Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

15-Sep-2008

English - Or. English

STATISTICS DIRECTORATE

STD/SES/WPTGS(2008)8
Unclassified

Working Party on International Trade in Goods and Trade in Services Statistics

HARMONISING INTERNATIONAL BILATERAL TRADE DATA FOR INTER-COUNTRY INPUT-OUTPUT ANALYSES: STATISTICAL ISSUES

Item 7 a) of the Agenda

22-24 September 2008, OECD Headquarters, Paris

This document has been prepared by Dong Guo, Norihiko Yamano and Colin Webb of OECD's Directorate for Science, Technology and Industry (STI). It is a draft of a forthcoming STI Working Paper and is presented under item 7 b) of the agenda for discussion by WPTGS delegates.

Contact person: Dong GUO, E-mail: dong.guo@oecd.org ; Norihiko YAMANO, E-mail: norihiko.yamano@oecd.org ; Colin WEBB, E-mail: colin.webb@oecd.org

JT03250584

English - Or. English

TOWARDS HARMONISED BILATERAL TRADE DATA FOR INTER-COUNTRY INPUT-OUTPUT ANALYSES: STATISTICAL ISSUES

Dong Guo, Norihiko Yamano and Colin Webb

ABSTRACT

Understanding the increasingly complex structures of international trade is an important concern for policy makers as deepening economic integration is characterised by the growing trade in intermediate goods and services between countries. Analyses based on international input-output tables can help address trade related policy issues as well as providing other insights into the socio-economic and environmental impacts of globalisation. To link national input-output tables in order to carry out interdependent analyses across countries requires a consistent set of harmonised international bilateral trade data that ideally reflects recent output by the economic activities in question. This paper discusses the challenges faced when attempting to construct appropriate bilateral trade matrices using annual data collected by the OECD and United Nations, as well as national sources. While the main focus is on the increasing presence of "re-exports" in reported exports of goods data, this paper also addresses some other statistical and data issues that need to be considered, such as treatment of confidential (or "unallocated") trade in goods; trade in second-hand goods, scrap metal and other waste; differences in trade statistics across international statistical agencies; and the additional problems encountered when converting product-based trade data to industry-based classifications. Issues concerning Balance of Payments data, the main source for trade in services, are also addressed.

VERS DES DONNÉES HARMONISÉES SUR LES ÉCHANGES BILATÉRAUX AUX FINS D'ANALYSES D'ENTRÉES-SORTIES INTERNATIONALES : QUESTIONS STATISTIQUES

Dong Guo, Norihiko Yamano et Colin Webb

RÉSUMÉ

Comprendre les structures de plus en plus complexes du commerce international constitue un enjeu important pour les responsables de l'action publique, dans la mesure où le renforcement de l'intégration économique se caractérise par des échanges croissants de services ainsi que de biens intermédiaires entre pays. Les analyses réalisées à partir de tableaux d'entrées-sorties internationaux peuvent apporter des éléments de réponse aux questions de politique publique liées aux échanges, et fournir d'autres enseignements sur les répercussions socioéconomiques et environnementales de la mondialisation. Pour analyser les relations d'interdépendance entre pays il faut coupler les tableaux d'entrées-sorties nationaux; pour ce faire, il faut disposer d'un ensemble de données harmonisées cohérentes portant sur les échanges internationaux et correspondant dans l'idéal à la production récente des activités économiques. Ce document examine les difficultés rencontrées pour construire des tableaux de commerce bilatéral adéquats à partir des bases de données annuelles sur le commerce international gérées par l'OCDE et les Nations Unies, ou proviennent aussi de sources nationales. Ce papier traite principalement de la présence croissante de « réexportations » dans les exportations de marchandises recensées, mais il soulève également d'autres problèmes statistiques et de données dont il faut tenir compte, notamment les différences de données du commerce entre les divers organismes statistiques internationaux, le traitement des échanges de biens confidentiels (ou « non attribués »), le commerce des biens d'occasion, de débris de métaux et autres déchets, ainsi que les problèmes supplémentaires liés à la conversion des données d'échange par produit en données d'échange par branche d'activité. Ce document soulève aussi des questions concernant les données de la Balance des Paiements, laquelle est la principale source d'informations sur les échanges de services.

STI Working Paper Series

The Working Paper series of the OECD Directorate for Science, Technology and Industry is designed to make available to a wider readership selected studies prepared by staff in the Directorate or by outside consultants working on OECD projects. The papers included in the series cover a broad range of issues, of both a technical and policy-analytical nature, in the areas of work of the DSTI. The Working Papers are generally available only in their original language – English or French – with a summary in the other. Comments on the papers are invited, and should be sent to the Directorate for Science, Technology and Industry, OECD, 2 rue André-Pascal, 75775 Paris Cedex 16, France.

The opinions expressed in these papers are the sole responsibility of the author(s) and do not necessarily reflect those of the OECD or of the governments of its member countries.

---

http://www.oecd.org/sti/working-papers

SUMMARY FOR WPTGS DELEGATES

Analyses based on international input-output (I-O) tables can help address trade-related policy issues as well as providing insights into the socio-economic and environmental impacts of globalisation. To link national I-O tables in order to carry out interdependent analyses across countries requires a consistent set of harmonised international bilateral trade data. The main aims of the paper are to

- highlight the challenges faced when attempting to construct appropriate bilateral trade matrices, using the widely-used annual trade statistics published by the OECD and United Nations (ITCS and COMTRADE, respectively), to link *harmonised* I-O tables. In particular, the presence of 're-exports' in the published statistics;
- generally inform users of other particular types of transactions that are present in annual merchandise trade statistics, their identification and potential effects on analyses. For example, 'confidential' trade in goods, 'goods for processing', consequences of 'merchanting', and trade in second-hand goods, scrap metal and other waste;
- describe the problems encountered when a) converting product-based (HS) bilateral trade in goods data to an industry classification (ISIC Rev. 3) and/or linking to BPM5 and SNA93 data; and b) linking BPM5 trade in services data to ISIC Rev.3 industries;
- alert researchers to the impending changes in Balance of Payments and SNA definitions that will alter the ways in which certain transactions (goods for processing and merchanting) are recorded. This will have an impact on future construction of Supply-Use and Input-Output tables and future methods for linking with bilateral trade data.
- suggest possible short- and long-term solutions for adjusting trade data for I-O analyses.

While trade statisticians and experienced researchers are familiar with these issues, many users are not and may undertake trade-related studies based on Comtrade on ITCS without taking some of these issues into consideration. *Basic message: There is more to international trade statistics than meets the eye – this is an attempt at a user guide of possible pitfalls, with an emphasis on linking bilateral trade to I-O tables.*

All comments and suggestions from WPTGS delegates would be greatly appreciated.

TABLE OF CONTENTS

Boxes

1. INTRODUCTION

Economic globalization is currently characterized not only by increasing international trade in final goods but also by increasing trade in intermediate goods and service transactions as innovation and production processes are fragmented across countries. The structure of such trends can be tracked by well-built multi-national input-output (I-O) tables. To do so, researchers often link standardised (or harmonised) national I-O tables to international bilateral trade matrices using standard assumptions (see Box 1.) In recent years, the OECD has undertaken efforts to improve and increase the coverage of its database of harmonized I-O tables, not least to incorporate major non-OECD countries such as Brazil, China, India, Indonesia and Russia (Yamano and Ahmad, 2006). A useful feature of the OECD I-O tables is that intermediate inputs are divided into domestically produced and imported goods and services. To extend the analytical power of this data set, OECD is embarking on a project to develop bilateral trade matrices that can help identify the country of origin of imported intermediate inputs and be used to link I-O tables. However, this requires analyses of currently available international bilateral trade data to identify areas where adjustments may be required to best match the trade data in I-O tables.

This paper discusses the challenges faced when attempting to construct consistent bilateral trade matrices using the widely used annual databases of international trade hosted by the OECD and United Nations Statistical Division (UNSD)[1] as well as national sources. While the focus is on identifying and measuring re-exported goods, other reasons for inconsistencies in so-called *mirror trade* are discussed as is the issue of identifying internationally traded goods that were not manufactured recently (for example second-hand goods, scrap metal and other waste products). The additional problems faced when attempting to convert trade data from product classifications to industry classification are also addressed – not least identifying imported intermediate products While the discussion mainly concerns international trade in goods, one cannot ignore the issues concerning measurement of international trade in services and the related methodological requirements of Balance of Payments (BOP) accounts. National Supply-Use tables (SUTs) and I-O tables are constructed within the framework of National Accounts (according to SNA93[2] or, in EU, ESA95 recommendations) which use BOP definitions for aggregate international trade data. Ultimately, to link national harmonised I-O tables, matrices with 'adjusted' bilateral trade data for both goods and services are required. Discussion of certain types of international trade in services such as Foreign Affiliates Trade in Services (FATS) data is not included here but can be found in separate studies such as Bensidoun and Ünal-Kesenci (2008)[3].

1. For trade in goods, OECD's International Trade in Commodity Statistics (ITCS) and U.N.'s Comtrade database.
2. http://unstats.un.org/unsd/sna1993/toctop.asp
3. The General Agreement on Trade in Services (GATS) recognises four modes of provision of trade in services. BOP covers modes 1 and 2 (Cross-border supply and Consumption abroad) while FATS mainly covers mode 3 (Commercial presence). Mode 4 (Presence of natural persons) can be found in both BOP and FATS.

Box 1. Using inter-regional trade matrices in input-output systems

In general, to measure economic interactions between regions, there are two different ways in input-output systems to take account of trade flows: inter-regional input-output (IRIO) and multi-regional input-output (MRIO).

For **IRIO**, suppose that an inter-regional trade flow can be expressed as z_{ij}^{hm}- i.e. the value of intermediate goods from industry *i* in region *h* purchased by industry *j* in region *m*; that x_j^m is the total output of industry *j* in region *m*; that f_m is the final demand in region *m*; and that *N* and *R* represent the number of industries and regions, respectively; then, in IRIO, the total output of industry *j* in region *m* can be written as:

$$x_j^m = \sum_{h=1}^{R} \sum_{i=1}^{N} a_{ij}^{hm} * x_j^m + f_j^m \qquad \text{or, in matrix format, } \mathbf{X} = \mathbf{AX} + \mathbf{f},$$

where a_{ij}^{hm}=z_{ij}^{hm}/x_j^m are the input coefficients (**A**) and **X** and **f** are the output and final demand vectors respectively. In IRIO, the data requirements are substantial as consistent matrices of inter-regional, inter-industry trade are required.

Alternatively, **MRIO** makes some assumptions to build matrices with reduced data requirements. Notably, it uses transactions data where the sector of destination is ignored. Rather than using trade flows between industries *i* and *j*, it requires z_i^{hm}: the value of goods i that region m ships from region *h*. This yields the proportion of good *i* in region *m* shipped from other regions, which can be called *trade coefficient* of region *m* of goods *i* and expressed as $t_i^{hm} = z_i^{hm}/x_i^m$ with $\sum_{h=1}^{R} t_i^{hm}$=1. It requires that each region's input coefficient (a_{ij}^{mm}, *m* = 1, 2, …, *R*) available, then in MRIO system, the inter-regional flow can be expressed as:

$$x_j^m = \sum_{h=1}^{R} \sum_{i=1}^{N} t_i^{hm} * a_{ij}^{mm} * x_j^m + \sum_{i=1}^{R} t_i^{hm} * f_j^m \qquad \text{or, in matrix format, } \mathbf{X} = \mathbf{T}\hat{\mathbf{A}}\mathbf{X} + \mathbf{Tf}$$

Source: Isard et al (1998)

For measuring trade flows among the 40 or so countries targeted in OECD I-O database, the trade coefficient matrix can be estimated using OECD's STAN Bilateral Trade by industry Database (BTD) and ITCS for member countries and UN Comtrade Database for non-member countries.

<< *double check the text and equations* >>

2. INTERNATIONAL TRADE IN GOODS: STATISTICAL ISSUES AND DATA ISSUES

2.1. Origins of problems with 'mirror statistics' – an overview

Trade is the activity of buying, selling, or exchanging goods or services within a country or between countries. In this paper we concentrate on international trade between countries. Statistically, international merchandise trade in goods measures physical movements of goods across international frontiers. In Balance of Payments, BPM5 definitions, international trade should be recorded when there has been a change of ownership of goods between a resident and non-resident.

When conducting analyses of trade flows between countries or regions, it is highly desirable that merchandise trade data recorded by country A for exports to country B match data recorded by country B for imports from country A - in order to produce consistent A-B trade flow matrices by year (and by commodity groups). Unfortunately this is rarely the case. Problems with 'mirror' statistics occur for many reasons, including

- different valuations for imports (c.i.f.) and exports (f.o.b);
- different trade recording systems for imports and exports, general v. special trade[4];
- differences across countries in definitions of trade partners;
- differences in thresholds for recording international trade[5] which by extension means differences in definition of trade in 'small transactions';
- consequences of 'merchanting'; and
- others, such as timing of measurement (recording by customs), differing allocation of product classification to goods or mis-attribution; and smuggling (Tsigas *et al.*1992).

At an aggregate level, in the context of National Accounts and Balance of Payments (BoP), adjustments are made to merchandise trade in goods to produce more consistent estimates. For example, valuation adjustments for imports (i.e. costs of insurance and freight are deducted from imports of goods and added to imports of services), adjustments due to timing (i.e. when time of change in ownership does not coincide with movement of goods), and adjustments when there has been a change in ownership but the goods have not crossed the customs frontier (for example, large value capital items such as ships and aircraft). However, few national authorities make such BoP adjustments at more detailed levels – either by partner country or by commodity (even for relatively aggregate levels). Also, while United Nations (1998) provides clear recommendations on defining trade partners, practices may differ across countries when compiling trade statistics. Close attention needs to be paid to national definitions when looking at trade statistics.

For analyses of the impact of globalization, linking harmonised I-O tables with consistent trade matrices can provide a range of interesting insights (inter-dependencies etc.). While the general problems

4. For definitions of different trade systems, c.i.f. and f.o.b, please refer to Table3.

5. In the EU, external trade statistics apply a transaction threshold system. Transactions below a certain value or quantity do not have to be reported by Member States. For extra-EU trade this threshold is currently 1000 Euros or 1000 kg in net mass. For intra-EU trade statistics the threshold is 200 Euros. (see: http://europa.eu.int/estatref/info/sdds/en/ext/ext_sm.htm). Note that the EU Intrastat system is the main reason for differences in trade statistics published by OECD/UN and EU (see Lindner, 2008).

connected with mirror statistics need to be addressed, an increasingly significant problem across an increasing number of countries is the presence of **'re-exports'** in recorded trade statistics. Indeed it is a major reason for the existing discrepancies between international trade data reported by importers and exporters.

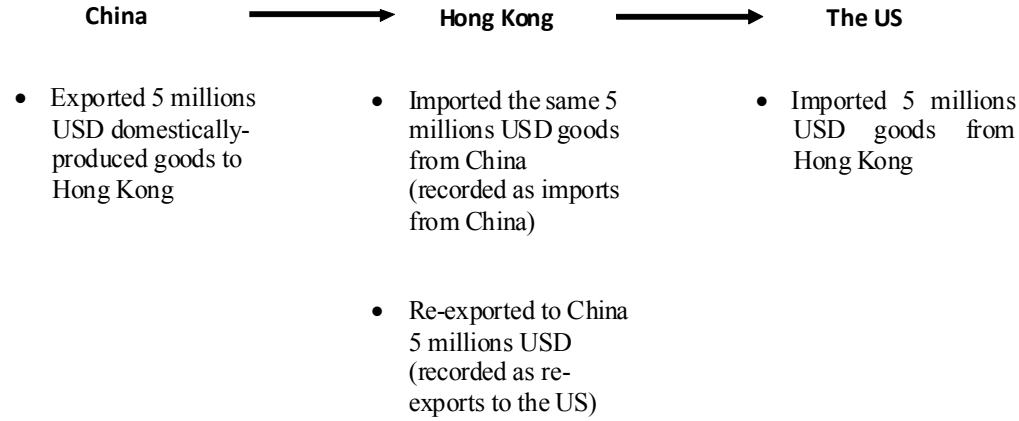
2.2. Re-exports

According to the U.N. definition of general trade flows (United Nations, 1998), re-exports take place when goods enter a customs territory from one country and are shipped to another country without being transformed[6]. It is also known as transhipment (see Mellens *et al*., 2007, Andriamananjara *et al.,* 2004, Fung and Lau, 1998). Although rarely recorded separately in published national or international databases (see Table 3 for availability in ITCS and Comtrade), re-exports can be distinguished from other trade flows as demonstrated by Roos (2005, 2006) in the case of the Netherlands (where re-exports now account for over 40% of recorded exports).

The presence of re-exports is most likely in those countries and regions with favourable geographical positions from a perspective of intercontinental transportation. These include the Netherlands, Belgium, Germany, and probably France in Europe, and Hong Kong and Singapore in Asia, in the sense that these countries act as the hubs for shipments of trade between countries of their continental region and the rest of the world. For example, major hub functions between the European economy and the rest of the world are located at Dutch and Belgian ports while the ports of Hong Kong play a similar role for eastern Asia. In this context it should be noted that about 90% of the world's trade in goods is transported by sea (possible reference: http://www.unescap.org/oes/state/st020211.htm).

When coupled with differences across countries in definitions of country of origin and country of consignment for import partners, re-exports (and re-imports) can significantly increase export/import discrepancies between countries. For example, if , China exports 5 millions USD domestically-produced goods to the US via Hong Kong, then effectively China exports 5 million USD domestically-produced goods to Hong Kong and Hong Kong re-exports the same amount to the US (see figure 1).

Figure 1. An example of flows of goods in three countries/regions



6. A brief note about exports and re-exports is attached to UN Comtrade database at http://comtrade.un.org/kb/article.aspx?id=10152

	Exports recorded by China	Imports recorded by U.S.	Possible induced trade discrepancy between China and U.S.
(1)	Exports to the U.S.	Imports from China	-
(2)	Exports to the U.S.	Imports from Hong Kong	USD 5 million
(3)	Exports to Hong Kong	Imports from China	USD 5 million
(4)	Exports to Hong Kong	Imports from Hong Kong	USD 10 million

However, depending on how the transaction is recorded by each country, discrepancies in trade data may or may not arise. Taking the above example whereby China exports domestically produced goods to the U.S. via Hong Kong, from the perspective of Hong Kong, imports from China are recorded as are re-exports to the U.S. as shown in figure 1. However, for both China and the U.S., data compilers may record the transaction differently depending on the information available to them. Both countries follow the recommendations of UN (1998) to define their trading partners, as country of origin for imports and last known destination for exports. However, the US also takes country of shipment as an import partner country if country of origin could not be identified. Note that, the last known destination also limits the information known at the time of exports as specified in UN (1998). Therefore, there are potentially four different combinations recording the 5-million-dollar trade transaction:

1. China knows the last known destination of the exported goods is the U.S., and the U.S. identifies the origin of the goods as China;
2. China knows the last known destination of the exported goods is the U.S., however, the U.S. also could not identify the origin of the imports, but only can track that it is shipped from Hong Kong;
3. China only knows the exports go to Hong Kong[7], no further information of future destination is available, but somehow, the U.S. knows the origin of their imports are from China; and
4. China only knows the exports go to Hong Kong, no further information of future destination is available, neither can the U.S. track the origin of the import but only the shipment region is Hong Kong.

The different recordings are also illustrated in figure 1. In fact, this example reflects the reality of the long-existing and controversial trade discrepancies between China and the U.S. as shown in Table 1.

Table 1. Official U.S. and Chinese merchandise trade data (billion USD)

Year	official U.S. exports to China (U.S. data)	official Chinese imports from the U.S. (Chinese data)	Official U.S. imports from China (U.S. data)	Official Chinese exports to the U.S. (Chinese data)	Official U.S. - China trade balance (U.S. data)	Official U.S.- China trade balance (Chinese data)
1995	11.7	16.1	45.6	24.7	-33.8	-8.6
1996	12.0	16.2	51.5	26.7	-39.5	-10.5
1997	12.8	16.3	62.5	32.7	-49.7	-16.4
1998	14.3	17.0	71.2	38.0	-56.9	-21.0
1999	13.1	19.5	81.8	41.9	-68.7	-22.4
2000	16.2	22.4	100.0	52.1	-83.8	-29.7
2001	19.2	26.2	102.3	54.3	-83.1	-28.1
2002	22.1	27.2	125.2	70.0	-103.1	-42.8

Source: Fung and Lau (2003) Table 1.

7. According to Fung and Lau (2001), before 1993, Chinese customs counted all exports to Hong Kong whether they were consumed in Hong Kong or re-exported to a third party. Despite efforts made since 1993, China still cannot fully track the final destination of the goods exported to Hong Kong. Also see He (2007).

Note that this example does not deal with the possibility of mark-ups in Hong Kong (via branding, re-packaging etc.) before the goods are shipped to U.S. so that, for example, the USD 50 million worth of goods shipped from China to Hong Kong become USD 60 million worth of goods imported by USA.

2.2.1. Re-exports – a growing phenomenon

As liberalization of global trade increases, more countries, particularly those with special trade status or geographical locations (such as the Netherlands, Belgium, Hong Kong and Singapore), are starting to pay more attention to their trade flows as the traditionally domestically-produced goods are accounting for less of the total volume of trade with their partner countries and increasing asymmetries in trade statistics with their partner countries become apparent (Geyer-Schaefer 2007). The classic case is the trade discrepancy between China and the U.S. where re-exports from Hong Kong account for a very large share (see table 2). In the case of the Netherlands, the trend of increasing re-exports started in the mid of the 80s, and has continued since then. Currently, re-exports account for more than 40% of the total exports in the country compared to less than 20% in 1990 (Mellens *et al*., 2007, Kusters and Verbruggen 2001). Increasing re-exports is a worldwide trend, affecting not only Hong Kong and the Netherlands but countries such as Singapore and Germany. For Hong Kong the average growth rate of re-exports was about 18% from 1983 to 2005, while for the Netherlands it was about 9% between 1985 and 1997 and for Germany, the annual growth in re-exports from 1992 to 2002 was about 14%. Estimates of re-exports as a share of total exports varies across countries - in Germany it is about 15%, in Singapore, more that 50%, while in Hong Kong, it is around 95% (Mellens *et al*., 2007).

Table 2. Re-exports through Hong Kong (USD billion)

Year	Hong Kong re-exports of U.S. goods to China (Hong Kong data)	Hong Kong re-exports as a share of official U.S. data on exports to China (%)	Hong Kong re-exports of Chinese goods to the U.S. (Hong Kong data)	Hong Kong re-exports as a share of official Chinese data on exports to the U.S. (%)
1995	5.0	42.7	27.6	111.7
1996	5.9	49.2	29.2	109.4
1997	6.0	46.9	31.3	95.7
1998	5.3	37.1	31.1	81.8
1999	5.4	41.2	32.1	76.6
2000	6.1	37.7	36.5	70.1
2001	6.5	33.9	33.3	61.3
2002	6.2	28.1	34.3	49.0

Source: Fung and Lau (2003) Table 2.

As mentioned earlier, UN (1998) considers re-exports to be foreign goods exported from any part of the economic territory of a country in the same state[8] as previously imported[9]. However, in practice, countries have different ways to define and account for re-exports and consequently different methods for refining trade flow data. In the Netherlands, for example, re-exports are imported goods leaving the Netherlands in a largely unprocessed state. That is, a Dutch trader may buy goods in the United States, store them in his own warehouse searching for a buyer, and then export them to Germany. There are three different ways to define the re-exports, which are (1) based on the origin criteria, (2) based on the rule of

8. The term "goods in the same state" includes goods which underwent processing that did not change their origin. Re-packing, splitting into lots, sorting or grading, marking and the like are not considered as undergoing a process of transformation of a good.

9. For the definition of re-exports flows in general trade system and special trade system, see UN (1998), page. 27, paragraph 78 and page 30, paragraph 84, respectively.

value added, (3) the change code of a good. A distinction also has to be made for other types of flows such as transit and quasi transit via a custom warehouses or through the Netherlands (Roos, 2005).

2.2.2. Re-exports – Methodological issues

Roos (2005) presented some ways to identify and measure re-exports in the **Netherlands**. In practice, companies in the Netherlands have to provide Statistics Netherlands with a code to specify the flow to distinguish re-exports and domestic exports. In practice, not every company provides the correct code and as a result only one-third of what is assumed to be re-exports are reported in this way.

Re-exports can be estimated by using the information in the supply-and-use tables of National Accounts. This method can provide estimates at a reasonably detailed level of products and was applied to estimate re-exports of the Netherlands in the nineties. However, it has the drawback of only providing data at the total world level i.e. without additional information by partner country. Another way of identifying re-exports is to compare the volume of imports to the volumes exports of the company. If measured imports are more or less equal to exports for the same product code, then the exports are probably re-exports, while if measured exports are notably higher than imports, then there is some domestic production. Usually the largest exporters are profiled to enhance the estimations. Note that some other factors, such as production structure, can be taken into account of estimating re-exports. For example, if certain goods are not produced or grown in a country (*e.g.* bananas), then all exports of such goods can be considered re-exports (Roos 2006).

In **New Zealand** re-exports are defined as "merchandise exports that were earlier imported into New Zealand and comprise less than 50 percent New Zealand content by value." New Zealand has adopted a value added based assessment to determine whether a "transformation" of a good is "substantial", which is called "50 percent New Zealand content by value". Actually, it is a simplified definition, referring to the exact rules of origin in the Customs and Excise Regulations that govern whether a good is of domestic or foreign origin. In detail, the "50 percent rule of origin" is calculated as:

$$\frac{\textit{Qualifying Expenditure (QE)}}{\textit{Factory Cost (FC)}}$$

which is expressed as a percentage, where qualifying expenditure (*QE*) are domestic expenditure on materials, labour & overheads, while Factory Cost (*FC*) are the total expenditure on materials, labour & overheads, including (1) the purchase price, (2) overseas freight and insurance, (3) port and clearance charges, and (4) inward transport to store, but not (1) customs duty, (2) anti-dumping duty, (3) excise duty, and (4) sales & goods and services taxes. In March 2004, New Zealand implemented an electronic system for tracing the origin of a good being exported through New Zealand customs. This allows the timely transfer of monthly exports statistics to the Statistics New Zealand so that re-exports statistics can be compiled along with the total exports statistics[10]. Note that trade statistics in New Zealand are compiled at Harmonised System of 10 digits (HS 10).

In **Hong Kong**, more than 90% of merchandise trade is due to re-exports (re-imports) mainly involving China. This high profile case of re-exports has been recognised by many researchers in recent years with much effort going into making necessary adjustments to trade statistics prior to analyses. For example, in the series of analyses by Fung and Lau since 1998, they used the trade data from China, the US and Hong Kong to re-adjust the data on bilateral trade between the US and China by taking into account of different aspects of this issues which could cause the discrepancies, such as the uncovered re-exports data

10. For more detail, see Statistics New Zealand (2006).

in Hong Kong (1998), the measurement of exports and imports[11], smuggling, markup rate and trade in services (2001, 2003) - adjusting the data covering the period from 1998 to 2002. Recently Ferrantino and Wang (2007) tried to explore reasons for discrepancies by establishing a regression model.

Further, Noda (1997) and Feenstra *et al*. (2005) provide some methods to build trade matrices by using more extensive trade statistics. For example, Noda (1997) constructed an Hong Kong re-export trade matrix by using detailed re-exports statistics from 1988 to 1995. If the re-export value of a certain commodity from original country A_i to trading partner A_j via Hong Kong is designated as e_{ij}, then the total re-exporting value of this commodity to trading partner A_j from different origin countries via Hong Kong, ReX_j, can be expressed as $\mathrm{Re}X_j = \sum_{i=1}^{m} e_{ij}$, where m is the number of originating countries. Note that Hong Kong merchandise trade statistics are compiled at the 8-digit level of HS.

Feenstra *et al*. (2005), on the other hand, adjusted the trade flows between China/Hong Kong and other countries by taking into account the re-exports between China and Hong Kong. Their starting point is to consider the value-added generated in Hong Kong when the re-exports occur. Different mark-up rates are applied to different destination countries based on 1-digit SITC level according to the availability of trade statistics for Chinese exports to Hong Kong and the Hong Kong re-exports of the same commodities. That is, the mark-up of the value added is calculated by multiplying the mark-up rate to the value of Chinese re-exports through Hong Kong to the destination countries. However, in order to avoid the situation in which the Hong Kong re-export value added is higher than the import value from China as reported in UN trade statistics, the value added of Hong Kong is re-defined as:

HK VA = Mark-up rate × min {UN country imports from China, China re-exports to UN country}

Note that the import statistics from China reported by UN are at 4-digit SITC level. By doing so, for each country in the UN dataset, the value of imports from China is reduced by the calculated *HK VA*, while the value of imports from Hong Kong is increased by the calculated *HK VA*.

Jin (2005) also provides an interesting discussion concentrating on 'processing trade' and concludes:

> *"Hong Kong's re-export of Chinese goods, in particular Chinese processing goods, is the major reason for discrepancies in China's reported trade statistics with its major partners. The results reflect changing economic reality rather than casting doubt on the quality of published trade data: the real expansion of Chinese foreign trade in the last twenty years is due to the massive outsourcing schemes of foreign invested enterprises into the low-margin processing sector in China. Despite the decreasing trend in reliance on Hong Kong, the increasing scale of the processing trade means large discrepancies will still exist in the future."*

11. Such as the different valuations of exports and imports used by the US and China. Exports are measured by China as free on board (f.o.b.) while for the US the valuation is freight alongside ship (f.a.s.) - the difference being the cost of loading the goods from alongside the vessel or aircraft onto the vessel or aircraft. For import measurement, both countries use cost, insurance, and freight (c.i.f.). Note that to convert f.a.s. value to f.o.b. value, 1% cost is added to the f.a.s. exports value (see Fung and Lau, 2003).

2.3. Other data issues – an overview

When linking I-O tables we need to have trade in goods matrices that are consistent with countries' data for domestic production and intermediate consumption and thus adjustments for re-exports (re-imports) are an obvious priority. I-O analytical tools, especially multiregional/multinational I-O tables that link production structures across countries, are increasingly being used to address a wide range of socio-economic and environmental issues such as embodied carbon dioxide (CO_2) emissions (Ahmad and Wyckoff, 2003), international spatial organization of the motor vehicle production (Wixted, 2006), and material and environmental flows measurement (Wixted *et al.,* 2006). If multinational I-O tables are not well constructed, subsequent analyses may be misleading.

Besides re-exports, there are other issues related to international trade in goods data, which should be considered when linking I-O tables. These include:

- "Unallocated trade data': This is trade that is not recorded in international databases under regular (HS or SITC) product codes and/or not recorded by partner country, due to confidentiality or other reasons. Such transactions may be recorded with special codes (e.g. HS 99 for products). Unallocated trade as a share of total trade varies across countries and is often likely to be concentrated in certain product groups or industries. The extent to which special codes are used may even vary across time. In order to optimise trade data for linking input-output tables it would be useful to have an idea of the underlying composition of any "unallocated trade";

- Identification of trade in second-hand goods (e.g. transport equipment): Not the result of recent production and thus should not be linked to manufacturing production data for a given year;

- Identification of certain scrap and waste products for recycling or disposal (e.g. PCs);

- Identification of exports from the recycling industry: For example, distinguishing exports of recycled metals or paper from exports of similar products manufactured from raw materials;

- Consequences of 'merchanting': If a merchant in country A buys goods in country B and sells them to country C, and the physical movement of goods is directly from B to C, then the value of imports recorded by country C is usually greater than the value of exports recorded by country B – the difference being recorded as a merchanting service credit in the Balance of Payments account of country A. See Takeda (2006) for detailed discussion;

- Differences in trade structures when comparing, within countries, merchandise trade statistics found in ITCS or Comtrade with those given in official Supply-Use or I-O tables even when allowing for the differences in definitions used for BoP and customs based trade statistics;

- *Miscellaneous*: For example, the significant impact of VAT intra-Community missing trader fraud ('Carousel fraud') as documented by UK affecting high-value low weight goods (such as mobile phones). 'Official' adjustments only made for total goods in a Balance of Payments context - upward adjustments to imports of £1.7 billion-in 1999, £2.8 billion in 2000, £7.1 billion in 2001 and £11.1 billion in 2002. – see www.statistics.gov.uk/cci/article.asp?id=402

Also, for certain trade data sources, such as UN Comtrade and OECD ITCS, there may be differences in reported trade statistics for certain countries, by partner country as well at total level.

Table 3. Trade data definitions and availability of re-exports data

Country	Exports partner (UN)	Imports partner (UN) [1]	Trade system [2]	Trade Valuation Exports/Imports [3]	Re-exports recorded in I-O tables	Re-exports reported in Comtrade or ITCS
EU countries	**L**	**O/C**	**S [4]**	**FOB/CIF [5]**	**yes [6]**	
Other OECD countries						
Australia	L	O	S/G	FOB/FOB	-	
Canada	L	O	G	FOB/FOB	yes	
Iceland	L	O	S	FOB/CIF	-	
Japan	L	O	G	FOB/CIF	-	
Korea	L	O	S	FOB/CIF	-	
Mexico	L	O	G	FOB/CIF	-	
New Zealand	L	C	G	FOB/CIF	-	Yes
Norway	L	O	G	FOB/CIF	yes	
Switzerland	L	O	S	FOB/CIF	yes	-
Turkey	L	O	S	FOB/CIF	yes	-
United States	L	O	G [7]	FAS [8]/CIF	-	Yes
Non-OECD countries						
Argentina	L	O	G	FOB/CIF	-	-
Brazil	L	O	S	FOB/CIF	-	-
China	L	O	G	FOB/CIF	-	-
Chinese Taipei					Yes	-
Hong Kong, China	L	C	G	FOB/CIF	-	Yes
India	L	O	G	FOB/CIF	-	-
Indonesia	L	O	S	FOB/CIF	-	-
Israel	Sale	O	S	FOB/CIF	-	-
Russia	L	O	G	FOB/CIF	-	Yes
Singapore	L	O	G	FOB/CIF	-	Yes
South Africa	L	O	G	FOB	Yes	-

L: Last known destination at the time of shipment.
1. O: Country of Origin; C: Country of Consignment; O/C: Country of Origin / Country of consignment for intra-EU.
2. G: **General trade**; S: **Special trade**. According to IMTS (UN, 1998, paragraph 66 and 67), the general trade system is in use when the statistical territory of a country coincides with its economic territory, while a special trade system is in use when the statistical territory comprises only a particular part of the economic territory.
3. **CIF**: Cost, Insurance and Freight. The seller must pay the insurance and freight costs necessary to bring the goods to the port of destination. The seller contracts for insurance and pays the insurance premium. For more detail, see UN (1998, Annex D, page 82-83). **FOB**: Free on Board. This term means the seller's obligation to deliver is fulfilled when the goods have passed over the ship's rail at the named port of shipment. This means the buyer has to bear all costs and risks of loss of or damage to the goods from the point. This tern can only be used for sea or inland waterway transport, for more detail see UN (1998, Annex D, page 82).
4. General trade for Denmark, Ireland and United Kingdom.
5. FOB/FOB for Czech Republic and Slovak Republic.
6. except for Czech Republic, Portugal, Slovak Republic, Spain and United Kingdom.
7. Imports also disseminated according to special trade definitions.
8. FAS: Free Alongside Ship. The seller's obligation to deliver is fulfilled when the goods have been placed alongside the vessel on the quay or in lighters at the named port of shipment. The buyer has to bear all costs and risks of loss of or damage to the goods from that moment. This term can only be used for sea and inland waterway transport.
9. Indonesia also classifies exports by country of consumption or home use.

2.3.1. Difference of definitions in compiling trade statistics

Table 3 summarises the different trade definitions and valuations used by the countries targeted in OECD I-O tables. Even though the UN has recommendations for defining trade partners of each country, different countries still have different definitions on imports and exports partner countries. Most countries on our list consider the country of origin as their import partner and the last known destination as their export partner. However, there are still some exceptions. For example, New Zealand and Hong Kong take the country of consignment as the import partner. Some countries apply a second rule of defining partner countries if the first one could not meet. For example, the US takes the country of shipment as the import partner if the country of origin could not be identified.

Two different trade systems are commonly used – the General Trade System and the Special Trade System. The general trade system is in use when the statistical territory of a country coincides with its economic territory, while a special trade system is in use when the statistical territory comprises only a particular part of the economic territory (UN 1998). The general trade system is recommended by UN (1998) and used by most of the non-EU countries in our sample.-. In the EU, Special Trade is generally used, the exceptions being Denmark, Ireland and the United Kingdom. All European countries take countries of consignment as export and import partners as far as intra-EU trade is concerned[12]. However, there are exceptions. For example, Greece also takes country of the first consignment as import partner country, while Poland, considers the country of buyers as the import partner countries.

Concerning re-exports issues: many countries, especially those using special trade systems, do not provide detailed information on re-export statistics even though their exports figure always include re-exports as a routine.[13]

- Re-exports data are currently only available in OECD ITCS and UN Comtrade for New Zealand, United States, Hong Kong, Russia and Singapore;

- Re-exports data are available in 2006 edition of OECD Input-Output database for Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Luxembourg, Netherlands, Norway, Poland, Sweden, Chinese Taipei, and South Africa.

<< This section could be developed a little further >>

2.3.2. Unallocated trade data

Unallocated trade refers to reported transactions not allocated to regular HS product codes, and/or not allocated to a particular partner country, but reported using special codes (for example, HS 99 or

12. According to Eurostat, there are ten countries that use country of origin as criterion for their national figures, but provide data to Eurostat on a country of consignment basis for intra community trade.

13. See http://comtrade.un.org/kb/article.aspx?id=10152.

"Commodities not specified according to kind" for products; "Other Areas n.e.s." for partners). The special items cover confidential transactions as well as data that could not be allocated for other statistical reasons (e.g. incomplete or ambiguous information on transactions). Such data cannot be ignored when linking the trade data to I-O tables because unclassified goods in each country may be concentrated in certain industries and/or related to certain partners. A maximum amount of information concerning the product, and partner, composition of 'unallocated trade' should be solicited from national authorities to make the linkage of trade data to I-O tables more justified. On the other hand, if a country does not have unallocated trade reported in databases it may be worth investigating whether the country really does not have unallocated trade (confidential trade) or it is just not being reported.

The situation varies from country to country as shown in Table 4 which summarises the percentage of trade in products not specified, in HS, according to kind. On average, OECD countries have higher shares than non-OECD countries both exports and imports. Some countries such as Germany, Ireland, Russia, United Kingdom and United States have relatively high shares of unallocated trade in both exports and imports, while some other countries have high shares in either imports or exports. For example, Norway has high unallocated shares for exports compared to imports while Mexico has higher shares for imports.

Of particular note are variations of shares of unallocated trade across years within countries. For example, in OECD's ITCS database, Australia has very high shares of exports not allocated by product from 1990 to 2000 (14-19%) which drops to about 7% in 2005. Reasons for such variations can include improvements in identifying transactions; changes in trading structures so that more or fewer transactions in 'confidential trade' are undertaken; or changes in the way confidential are reported – from providing data by partner but not by product to providing data by product but not by partner or vice versa. For Australian exports in 2005, product detail given for partner "Other Areas n.e.s." represents over 10% of total trade whereas in 2000 it represented about 0.5% - hence the drop, shown in Table 4 between 2000 and 2005 for confidential exports data by product (though allocated to partners). Another possibility is that confidential trade is reported to UN and OECD for some years but not for others.

A consequence of such variations in reporting 'confidential' or 'unallocated' trade is that if it affects a small subset of products or partners, then any analyses of data over time for these products or partners may be subject to biases – and it is often not easy to identify which products and/or partners are affected.

<< Insert here a table of trade with partner "Other Areas n.e.s." as % of total? >>

Table 4. Merchandize trade not allocated by product
as a percentage of total merchandize trade

	Exports				Imports			
	1990	1995	2000	2005	1990	1995	2000	2005
Australia	14.4	15.9	19.1	6.7	3.6	2.3	2.1	0.3
Austria	-	2.8	1.9	2.1	-	0.4	0.2	0.8
Belgium	-	0.2	0.3	1.4	-	0.5	0.1	0.5
Canada	2.0	1.4	5.8	4.7	2.5	2.6	1.9	1.5
Czech Republic	-	0.4	0.0	0.6	-	0.1	0.0	3.0
Denmark	4.6	5.1	4.4	4.0	2.1	1.6	1.8	1.7
Finland	0.0	0.9	0.5	0.7	0.1	1.7	2.3	1.7
France	0.6	0.0	0.7	1.0	0.4	0.1	0.2	0.1
Germany	1.6	3.6	2.3	2.5	2.1	5.5	5.2	3.6
Greece	0.0	1.9	3.2	2.6	0.0	0.0	0.2	0.1
Hungary	-	0.4	0.1	0.7	-	0.1	3.5	1.3
Iceland	0.7	0.4	1.0	1.0	0.1	0.2	0.1	0.1
Ireland	4.4	6.9	4.3	3.8	2.9	9.2	5.8	5.9
Italy	1.6	1.2	0.8	1.6	2.5	2.5	3.7	5.0
Japan	1.6	2.1	3.6	4.5	2.9	1.3	1.6	1.6
Korea	-	0.1	0.1	0.1	-	0.3	0.1	0.1
Luxembourg	-	-	1.7	2.0	-	-	3.5	4.0
Mexico	0.6	0.1	0.1	0.2	13.8	5.4	0.3	1.0
Netherlands	3.9	3.9	0.2	0.2	0.4	0.5	0.1	0.0
New Zealand	1.7	0.9	4.5	3.4	0.4	0.1	0.1	0.6
Norway	5.6	7.3	4.4	3.5	0.8	0.9	1.0	0.4
Poland	-	0.1	0.1	0.8	-	0.0	0.1	0.7
Portugal	0.2	0.1	0.1	2.7	0.0	0.0	0.2	1.9
Slovak Republic	-	-	0.0	1.3	-	-	0.0	0.7
Spain	1.1	0.8	1.6	1.6	0.3	0.1	0.5	0.6
Sweden	7.8	7.7	5.3	2.5	1.8	1.5	5.8	2.7
Switzerland	2.6	0.8	1.1	0.8	1.5	0.6	1.0	1.2
Turkey	0.0	0.0	0.1	1.1	0.0	0.0	0.3	4.9
United Kingdom	5.0	2.6	2.8	2.5	2.9	1.5	2.9	5.3
United States	3.9	3.3	3.5	3.4	3.5	3.4	4.4	3.5
OECD	-	2.5	2.6	2.4	-	2.3	2.6	2.4
Argentina	-	0.0	1.3	1.5	-	0.0	0.6	0.9
Brazil	1.2	1.3	1.9	1.8	0.0	0.0	0.0	0.0
Chile	1.3	1.3	2.3	2.2	1.3	1.3	0.9	0.5
China	-	0.3	0.2	0.2	-	1.0	0.7	0.3
Chinese Taipei	0.2	0.1	0.8	0.6	2.6	2.0	1.6	1.0
Estonia	-	0.0	0.0	3.3	-	0.1	0.0	2.1
Hong Kong, China	-	0.6	0.1	0.2	-	0.4	0.1	0.1
India	2.1	1.7	2.3	1.4	6.3	7.1	1.9	0.9
Indonesia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Israel	-	2.5	0.3	1.1	-	1.6	0.4	0.3
Malaysia	0.4	1.3	0.7	0.6	0.2	2.5	1.5	1.8
Philippines	-	-	0.0	0.0	-	-	0.0	0.0
Russia	-	-	11.8	8.4	-	-	11.3	6.2
Singapore	1.3	2.3	3.2	3.8	1.2	1.0	0.9	0.9
Slovenia	-	0.2	0.2	0.1	-	2.9	0.0	0.0
South Africa	-	-	24.9	-0.1	-	-	8.8	8.7
Thailand	1.2	0.9	2.7	1.4	2.1	1.2	0.7	1.1
Non-OECD sub-total	-	-	2.4	1.6	-	-	1.2	1.0
TOTAL	-	-	2.6	2.2	-	-	2.3	2.1

Source: OECD STAN BTD 2008, ITCS 2008.

2.3.3. Scrap metal, waste products and second hand goods

The increasing movement of scrap metal and assorted waste around the world is of obvious concern to environmental analysts, particularly the increasing exports from developed to developing countries, so it is important to be able to distinguish such products in international trade statistics. In a more general sense, when linking trade in goods data to I-O tables, we need to be able to distinguish scrap metal, waste products and second hand goods from the output of recent manufacturing production and, for example, identify imported inputs into the recycling industry. Currently, scrap metal and certain waste products (e.g. paper and plastic) can be identified as they are coded in HS – see Table 5. However, there are many types of used goods, such as discarded PCs and second-hand transport equipment that do not have their own codes in HS and are thus difficult to identify in trade statistics.

Table 5. Waste and scrap metal products identified in trade data by HS code

HS 1988 Code	HS Description
	Miscellaneous waste
3915	Waste, parings and scrap, of plastics.
401220	Used pneumatic tyres
4707	Waste and scrap of paper or paperboard.
5103	Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock.
5104	Garnetted stock of wool or of fine or coarse animal hair.
5202	Cotton waste (including yarn waste and garnetted stock).
5505	Waste (including noils, yarn waste and garnetted stock) of man-made fibres.
	Scrap metal
7112	Waste and scrap of precious metal or of metal clad with precious metal.
7204	Ferrous waste and scrap; remelting scrap ingots of iron or steel.
7404	Copper waste and scrap.
7503	Nickel waste and scrap.
7602	Aluminium waste and scrap.
7802	Lead waste and scrap.
7902	Zinc waste and scrap.
8002	Tin waste and scrap.
8908	Vessels and other floating structures for breaking up.

When looking at trade in identifiable scrap and waste (see Table 6), it is no surprise that non-OECD countries have higher and increasing import shares (e.g. China and India with about 1.8% each in 2005) while OECD countries tend to have higher export shares (exceptions include Korea and Turkey). On average, the import share for non-OECD countries was about 1% in 2005, double that for OECD, while for exports, the OECD share was about 0.6%, double that for OECD-countries. It is important to note that for many countries, scrap and waste materials may be exported to (or imported from) a limited number of trading partners so that while the share of such trade may be relatively low at total World level, it can be quite significant when looking at certain bilateral trade flows. Trade in used goods not identified by HS (or SITC) codes may follow similar patterns.

Table 6. Trade in scrap and waste, identifiable by HS codes, as % of total trade

	Exports			Imports		
	1995	2000	2005	1995	2000	2005
Australia	0.44	0.44	0.70	0.06	0.05	0.03
Austria	0.34	0.34	0.46	0.78	0.45	0.72
Belgium	0.46	0.46	0.50	1.00	0.93	0.77
Canad	0.60	0.36	0.63	0.86	0.47	0.51
Czech Republic	0.99	0.58	0.71	0.21	0.21	0.25
Denmark	0.65	0.45	0.69	0.26	0.17	0.17
Finland	0.29	0.35	0.31	0.53	0.52	1.52
France	0.54	0.47	0.72	0.37	0.29	0.30
Germany	0.62	0.51	0.53	0.60	0.63	0.69
Greece	0.47	0.36	0.58	0.35	0.23	0.72
Hungary	1.30	0.42	0.56	0.19	0.10	0.07
Iceland	0.34	0.39	0.36	0.07	0.03	0.01
Ireland	0.13	0.08	0.19	0.30	0.14	0.11
Italy	0.08	0.13	0.17	1.16	0.65	0.71
Japan	0.10	0.17	0.63	0.41	0.34	0.25
Korea	0.07	0.06	0.17	1.37	1.21	1.44
Mexico	0.65	0.39	0.45	0.62	0.37	0.36
Nethelands	0.92	0.65	1.01	0.88	0.55	0.65
New Zealand	0.33	0.39	0.71	0.18	0.10	0.05
Norway	0.25	0.15	0.17	0.59	0.50	0.34
Poland	0.34	0.64	0.75	0.11	0.12	0.14
Portugal	0.27	0.35	0.74	0.10	0.11	0.28
Spain	0.16	0.17	0.26	1.10	0.74	0.85
Sweden	0.28	0.28	0.42	0.86	0.64	0.52
Switzerland	0.45	0.49	0.53	0.40	0.26	0.88
Turkey	0.26	0.24	0.24	3.19	1.43	2.78
United Kingdom	0.51	0.41	0.94	0.36	0.37	0.22
United States	1.07	0.65	1.12	0.25	0.15	0.17
OECD	**0.52**	**0.41**	**0.63**	**0.59**	**0.42**	**0.49**
Argentina	0.16	0.11	0.09	0.04	0.01	0.04
Brazil	0.02	0.03	0.05	0.16	0.06	0.15
Chile	0.07	0.11	0.42	0.04	0.06	0.10
China	0.04	0.02	0.01	0.89	1.48	1.78
Estonia	2.12	2.89	1.67	0.38	0.88	0.27
Hong Kong	0.72	0.58	0.70	0.71	0.43	0.60
India	0.05	0.03	0.09	2.02	1.31	1.78
Indonesia	0.22	0.09	0.19	1.46	1.65	1.07
Israel	0.31	0.17	0.37	0.06	0.05	0.03
Malaysia	0.15	0.12	0.16	0.32	0.37	0.63
Philippines		0.22	0.49		0.25	0.11
Russia		0.59	0.95		0.10	0.03
Singapore	0.28	0.22	0.32	0.07	0.07	0.20
Slovenia	0.20	0.35	0.64	1.22	0.97	1.53
South Africa		1.11	0.93		0.09	0.12
Taiwan	0.17	0.12	0.18	0.81	0.65	1.08
Thailand	0.18	0.18	0.38	0.61	0.50	0.60
selected non-OECD *(sum of above)*		**0.25**	**0.31**		**0.62**	**0.97**

Source: OECD STAN Bilateral Trade Database (BTD), 2008

2.3.4. Differences in published merchandise trade statistics

One source of frustration for researchers in recent years has been apparent differences in trade in goods data from different published sources. While differences between OECD ITCS and Eurostat trade data are to be expected, not least because of the latter's use of the Intrastat system, differences between OECD ITCS and UN Comtrade are less intuitive since common definitions have generally been used. Previously, OECD and United Nations Statistics Division (UNSD) developed their merchandise trade statistics systems independently. However since 2001, via a 'Memorandum of Understanding', both organizations have been sharing data sources[14] . The general idea is that the trade data for OECD member countries are processed by OECD and the data for non-OECD countries are processed by UNSD for recent years. While some reduction in the data reporting burden of OECD national statistical institutes has occurred, the main aim of the exercise was the alignment and harmonisation of the UN and OECD trade databases. Data for years from 2005 have been processed by OECD and UNSD with near identical software systems and during 2008 increased efforts were made to 'harmonise' ITCS with Comtrade by reprocessing data for all OECD countries back to 2000 with the common software and procedures.

However, even when both databases have been 'synchronised' there remain some subtle differences. For example, ITCS has a more detailed treatment of 'unallocated trade' (see 2.3.2), or 'memoranda items', for EU countries than UNSD – it hosts a range of special 6-digit product codes for 'unallocated trade' below the 2-digit HS level. A consequence is that for certain 2-digit product groups, ITCS data may be higher than Comtrade while being lower for the general "Commodities not specified according to kind". This is illustrated in Table 7 by a comparison between ITCS and Comtrade 2-digit HS data for Germany, where for example, exports of HS 88 "Aircraft, spacecraft and parts thereof" are reported to be 5-7% higher in ITCS than in Comtrade.

Table 7. ITCS data as a % of COMTRADE
Germany total trade, 2002-2006

	Exports					Imports				
HS 1996 commodities	**2002**	**2003**	**2004**	**2005**	**2006**	**2002**	**2003**	**2004**	**2005**	**2006**
Total	99.9	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0
Commodities not specified according to kind	48.4	75.7	80.1	65.2	66.2	79.8	92.1	92.2	83.7	86.8
63: Other textile articles; clothing etc	101.7	102.0	102.4	102.0	102.2	100.4	100.2	100.4	100.2	100.0
73: Articles of iron or steel.	102.0	102.2	102.7	101.8	101.4	100.0	99.9	100.3	100.0	100.0
82: Tools and implements of base metal	103.7	103.8	104.8	103.8	103.1	100.2	100.7	101.1	101.4	100.9
84: Machinery and mechanical appliances and parts; boilers etc.	100.9	100.9	100.6	101.5	101.5	99.3	99.1	99.2	100.0	100.1
85: Electrical machinery and equipment and parts thereof	102.5	102.4	102.2	100.8	100.8	100.7	101.0	101.0	100.0	100.0
87: Vehicles other than railway or tramway rolling-stock; parts	105.9	105.9	104.9	104.3	104.7	105.7	106.0	106.6	105.9	105.2
88: Aircraft, spacecraft, and parts thereof.	105.7	106.6	107.3	106.7	105.7	107.5	105.7	106.8	106.7	106.0
Sum of all other 2-digit HS commodities	100.0	100.1	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: ITCS and COMTRADE databases, July 2008

For certain countries and/or years, data for years prior to 2000, may differ significantly between ITCS and Comtrade. There may be several reasons for this such as: *i)* use of different versions of national source data i.e. first version versus subsequent revision(s); *ii)* differing treatment of confidential data e.g. allocated to partner "Other Areas n.e.s." versus allocated to "Commodities n.e.s."; and *iii)* differing partner country and commodity coding regimes. Such problems mainly affect data for OECD countries since the OECD has only ever processed a few non-OECD countries such as China, Hong Kong and Chinese Taipei (not recognised by the U.N.). Resources permitting, OECD hopes to extend the synchronisation exercise to data prior to 2000. Reviewing data for 1995 would be particularly useful as this was a common benchmark year for national I-O tables. *<< Insert here table comparing ITCS and Comtrade data for 1995? >>*

14. For details concerning UNSD-OECD joint trade data collection and processing see Legoff, (2005, 2006).

2.3.5. Bilateral trade by industry classifications

As well as the conceptual and statistical issues that affect the basic bilateral trade by commodity data, such as re-exports and unallocated trade, there are additional challenges to be faced when attempting to estimate trade flows by economic activity (whether producers of primary products, manufactures or services). When linking industry x industry I-O tables for inter-country I-O analysis, matrices of bilateral trade according to an industry classification are required and there are particular problems when constructing them.

For some years the OECD has produced the Bilateral Trade Database for industrial analysis (BTD) which presents trade in goods according to economic activities, most recently using a classification based on ISIC Rev.3. It is designed to be comparable with other data sets in OECD's 'STAN family' including OECD's I-O tables[15]. BTD is compiled from OECD's ITCS by using a standard conversion from the 1988 version of the Harmonized Commodity Description and Coding System (HS 1988) to ISIC Rev.3 for all countries[16]. Data recorded in later versions of HS (HS 1996, HS 2002) are converted to HS 1988 beforehand. The drawbacks of this standard approach include:

- BTD does not necessarily provide explicit trade figures for industry: products are linked to the industries that typically produce them (and thus assumes 'homogeneity' in industries). For industrial activity data, enterprises (or establishments) are allocated an ISIC code according to their primary activity. If an industry has significant goods producing secondary activities, its exports in BTD may be underestimated (and over-estimated in the industry deemed likely to produce the goods);

- BTD presents estimates for all imports from partners' industries not intermediate imports by domestic industries. While useful for developing indicators such as import penetration by industry, this restricts the use of BTD imports for linking to imports of intermediates by industry that are present in I-O tables;

- There are very few product codes allocated to service industries: However, industrial activity data for some service sectors (e.g. wholesale and retail) may include enterprises involved in assembly and export of final goods (e.g. PCs), considered as secondary activities. This is not recorded in BTD (c.f. first bullet above)

- Exported output of recycling industry cannot be identified.

The consequences of some of the issues described above are illustrated in Table 8 which shows exports as a percentage of production (gross output) for the ISIC Rev.3 activity "Office, accounting and computing machinery". For many countries the estimated value of exports is significantly greater than production. While the main reason may be the presence of re-exports (particularly for Belgium and Netherlands), there are undoubtedly cases where wholesale firms are involved in the assembly and export of PCs. Exports of used PCs to developing countries for re-use or dismantling may also be included but the value is probably quite low. In other words, in OECD countries 'true' manufacturing of PCs is not as prevalent as exports data may suggest.

15. BTD (www.oecd.org/sti/btd) was first developed by OECD's Directorate for Science, Technology and Industry in the early 1990s as part of a project to provide data tools for 'advanced' structural analysis such as the measurement of international technology diffusion. Other data sets developed, and still maintained, include the I-O database, STAN industry database (www.oecd.org/sti/stan) and the business R&D expenditure (ANBERD) database (www.oecd.org/sti/anberd).

16. www.oecd.org/dataoecd/50/24/37990672.xls

Table 8. Exports as a percentage of Production
"Office, accounting and computing machinery" (ISIC 30)

	1995	1996	1997	1998	1999	2000	2001
Austria	784.4	677.9	754.3	200.9	230.1	223.6	175.4
Belgium	1123.9	1203.2	1537.7	2543.2	2117.7	2439.2	2396.5
Canada	91.9	95.4	137.8	140.7	136.1	120.1	130.7
Denmark	342.2	270.7	452.3	357.4	272.6	384.1	347.0
Finland	86.5	83.0	96.5	97.3	87.8	243.4	383.2
France	72.0	98.3	102.6	110.8	107.9	119.8	98.8
Germany	82.3	86.6	86.1	94.8	111.2	112.6	116.6
Greece	155.6	138.5	263.6	300.0	440.0	900.0	1075.0
Hungary	74.0	7.8	93.7	104.9	111.1	136.5	108.2
Ireland	109.6	116.3	139.5	132.2	111.0	100.3	125.3
Italy	102.8	96.2	87.8	79.5	79.2	87.2	78.9
Japan	34.1	32.7	37.1	39.0	35.2	34.0	33.3
Korea	64.3	69.8	59.0	58.2	77.6	83.1	70.3
Mexico	120.1	111.8	101.6	109.3	119.7	121.5	142.7
Netherlands	532.5	710.4	932.6	983.5	1178.0	1427.9	1567.0
Norway	172.0	232.7	199.9	165.7	135.4	290.3	259.0
Poland	13.4	21.4	17.6	23.7	21.4	23.0	12.4
Portugal	16.7	20.9	27.0	22.6	21.0	26.2	97.3
Spain	44.9	45.7	50.7	58.2	65.5	65.9	50.5
Sweden	141.5	147.8	163.0	112.8	112.9	137.9	135.9
United Kingdom	97.7	92.9	94.1	93.8	101.3	109.2	102.1
United States	47.3	46.2	47.8	43.1	44.2	53.4	56.7

Source: OECD STAN database 2005

This illustrates the pressing need for an adjusted BTD for use with I-O tables. In fact, when comparing BTD estimates for total manufacturing exports for year 2000 with those present in I-O tables (Table 9), there are considerable differences for some countries not wholly due to the apparent BoP adjustments made for I-O.

<< this section could be developed a little further >>

Table 9. Exports of Manufactured goods, 2000
Comparison of estimates from OECD BTD and I-O data sets

Countries	BTD	I-O	Difference	% of I-O
Australia	30.8	24.5	6.3	25.8
Austria	59.8	58.6	1.2	2.1
Belgium	171.6	136.9	34.7	25.4
Canada	218.6	229.7	-11.1	-4.8
Czech Republic	27.9	26.3	1.5	5.8
Denmark	42.4	40.8	1.6	4.0
Finland	44.9	46.2	-1.3	-2.9
France	279.2	271.3	7.9	2.9
Germany	528.3	518.8	9.5	1.8
Greece	8.7	7.4	1.4	18.3
Hungary	27.1	27.4	-0.3	-0.9
Iceland	1.8	--	--	--
Ireland	72.1	78.4	-6.3	-8.0
Italy	232.8	212.6	20.2	9.5
Japan	460.7	420.4	40.3	9.6
Korea	171.1	170.4	0.7	0.4
Luxembourg	7.6	7.1	0.5	6.9
Mexico	144.9	--	--	--
Netherlands	163.3	176.2	-12.9	-7.3
New Zealand	11.4	9.8	1.6	16.0
Norway	20.7	20.0	0.7	3.5
Poland	29.9	28.6	1.3	4.4
Portugal	23.8	19.3	4.5	23.2
Slovak Republic	11.5	10.5	0.9	8.9
Spain	103.8	103.1	0.8	0.7
Sweden	81.2	83.6	-2.3	-2.8
Switzerland	78.5	79.5	-1.0	-1.3
Turkey	24.0	23.1	0.9	4.0
United Kingdom	248.1	199.6	48.5	24.3
United States	713.8	592.0	121.8	20.6
Argentina	18.1	--	--	--
Brazil	45.3	40.4	4.9	12.2
China	238.1	238.2	-0.2	-0.1
Chinese Taipei	121.3	110.9	10.5	9.4
Hong Kong, China	0.0	--	--	--
India	29.6	29.0	0.5	1.9
Indonesia	44.1	39.1	5.0	12.8
Israel	28.8	--	--	--
Russia	45.7	53.7	-8.0	-15.0
Singapore	135.3	83.5	51.8	62.1
South Africa	17.5	13.8	3.7	27.0

Sources: OECD Bilateral trade by industry database (BTD); OECD Input-Output Database, 2006 editions.

3. INTERNATIONAL TRADE IN SERVICES

3.1. Sources of data – Balance of Payments

International trade in services is defined as the supply of a service with four GATS modes of provision: 1. Cross-border supply, 2. Consumption abroad, 3. Commercial presence and 4. Presence of natural persons (United Nations, 2002, page 11; and page 23 for a graphical summary). The well established Balance of Payments accounts cover the first two, as well as aspects of modes 3. and 4., and is the principle source for estimates of bilateral trade in services. There is no equivalent of detailed customs records for measuring international service transactions.

In the currently used recommendations of 5th edition of the Balance of Payments Manual (BPM5), international service transactions are classified into a dozen or so major categories with some additional detail (see IMF, 1993, page 43). More detailed information became available with the development and introduction from 1996 of the Extended Balance of Payment Services (EBOPS) classification (United Nations, 2002, pages 29-53). A concordance table is provided between EBOPS and the CPC Ver.1 production classification (United Nations, 2002, Annex III). However, reconciling the EBOPS classification with the activity classification used in harmonised industry x industry I-O tables is not straightforward (Annex Table 1.). For example, the subcategories of "Travel" (EBOPS236), "Business travel expenditure" (EBOPS237) and "Personal travel expenditure" (EBOPS240), are recorded in the consumption in a variety of service industries such as accommodation, restaurants and retail industries.

3.2. Availability of bilateral trade in services statistics

Despite substantial improvements in recent years, published bilateral trade in services data are still quite limited compared to the availability of bilateral trade in goods. While most exports and imports figures of commodity trade for all partners of our target of 40 or so countries are available, the number of available figures of exports (credit) and imports (debit) are limited for services sectors. In the OECD Trade in Services by partner countries database, 34 of our targeted reporter countries are currently covered, while in UN Service Trade dataset, 29 reporter countries are covered. OECD Trade in Services provide as much data as possible by different service categories among partner countries, while UN Service Trade only has trade data on countries with the world as their partner.

Although the availability of data on bilateral trade in services is expanding steadily, there remain conceptual differences between EBOPS and activity classifications such as ISIC Rev. 3. One solution for developing appropriate bilateral trade in service matrices for linking I-O tables is to exploit existing bilateral trade in services data through use of non-survey modelling techniques such as gravity equations (Kimura and Lee, 2006).

Differences not only exist for trade in goods, they also occur in trade in service statistics, for example between UN and OECD trade in service databases. Encouragingly, notable differences in total trade in services are observed for few countries (see Table 10).

<< this section could be developed a little further >>

Table 10. Total exports and imports of services, 2000 comparison between OECD and UN data sources, USD billion

	OECD TIS		UN SITS		differences	
	Imports	Exports	Imports	Exports	Imports	Exports
Australia	18.9	19.9	18.7	19.0	0.3	0.9
Austria	29.7	31.4	29.8	31.4	-0.1	-0.1
Canada	44.1	40.2	44.1	40.2	0.0	0.0
Czech Republic	5.4	6.8	5.4	6.8	0.0	0.0
Denmark	21.1	24.0	21.0	23.9	0.1	0.0
Finland	8.4	6.2	8.4	6.2	0.0	0.0
France	60.8	80.6	61.0	80.8	-0.2	-0.2
Germany	141.4	86.5	141.8	86.8	-0.4	-0.3
Greece	11.3	19.3	11.3	19.4	0.0	-0.1
Hungary	5.0	6.1	5.0	6.1	0.0	0.0
Iceland	1.2	1.0	1.2	1.0	0.0	0.0
Ireland	28.9	16.9	29.0	16.9	-0.1	0.0
Italy	55.4	56.4	55.6	56.6	-0.2	-0.2
Japan	115.1	69.2	116.5	69.1	-1.4	0.2
Korea	33.4	30.5	33.4	30.5	0.0	0.0
Mexico	17.4	13.8	17.4	13.8	0.0	0.0
Netherlands	53.3	52.4	53.4	52.5	-0.2	-0.2
New Zealand	4.5	4.4	--	--	--	--
Norway	14.5	17.3	15.5	17.4	-1.0	-0.1
Poland	9.0	10.4	9.0	10.4	0.0	0.0
Portugal	7.0	9.0	7.1	9.1	0.0	0.0
Slovak Republic	1.9	2.3	1.9	2.3	0.0	0.0
Spain	33.2	52.6	33.2	52.6	0.0	0.0
Sweden	24.0	21.6	24.0	21.7	0.0	-0.1
Switzerland	12.8	28.7	14.3	30.9	-1.5	-2.2
Turkey	8.2	19.5	9.1	20.4	-0.9	-0.9
United Kingdom	99.4	120.1	--	--	--	--
United States	223.7	296.0	223.7	298.6	0.0	-2.6
China	--	--	36.0	30.4	--	--
Hong Kong, China	24.7	40.4	--	--	--	--
India	--	--	14.6	16.3	--	--
Singapore	--	--	22.7	28.0	--	--
South Africa	--	--	5.1	5.8	--	--

Sources: OECD International Trade in Services (TIS); UN Statistics of International Trade in Services (SITS)

4. IMPENDING CHANGES TO BALANCE OF PAYMENTS DEFINITIONS

There are two types of international transactions that will be recorded differently in the forthcoming revisions to BoP recommendations, BPM6, and System of National Accounts (SNA 1993 Rev.1), to be finalised in 2009, namely "Goods sent abroad for processing" and "Merchanting".

4.1. Goods sent abroad for processing

Goods sent abroad for processing are defined as materials or semi-processed goods belonging to a unit in country A which are shipped to a unit in country B for significant transformation and then either *i)* returned to the original unit in country A; *ii)* enter domestic economy of B; or *iii)* exported to a third country C. The goods do not change ownership from A to B and B receives a fee from A for processing the goods. Minor transformations of goods, such as repair and packaging are not regarded as processing and are excluded from this consideration. See Chapter 4.of United Nations (2008) for detailed discussion.

Under BPM5 and SNA 1993, "goods for processing" are recorded in both exports and imports of goods as genuine external trade in gross terms although no change of ownership has taken place. This is contrary to the basic principle of Balance of Payments that transactions should involve a change of ownership. To rectify this, under the new recommendations, goods for processing will be excluded from exports and imports in the goods accounts. Instead, the exchange of processing fees will be recorded under services in the economies concerned: the outward processing economy recording payment of fees as imports of services, the inward processing economy recording the receipt of fees as exports of services. Thus there will be a mismatch with the physical movement of goods recorded in customs based merchandise trade statistics.

4.2. Merchanting

Merchanting is defined as the purchase of a good by a resident (of compiling economy A) from a non-resident in country B and the subsequent resale of the good to another non-resident in country C. During the process, the good does not enter or leave the compiling economy A. The difference between the value of goods when acquired and the value when sold is recorded, under BPM5, as a merchanting service credit in country A. Three categories of merchanting can be identified: "Transactions accompanied by global manufacturing", "Global wholesaling" and "Commodity dealing" (Takeda, 2006). Under BPM6, the merchant's margin will be recorded in the goods account of economy A as a "net export of goods under merchanting". Thus, as with goods for processing, there will be mismatch with the physical movement of goods recorded merchandise trade statistics

4.3. Impact of changes

In international merchandise trade statistics, goods for processing will continue to be recorded on a gross basis (i.e. as re-exports for the processing country if returning goods to country of ownership), as will the movement of goods under merchanting. Therefore, any approach adopted for adjusting/analysing bilateral merchandise trade statistics will not necessarily have to change. However when linking to Supply-Use and I-O tables, there could be increased difficulties in reconciling the merchandise trade data with SNA 1993 Rev.1 data since, for example, many transactions previously recorded as manufactured goods in I-O tables will now be recorded as services. Given the time lags (2-3 years or more) involved in implementing major changes to international standards, it is not expected that there will be a great impact on harmonising and linking forthcoming 2005 (benchmark) I-O tables. However, when the time comes to focus on 2010 I-O tables these issues will need to be addressed.

5. SUMMARY

This paper highlights some issues that need to be taken into consideration when using bilateral trade in goods statistics from existing international databases in order to construct multi-national I-O tables. For researchers undertaking such work, the goal is to produce the best possible bilateral trade in goods and services matrices that can be linked to the trade data present in harmonised I-O tables via, for example, a multi-regional input-output (MRIO) model (as described in Box 1). Even if only analysing trade statistics, the issues are worth taking into account.

In order to make the best possible use of existing trade statistics some short-term solutions could help make necessary adjustments:

- Re-exports are of the most immediate concern due to their increasing shares in total trade reported by many countries. Starting with countries with significant re-exports, national statistical authorities could be requested to provide information on re-exports at the most detailed level possible by partner and/or commodity for a few key years (e.g. 2000 and 2005). Some countries have already carried out research concerning re-exports and their results could be exploited;

- For unallocated trade, national statistical authorities or research institutes with local knowledge may be able to provide indications of the composition 'unallocated trade' reported in OECD and UNSD databases. Again, first concentrate on the countries where the problem is predominant;

- Identifying second-hand goods and assorted scrap and waste may be possible, under certain circumstances, by exploiting quantity information and analysing average unit values of transactions between countries;

- The most significant BoP adjustment concerns removing c.i.f. from total imports of goods and allocating to services. For imports by commodity (or industry) c.i.f. adjustments could be made on a pro rata basis, but it may be preferable for researchers to continue to benchmark bilateral imports on the imports present in I-O tables with possible further adjustments for certain partner countries based on distance matrices. In fact, understanding how national statisticians estimate merchandise imports and exports by product (or industry) for integration into SUTs and I-O tables could be beneficial;

- Close inspection of detailed HS categories in order to identify, where possible, products that are likely to be intermediate goods rather than final consumption goods. For example, referring to UN classification of Broad Economic Categories (BEC Rev.3) and/or concentrating on HS codes for parts and components – c.f. Yeats (1998) and use of SITC Rev. 2 based list.

Long term solutions to improve trade statistics databases could include (i) Systematic reporting of re-exports for all countries; (ii) more detailed reporting of 'unallocated trade' without breaking any confidentiality barriers; (iii) additional product codes (or other coding system) to identify second-hand goods and waste and scrap not currently coded; (iv) additional product codes (or other coding system) to identify recycled goods; and (v) Reporting of Balance of Payments trade in goods by commodity groups (i.e. adjustments below the level of total goods); (vi) introduce export and import variables for goods and services in structural business statistics; (vii) encourage more countries to produce (more) detailed bilateral trade in services data.

Whatever progress is made towards producing 'ideal' bilateral trade matrices, researchers will still need to build econometric models to fill the data shortage. However, this paper provides some insights as

why certain difficulties in matching trade and I-O may occur and so help researchers focus their efforts when carrying out further data adjustments. Furthermore it provides the groundwork for a possible OECD project to develop improved bilateral trade matrices for use with I-O tables.

REFERENCES

Ahmad, N. and A. Wyckoff (2003), "*Carbon dioxide emissions embodied in international trade of goods*", STI Working Paper 2003/15, OECD, Paris. www.olis.oecd.org/olis/2003doc.nsf/linkto/dsti-doc(2003)15

Andriamananjara, S., H. Arce and M. J. Ferrantino (2004), *"Transhipment in the United States"*, US International Trade Commission of Economics Working Paper No. 2004-04-B, April 2004.

Bensidoun, I. and D. Ünal-Kesenci (2008), Centre d'Etudes Prospectives et d'Information Internationales (CEPII), "*Globalisation in Services: From Measurement to Analysis*", STD Working Paper 2008/3, OECD, Paris. www.olis.oecd.org/olis/2008doc.nsf/linkTo/std-doc(2008)3-rev1

Feenstra, R.C., R.E. Lipsey, H. Deng, A. C. Ma, and H. Mo (2005), "*World trade flows: 1962-2000*", NBER Working Paper 11040, National Bureau of Economic Research, Cambridge, MA: www.nber.org/papers/w11040.

Ferrantino, M. J. and Z. Wang (2007), *"Accounting for discrepancies in bilateral trade: the case of China, Hong Kong, and the United States"*, Office of Economic Working Paper, No.2007-04-A, UN International Trade Commission.

Fung, K. C. and L. J. Lau (1998), *"The China-United States bilateral trade balance: how big is it really?"* Pacific Economic Review 3: 33-47.

Fung, K. C. and L. J. Lau (2001), *"New estimates of the United States-China bilateral trade balance: 1995-2002"*, Journal of the Japanese and International Economies 15: 102-130.

Fung, K. C. and L. J. Lau (2003), *"Adjusted estimates of United States-China bilateral trade balances: 1995-2002"*. Journal of Asian Economics, 14:489-496.

Geyer-Schaefer, K. (2007), *"Analysis of asymmetries of trade statistics between Germany and China"*, STD/NAES/TASS/ITS (2007)22, paper presented to the 8th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/17/59/39244940.pdf.

He, X. (2007), *"An evaluation of the intermediation role of Hong Kong in Chinese foreign trade"*, Institute of World Economics and Politics Working Paper No.15/2007, Chinese Academy of Social Sciences, Beijing.

International Monetary Fund (1993), Balance of Payments Manual, 5th Edition: www.imf.org/external/pubs/ft/bopman/bopman.pdf

Isard, W., I.J.Azis, M.P.Drennan, R.E.Miller, S.Saltzman and E.Thorbecke (1998), *Methods of Interregional and Regional Analysis*, Aldershot: Ashgate Publishing.

Jin, H., *"Reasons for the discrepancies in China's Trade Statistics with major partners: The particular role of the processing trade"*, STD/NAES/TASS/ITS(2005)11, paper presented to the 6th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/51/6/35308958.pdf

Kimura, F. and Lee, H.H. (2006), *"The gravity equation in international trade in services"*, Review of World Economics, 142, 1, pp. 92-121.

Kuroko, M. (2002), "*Conversion of Trade Commodity Classification SITC to IO24 Sector Classification: Processing Conversion Error Data*", in Noda, Yosuke [ed.] World trade matrix: by Asian international input-output table 24 sectors, Chapter 2. IDE Statistical Data Series No.84, Institute of Developing Economies, pp. 44-47: www.ide.go.jp/English/Publish/Books/Sds/084.html

Kusters, A. and J. Verbruggen (2001), *"Re-exports and the Dutch market position*", CPB Report 2001/4, Netherlands Bureau for Economic Policy Analysis: www.cpb.nl/nl/pub/cpbreeksen/cpbreport/2001_4/

Legoff, G. (2005), "*The OECD ITCS database in the UN/OECD joint trade data collection and processing system*", STD/NAES/TASS/ITS (2005)3, paper presented to the 6th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/24/59/35276693.pdf.

Legoff, G. (2006), "*The new and operational UNSD-OECD joint trade data collection and processing system, methodological issues*", STD/NAES/TASS/ITS (2006)5, paper presented to the 7th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/46/34/37364061.pdf.

Linden, J.A. van der and J. Oosterhaven (1995), *"European Community Intercountry Input-Output Relations: Construction Method and Main Results for 1965-1985"*, Economic Systems Research 7, 3: 249-269.

Lindner, A., B. Cave, L. Deloumeaux and J. Magdeleine (2001), *"Trade in goods and services: statistical trends and measurement challenges"*, OECD Statistics Brief no.1. Paris: www.oecd.org/dataoecd/55/11/2539563.pdf

Lindner, A. (2008), "*International co-operation on trade statistics"*, STD/CSTAT/RD(2008)4, paper presented to the Meeting of the Committee on Statistics, Paris, June 2008.

Mellens, M.C., H.G.A. Noordman and J.P.Verbruggen (2007), "*Re-exports: international comparison and implications for performance indicators*", CPB Document 2007, No.149, Netherlands Bureau for Economic Policy Analysis, The Hague: www.cpb.nl/nl/pub/cpbreeksen/document/149/doc149.pdf.

Noda, Y. (1997), "*Transaction table by country of origin in Hong Kong re-export trade statistics: compilation and evaluation method*", in Y. Yamamoto and Y. Noda [eds.] Trade structure of Hong Kong, Taiwan and China, and Hong Kong re-export trade statistics, IDE Statistical Data Series No.75, Institute of Development Economies, Japan.

Noda, Y. (2002), "*Evaluation of consistency of compiling world trade matrices*", Chapter 3 in Y. Noda [ed.] World trade matrix: by Asian international input-output table 24 sectors, IDE Statistical Data Series No.84, Institute of Developing Economics , pp: 78-81. www.ide.go.jp/English/Publish/Books/Sds/084.html

Ou-Yang, L. (2008), Census and Statistics Department of Hong Kong SAR, China, *"The changed treatment of goods for processing and merchanting in the revised system of National Accounts (SNA93, Rev.1) and the sixth Balance of Payments Manual (BPM6)"*, paper presented to meeting of the OECD Working Party on International Trade in Goods and Services Statistics (WPTGS), 22-24 September 2008, Paris: www.olis.oecd.org/olis/2008doc.nsf/linkTo/std-ses-wptgs(2008)19

Roos, J. (2005), "*International transport and trade statistics*", STD/NAES/TASS/ITS(2005)21, paper presented to the 6th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/33/32/35331631.pdf.

Roos, J. (2006), "*Identifying and measuring re-exports and re-imports*", STD/NAES/TASS/ITS(2006)18, paper presented to the 7th OECD International Trade Statistics Expert Meeting, Paris: www.oecd.org/dataoecd/3/22/37358015.pdf.

Statistics New Zealand (2006), Country paper in International workshop on country practices in compilation of international merchandise trade statistics by Department of economics and social affairs, Statistics Division, Bangkok, Thailand, 12 – 15 December 2006.

Takeda, H. (2006), "*Merchanting*", Issues paper, SNA/M1.06/19, presented to the Fourth meeting of the Advisory Expert Group on National Accounts, 30 January – 8 February 2006, Frankfurt. http://unstats.un.org/unsd/nationalaccount/AEG/papers/m4Merchanting.pdf

United Nations (1998), "*International Merchandise Trade Statistics: Concepts and Definitions*", Department of Economics and Social Affairs, Statistical Division, ST/ESA/STAT/SER.M/52/Rev.2: http://unstats.un.org/unsd/publication/SeriesM/SeriesM_52rev2E.pdf.

United Nations (2002), "Manual on Statistics of International Trade in Services", Statistical papers series No.86: www.oecd.org/dataoecd/32/45/2404428.pdf

United Nations (2008), "*International Merchandise Trade Statistics: Supplement to Compilers Manual*", final draft, March 2008, Department of Economics and Social Affairs, Statistical Division, ST/ESA/STAT/SER.F/87/Add.1: http://unstats.un.org/unsd/trade/imtssupplcompilersmanual.htm.

Wixted, B. (2006), "*The international spatial organization of the motor vehicle production system: place, flows, hierarchy and co-evolution*", paper presented at the *DRUID Summer Conference 2006 on Knowledge, innovation and competitiveness: dynamic of firms, networks, regions and institutions*, Copenhagen, Denmark, June 18-20, 2006.

Wixted, B., N. Yamano and C. Webb (2006), "*Input-output analysis in an increasingly globalised world: applications of OECD's harmonised international tables*", STI Working paper 2006/7, OECD, Paris: www.oecd.org/dataoecd/6/34/37349386.pdf

Yamano, N., and N. Ahmad (2006), "*The OECD Input-Output Database 2006 Edition*", *STI Working Paper 2006/8*, OECD, Paris: www.oecd.org/dataoecd/46/54/37585924.pdf

Yeats, A. J. (1998), *"Just how big is global production sharing?"*, Policy Research Working Paper Series 1871, The World Bank: http://ideas.repec.org/p/wbk/wbrwps/1871.html

Annex Table 1.
A concordance between OECD I-O categories and product and industry classifications

	OECD I-O 37 sector aggregates	ISIC Rev.3 Division code	CPC Ver.1 Division code	HS1988	EBOPS
1	Agriculture, hunting and fishing	01 + 02 + 05	01*,02*,03*,04*,23*,38*,86*	01,020820,0301-0302,030621-030629,030710-030721,030731,030741,030751,030760,030791,0407,0409,0410,0503,0508-0509,051110,06,07 ex 0710,0711,0712,08 ex 080620,0811-0812,081350,0814,09 ex 090112-090140,090210,090230,10 ex 100620,100630,100640,12 ex 1208,121230,1214,1301,14 ex 140410,140420,152190,1801,240110-240120,4001,410320,410390,4301,440110,440320-440399,4404,450110,5001,5102,5201,530110,530210,530310,530410,530511,530521,530591,710110,710121	283*
2	Mining and quarrying	10 + 11 + 12 + 13 + 14	11*,12*,13*,14*,86*	25 ex 252020,2522,2523,26 ex 260120,2618-2620,2701-2703,2709,271111,271121,271410,271490,710210,710221,710231,710310	283*
3	Food products, beverages and tobacco	15 + 16	01*,02*,21*,22*,23*,24*,25*,86*	02 ex 020820,030270,0303-0305,030611-030619,030729, 030739, 030749, 030759,030799,04 ex 0407,0409,0410,0502,0504-0507,0510,051191-051199,0710-0712,080620,0811-0812,081350,0814,090112-090140,090210,090230,100620-100640,11,1208,121230,1214,1302,140410,140420,15 ex 1505,1518,1519,1520,152190,16-17,18 ex 1801,19-23,240130,2402,2403,350110,350210,350510,4101-4102,410310,510119	-
4	textiles, extile products, leather and footwear	17 +18 +19	21*,26*,27*,28*29*,86*	1505,4104-4111,42 ex 420321,4206,4302-4303,5002-5007,510111,510121-510130,5105-5113,52 ex 5201,53 ex530110,530210,530310,530410,530511,530521,530591,5401,54026 1-540269,540341-540349,5406-5408,5506-5516,56-58,5901-5903,590699,5907-5911,60-62,630120-630190,6302-6308,64,65 ex 650610 650691,701920,8804,911390,940430,940490	-
5	Wood and products of wood and cork	20	31*,86*	440121-440130,440310,4405-4421,45 ex 450110, 46	-
6	Pulp, paper, paper products, printing and publishing	21 + 22	32*,47*,86*	47-49,5905,844250,8524	-
7	Coke, refined petroleum products and nuclear fuel	23	33*,86*	2704,2706,2710,271112-271119,271129,2712-2713,284410-284440,840130	-
8	Chemicals	24	34*,35*,47*,48*,86*	1518-1520,260120,2707,2708,28 ex 281810,281820,284410-284440,284450,29-33,34 ex 3406,35 ex 350110,350210,350510,36 ex 3605,3606,37 ex 3706,38 ex 3801,3816,382350,3901-3914,4002,4402,540210-540259,540310-540339, 5404-5405,5501-5504,710410,710420,8523	-
9	Rubber & plastics products	25	28*,36*,86*	3916-3926,4003-4017,590610,590691,650610,650691,854720,940592	-
10	Other non-metallic mineral products	26	37*,86*	252020,2522,2523,2715,281810,3801,3816,382350,68-69,70 ex 701920,854610,854620,854710,940591	-
11	Basic metals	27	41,86*	2618-2620,281820,7106-7111,72,7301-7307,7401-7412,75 ex 7508,7601-7609,78 ex 7806,79 ex 7907,80 ex 8007, 81	-
12	Fabricated metal products, except machinery &equipment	28	38*,42,44*,86*,87*	7308-7314,731520-731590,7316-7320,732211-732219,7323-7326,7413-7416,7418-7419,7610-7616,7806,7907,8007, 82-83,840110,840140,8402-8406,848510,9307,9406	-
13	Machinery & equipment,	29	43*,44*,86*,87*	630110,731511-731519,7321,732290,7417,840120,840721,840729,840790,840810,840890,8410,841181,841182,841199,841221-841290,8413-8418,841911,841919,841931-841990,8420-8421,842211,842220-842290,8423-8441,844210-844240,844311,844319-844390,8444-8468,8474-8484,848590,8508-8510,8514-8516,93 ex 9307	-
14	Office, accounting & computing machinery	30	45*,86,87*	844312,8469-8473,9009	-
15	electrical machinery& apparatus, n.e.c	31	46*,86*,87*	842219,8501-8507,8511-8513,8530-8531,8535-8539,8543-8545,854690,854790,8548,900662,940510-940560, 940599	-
16	Radio, television & communication equipment	32	47*,86*	8517-8522,8525,8527-8529,8532-8534,8540-8542	-
17	Medical, precision &optical instruments	33	48*,86*,87*	841920,8526,90 ex 900662,9009,9023,91 ex 911390,9402	-
18	Moto vehicles, trailers & semi-trailers	34	43*,49*,86*,87*	840731-840734,840820,840991,840999,8609,870120,8702-8708,871610,871631-871640,871690	-
19	Other transport equipment	35	43*,49*,86*,87*	840710,840910,841111-841122,841191,841210,86 ex 8609,8711-8714,871680,88ex 8804, 89	-
20	Manufacturing n.e.c; recycling (include Furniture)	36 + 37	38*,86*	3406,3605,3606,420321,4206,5904,6309-6310,66-67,710122,710229,710239,710391,710399,710490,7105,7113-7118,8715,9023,92,9401,9403,940410-940429,95-96	-
21	Utility	40 + 41	17*,33*,69*,86*	2705,2716,284450	-
22	Construction	45	53*,54*	-	249
23	Whole sale & retail trade; repairs	50 + 51 + 52	61,62,87*	-	269
24	Hotels and restaurants	55	63	-	236*
25	Transport and storage	60 + 61 + 62 + 63	64*,65,66,67	-	205,236*
26	Post and telecommunications	64	64*,68,84*	-	245
27	Finance and insurance	65 + 66 +67	71,73*	-	260253
28	Real state activities	70	72	-	284*
29	Renting of machinery & equipment	71	73*	-	272
30	Computer and related activities	72	47*,83*,84*,85*,87*	-	263
31	Research and development	73	81	-	279
32	Other business activities	74	32*,38*,82*,83*,85*	-	275-278,280,284*
33	Public administration and defence; compulsory social security	75	91	-	-
34	Education	80	92	-	289*
35	Health and social work	85	93	-	289*
36	Other community, social & personal services	90 + 91 + 92 + 93	38*,84*,94*,95*,96*,97*	-	284,282,289*
37	Private households with employed persons& extra-territorrial organisations & bodies	95 + 99	98,99	-	288

* partial