party is an affiliate of a multi-national enterprise.
- The possibility of confidential exports should be checked.
- Time series and unit-values on the export valuation should be checked to discover possible lack of accuracy.
- Similar to above, reporting exports from processing zones can also create discrepancies.
- Similar to above, discrepancies might arise due to different classification of products in imports and exports.

From the data analysed, it is clear that the discrepancy indexes are skewed towards negative values. The total number of positive (47) versus negative (43) discrepancy indexes is balanced, but the magnitude of the negative discrepancies is larger. There are five discrepancy indexes smaller than -100% and 13 between -100% and -50%, whereas there is only one larger than +50%. This would suggest that the discrepancies in reporting larger exports compared to the reported imports are more extreme.

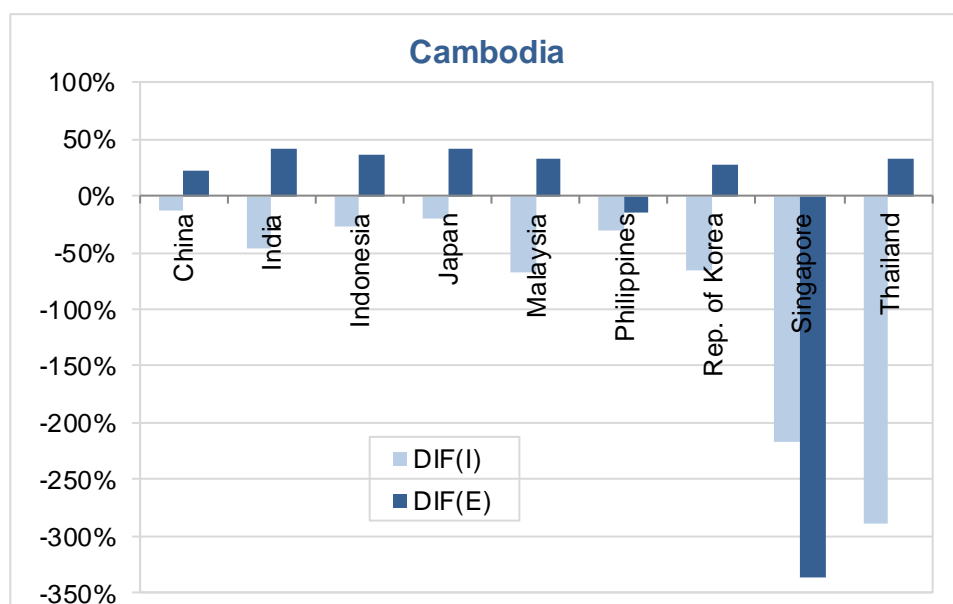
4.2 Case studies of selected countries

Among the 10 countries analysed three seem to have the highest asymmetries, Cambodia, the Philippines and Singapore. These cases are looked at in more detail.

Cambodia

Figure 1 shows the bilateral trade discrepancy indexes for Cambodia as importer and as exporter (DIF(I) and DIF(E)) for 2013. The biggest discrepancies are observed for the trade reported with Singapore and Thailand, but significant discrepancies exist also with Republic of Korea and Malaysia. The discrepancies are in particular for Cambodia as importer, this may show that Cambodia is under-reporting imports from these partners, or that they are over-reporting their exports to Cambodia. The latter might be the reason for the discrepancy with Singapore is a trading hub and as such reports exports to Cambodia of goods that are only passing through its ports, but Cambodia reports these as imports from third countries based on the country of origin principle. On the other hand the DIF(E) is moderately positive with most countries, except for trade with the Philippines and Singapore.

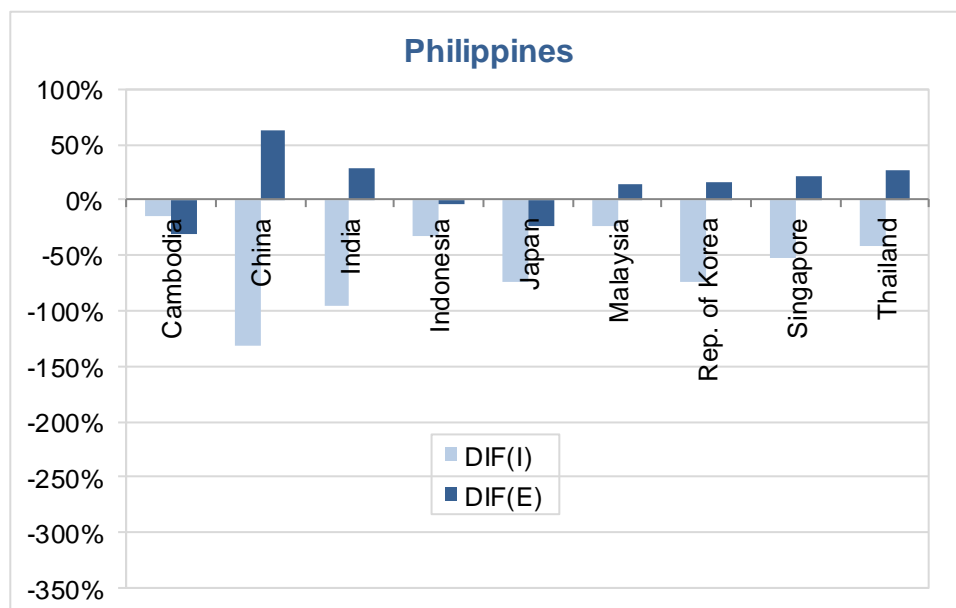
Figure 1: Bilateral trade discrepancy indexes for Cambodia and its partners, 2013



Source: own analysis of UN Comtrade data.

The Philippines

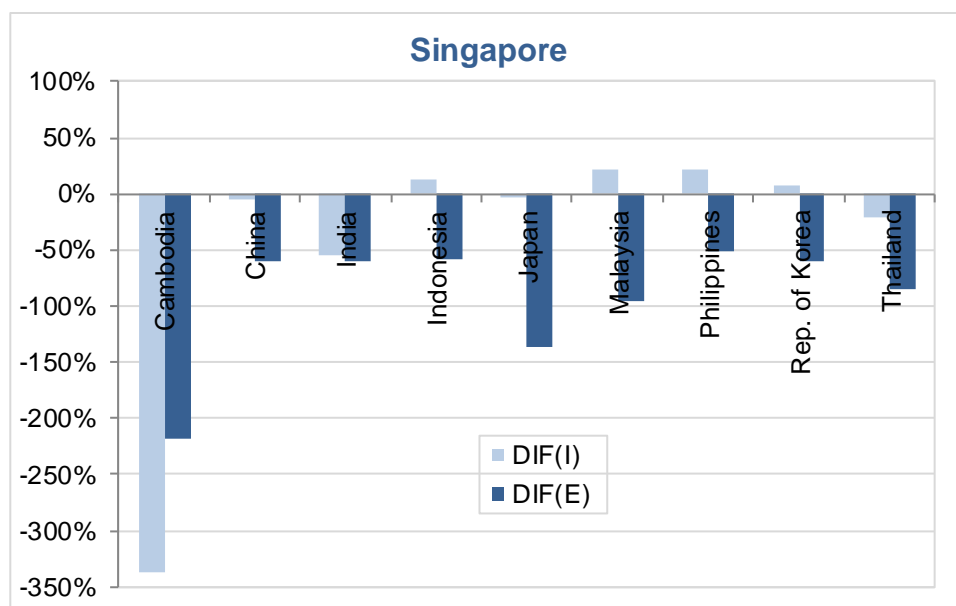
Figure 2 indicates large discrepancies in the DIF(I) –Philippines as importer– with partner countries such as China, India, Japan and the Republic of Korea. These discrepancies might mean that the Philippines are under-reporting their imports from these countries or that their partners are over-reporting their exports to the Philippines. The Philippines discrepancy as exporter index – DIF(E) – is large for trade with China, which could mean that the Philippines is under-reporting exports to China or that China is over-reporting imports from the Philippines – an indication that the trade between them might be going through Hong Kong, China.

Figure 2: Bilateral trade discrepancy indexes for the Philippines and its partners, 2013

Source: own analysis of UN Comtrade data.

Singapore

Figure 3 shows that the discrepancies for Singapore as exporter (DIF(E)) are smaller than -50% with all analysed trading partners, in particular, they are very large for trade flows with Cambodia and Japan. Singapore could be over-reporting exports to their partners or the other countries could be under-reporting imports from Singapore. This is fully in line with the role of Singapore as a trading hub. Goods that are not produced in Singapore are traded through its territory and reported by Singapore as exports to these countries, but their partners might not attribute these imports to Singapore but to countries where the goods were produced.¹⁷

Figure 3: Bilateral trade discrepancy index for Singapore and its partners, 2013

Source: own analysis of UN Comtrade data.

¹⁷ See IMTS recommendations in sections 5.2 and 5.3 below.

In both cases large discrepancy indexes for trade between Cambodia and Singapore were observed. It is really hard to understand the real causes for these discrepancies as this is a very high-level analysis. However, a recommendation can be made to the national statistical offices of these two countries and their international partners to investigate the main sources of these discrepancies and consequently improve the quality of trade statistics. Both Cambodia and Singapore are partners in ASEAN, where regional trade is an important factor of economic integration, so reliable trade data are important to deepen economic integration between these two countries.

5. Sources of asymmetries in merchandise trade statistics

The paper, so far, specified what bilateral trade asymmetries are and illustrated it with several examples and measurement. However, the question remains of what are the causes and how can they be solved. In the follow-up the paper illustrates some of the factors that can cause bilateral asymmetries. This overview is based on Guo, Webb, and Yamano (2009), Guo (2010), and Markhonko (2014).

5.1 Differences in valuations of imports and exports

The IMTS Manual recommends the use of statistical valuation methods based on the WTO Agreement on Valuation.¹⁸ To value exported goods it is recommended to use an FOB value (free on board), which includes the transaction value of the goods and the value of services performed to deliver goods to the border of the exporting country. Whereas, to value the imported goods it is recommended to use a CIF value (cost, insurance and freight), which includes the transaction value of the goods, the value of services performed to deliver goods to the border of the exporting country and the value of the services performed to deliver the goods from the border of the exporting country to the border of the importing country.

The differences in the recommended valuation methods introduce discrepancies in values of the reported exports/imports. An adjustment to make the exports/imports comparable is made, i.e. usually imports are adjusted to FOB value. The IMTS Manual further encourages countries to compile an FOB value of imported goods as supplementary information, or at least, to compile separate data for freight and insurance at the most detailed commodity and partner level possible. This supplementary information would be essential to reconcile some of the differences in mirror statistics. Unfortunately, only a few countries, such as Australia for example, report FOB values for both imports and exports.

5.2 Differences in attribution of trade partners

There are different options for attribution of partner countries for IMTS. The IMTS Manual recommends that countries use the *country of origin* attribution for imports and the *country of last known destination* attribution for exports. Furthermore, it also specifies that countries should use the provisions of the Revised Kyoto Convention to determine the country of origin of goods.¹⁹ To overcome the differences, the attribution of a second partner country based on the *country of consignment* principle is recommended for imports and encouraged for exports in the IMTS Manual.

¹⁸ See the WTO Agreement of Customs Valuation, article 8, paragraph 2. Available from: https://www.wto.org/english/docs_e/legal_e/20-val_01_e.htm

¹⁹ See Revised Kyoto Convention, Specific annex K / Chapter 1. Available from: http://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/conventions/pf_revised_kyoto_conv/kyoto_new.aspx

The difference in attribution of partner country is one of the largest causes of asymmetries in trade statistics. Due to customs duty attribution, countries have a strong interest in attributing the correct country of origin for their imports, which, in many cases, might be very different from the country of consignment. Different countries use different methods of partner country attribution, which is a potential source of trade discrepancies.

5.3 Differences in recording re-exports

Based on the IMTS Manual re-exports occur when goods enter the territory of one country and are subsequently shipped to another country without being transformed. For example, in the case of re-exports of Country A to Country B, one would expect that the importing Country B will actually report a different country (not A) as the exporter given the country of origin principle. Two economies in the region, Singapore and Hong Kong, China are well known for the fact that their merchandise trade (both imports and exports) significantly surpasses the size of their GDP due to large volume of re-exports.

A classic example is the trade between China and United States via Hong Kong, China (Guo, 2010). Goods that are produced in China are shipped to Hong Kong, China, and then re-exported (without changing any characteristics of the goods) to the United States. There are 4 possible outcomes for the recording for this relatively simple and common transaction, and each will result in a very different IMTS flow:

- 1) China knows that the last destination of its exports is the US and the US identifies China as the country of origin for its imports;
- 2) China knows that the last destination of its export is the US, however the US does not know that China is the country of origin and it records imports from Hong Kong, China;
- 3) China only knows that the goods are exported to Hong Kong, China, but the US is able to attribute the origin of the goods to China; or
- 4) China only knows that the goods are exported to Hong Kong, China and the US only knows that the goods are coming from Hong Kong, China.

The IMTS Manual recommends that countries include re-exports in the total exports, in addition to recording them separately for analytical purposes. In the example above Hong Kong, China would also need to include these goods into its exports, but also identify them as re-exports. However, in practice many countries don't record re-exports separately and it is difficult for countries to do so. In case re-exports are not available from IMTS, they can be estimated based on the supply and use tables (SUT), but these estimates are available at the total world level and not detailed by partner countries (Roos, 2006).

5.4 Other sources of discrepancies

There are other sources of discrepancies between the reported mirror data, such as:

- *Unallocated trade*: These are transactions that, due to confidentiality, are not allocated to a specific trade partner country or to a specific product code when they are reported to international organizations. This may be because of trade with partners under international embargoes or trade in products that a country does not want to disclose (e.g. arms). In many cases such trade transactions are recorded under product code H99 in the Harmonised System (Guo, Webb, and Yamano, 2009).

- *Trade system:* The IMTS Manual distinguishes between two trade systems, depending on what parts of the economic territory are included on the statistical territory: (1) the general trade system (statistical and economic territory of a country are the same); and (2) the special trade system, which can further be subdivided on strict and relaxed (some parts of the economic territory are excluded). IMTS Manual recommends countries to use the general trade system; however, it also recognises that in some cases the general system might not be feasible if there is no customs recording in some parts of the economic territory, such as in free zones. Application of different trade systems between countries can lead to discrepancies in mirror statistics and differences in reporting of the trade partner statistics.
- *Currency conversion:* The WTO Agreement on Customs Valuation²⁰ states that “the conversion rate to be used shall be that in effect at the time of exportation or the time of importation, as provided by each Member.” However, this can still result in different exchange rates applied and hence in discrepancies in mirror statistics, especially if the trade flow recording happens in different periods.
- *Recording of small transactions:* Differences in recording practices of small transactions may also cause discrepancies in mirror data. For example, in the European Union countries are allowed to collect less detailed information on transactions in value of less than EUR 1,000 and 1,000 kg (Eurostat, 2014).
- *Time lag:* Transactions can be recorded in different time periods as a result of the time shipments of merchandise between countries, particularly applicable to asymmetries in monthly data (Eurostat, 2014).
- *Differences in classifications:* Customs agencies, or other relevant authorities, may misclassify products or use different versions of the product classifications (e.g. HS2007 vs. HS2012), which causes discrepancies when looking at trade by product line (Guo, 2010).

6. Conclusion

There are many sources, or reasons, for bilateral trade asymmetries in IMTS, with the main ones being different interpretations of international statistical standards and the difficulty in knowing the final destination of the goods beyond countries' borders. As a result, bilateral trade asymmetries can be relatively large and have various impacts on quality of trade statistics or trade related policy.

Asymmetries in bilateral trade data also cause a significant issue for trade researchers. Balanced bilateral trade flows are crucial for constructing international SUTs and IOTs, which are in turn needed to estimate TiVA. Construction of international IOTs and estimation of TiVA already requires many assumptions and, hence, in the absence of consistent and reliable input data, the quality of such analysis is even more questionable.

There are some practical ideas on how to deal with these discrepancies and how to improve the quality of IMTS and thus help researchers to overcome the hurdles of unbalanced IMTS:

- *Using country of consignment:* A possible way to reduce asymmetries and improve bilateral data for analytical purposes would be to record partner country based on country of consignment for both imports and exports, as already recommended in the IMTS Manual.

²⁰ Article 9, para. 2. Available from: https://www.wto.org/english/docs_e/legal_e/20-val_01_e.htm

This seems to be especially useful if the ultimate objective is to measure trade in terms of value-added and to estimate the contributions of all trading partners in the GVCs (Markhonko, 2014).

- *Understanding the different trade systems:* Particular efforts could be made to understand the trade systems of the partners and to have a good overview of the different trade systems used (Markhonko, 2014).
- *Conducting bilateral reconciliation studies:* Such studies aim to reconcile the differences in bilateral trade flows between trading partners and understand the conceptual or methodological differences in data collection. As a result, they can lead to the harmonization of the conceptual frameworks between trading partners and improve the overall quality of trade statistics (UNDESA, 2013).
- *Improved reporting of re-exports:* IMTS are, in general, not very complete in coverage of re-exports. The best solution would be to improve the quality of reporting of re-exports, but in many cases this might be difficult and impractical. For trading partners, which have low values of re-exports, it might be justified to ignore them, but those where they are significant, e.g. China – United States (via Hong Kong, China),²¹ it would be worthwhile investing resources to improve the reporting of re-exports (Fung and Lau, 2003). Particular attention could be placed on economies that engage in trading activities with resulting high re-exports, such as Singapore and Hong Kong, China in Asia-Pacific.
- *Reconciliation of trade data for analytical purposes:* Many international trade databases use different methods to adjust for the asymmetries in trade data. Most widely trade data are from UN Comtrade that are reconciled either by using import data or some sort of data quality weighting method. For analytical purposes, and to achieve consistency between bilateral flows, it is common to define exports as mirror flows of imports, as done by WIOD for example (Dietzenbacher and others, 2013). That is mainly because imports data are perceived to be more accurate as the exports flows, since they are recorded based on country of origin principle. On the other hand, other databases, such as OECD and GTAP, calculate an export symmetry index which is used as proxy for data quality from a particular reporting country and hence bilateral trade data are weighted according to this proxy quality indicator (Fortanier and others, 2015).

Many authors have been researching bilateral trade asymmetries over the past years and the sources for these asymmetries are well understood. Most of the empirical research has been focused on looking at particular pairs (or clusters) of trading partners, most commonly trade between China and the United States, for example. This analysis, however, aims to present a method to analyse asymmetries on a multi-country basis and developed own presentation.

Nevertheless, it needs to be recognized that this analysis has deficiencies and it could be improved and expanded. Future research could aim to focus on the following aspects:

- The analysis could be expanded to all economies in Asia-Pacific, as data are readily available for most of the ESCAP members and associated members.
- The analysis could look at the bilateral trade asymmetries as a time series. That is, analyse the evolution of discrepancies over time and try to identify whether there are any patterns in

²¹ Fung and Lau (2003) claim that bilateral trade data of most countries with China are inaccurate; that includes United States, Japan and the European Union.

the datasets over time or any concrete breaks, which could indicate change in quality of IMTS data.

- The analysis could be expanded by focusing on particular products and/or product families. This enhanced view would increase the value of the analysis and give insight into where most discrepancies are and why. The reconciliation of data will, most likely, be most effective on a product-by-product analysis. Product-level analysis would also allow for analysis of physical quantities, rather than monetary values. Differences in monetary value of goods traded can arise due to customs valuation or other factors, whereas physical quantities could be perceived more objective.
- In order to fully understand the over- or under-reporting of exports/imports, reporting mechanisms used by the various countries would require more study. For each country, information on the use of trade system, valuation of exports/imports and the way partner territory specified would need to be collected.
- The analysis could be expanded by including re-exports and re-imports and their effects on trade flows, with a focus on territories mainly engaged in trading activities, such as Singapore and Hong Kong, China.

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Annex

Table 3: Bilateral trade asymmetries for the selected countries, 2013.

	Cambodia	China	India	Indonesia	Japan	Malaysia	Philippines	Rep. of Korea	Singapore	Thailand
Cambodia		0.28 0.36 0.08 22.8%	0.01 0.01 0.01 42.2%	0.01 0.02 0.01 36.5%	0.33 0.58 0.25 42.6%	0.13 0.19 0.07 33.6%	0.01 0.01 0.00 -14.8%	0.10 0.14 0.04 27.9%	0.79 0.18 -0.61 -337.0%	0.24 0.36 0.12 33.6%
China	3.41 3.00 -0.41 -13.5%		48.43 51.64 3.20 6.2%	36.93 29.85 -7.08 -23.7%	150.13 180.98 30.84 17.0%	45.93 33.73 -12.20 -36.2%	19.87 8.55 -11.31 -132.3%	91.16 83.05 -8.11 -9.8%	45.83 43.69 -2.14 -4.9%	32.72 37.73 5.01 13.3%
India	0.14 0.09 -0.04 -46.6%	16.42 16.97 0.55 3.3%		5.56 3.96 -1.59 -40.2%	7.33 7.07 -0.25 -3.6%	5.50 5.19 -0.31 -5.9%	1.47 0.75 -0.72 -95.0%	4.50 6.18 1.68 27.3%	14.19 9.12 -5.07 -55.5%	4.20 3.50 -0.70 -20.0%
Indonesia	0.31 0.25 -0.07 -26.5%	22.60 31.42 8.82 28.1%	13.03 14.98 1.95 13.0%		27.09 28.88 1.80 6.2%	10.67 8.87 -1.80 -20.3%	3.82 2.89 -0.92 -31.9%	11.42 13.19 1.77 13.4%	16.69 19.22 2.53 13.2%	6.06 8.07 2.01 24.9%
Japan	0.21 0.18 -0.03 -19.6%	129.40 162.25 32.84 20.2%	8.59 10.49 1.90 18.1%	17.03 19.28 2.25 11.7%		15.24 17.89 2.65 14.8%	9.68 5.59 -4.09 -73.3%	56.51 60.03 3.52 5.9%	20.98 20.39 -0.59 -2.9%	35.95 41.08 5.14 12.5%
Malaysia	0.24 0.14 -0.09 -67.4%	30.78 60.15 29.38 48.8%	8.16 9.33 1.17 12.5%	10.50 13.32 2.82 21.2%	25.12 29.75 4.63 15.6%		2.96 2.39 -0.57 -23.7%	8.31 11.10 2.79 25.1%	31.78 40.83 9.05 22.2%	12.66 13.25 0.59 4.4%
Philippines	0.01 0.01 0.00 -30.6%	6.58 18.18 11.60 63.8%	0.29 0.41 0.12 29.5%	0.80 0.78 -0.03 -3.3%	11.42 9.25 -2.18 -23.6%	1.30 1.51 0.21 13.9%		3.13 3.71 0.58 15.7%	4.01 5.09 1.07 21.1%	1.94 2.63 0.69 26.3%
Rep. of Korea	0.61 0.37 -0.24 -65.5%	145.87 183.07 37.20 20.3%	11.38 12.43 1.05 8.5%	11.57 11.59 0.02 0.2%	34.66 35.82 1.16 3.2%	8.59 9.71 1.12 11.6%	8.78 5.03 -3.76 -74.8%		22.29 24.03 1.74 7.2%	8.06 9.06 0.99 11.0%
Singapore	1.11 0.35 -0.76 -217.4%	48.37 30.06 -18.31 -60.9%	11.22 7.03 -4.19 -59.6%	40.55 25.58 -14.97 -58.5%	17.62 7.46 -10.17 -136.4%	49.91 25.43 -24.48 -96.3%	6.70 4.41 -2.29 -51.8%	16.62 10.37 -6.25 -60.3%		15.17 8.23 -6.95 -84.4%
Thailand	4.26 1.10 -3.16 -288.5%	27.24 38.52 11.28 29.3%	5.18 5.48 0.29 5.4%	10.87 10.70 -0.17 -1.6%	22.24 22.04 -0.20 -0.9%	13.01 12.26 -0.75 -6.1%	5.04 3.56 -1.48 -41.5%	4.59 5.23 0.64 12.3%	11.24 9.27 -1.96 -21.2%	

Source: analysis based on UN Comtrade data.