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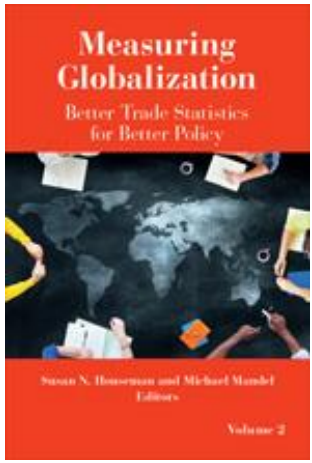
Measuring Trade in Value-Added and Beyond



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Chapter 6 (pp. 165-204) in:
Measuring Globalization: Better Trade Statistics for Better Policy, Volume 2, Factoryless Manufacturing, Global Supply Chains, and Trade in Intangibles and Data
Susan N. Houseman and Michael Mandel, eds.
Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 2015
DOI: 10.17848/9780880994903.vol2ch6

6
Measuring Trade in Value-Added and Beyond

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Global value chains (GVCs) have become a dominant feature of today's global economy. This growing process of international fragmentation of production, driven by technological progress, cost, trade policy reforms, and access to resources and markets, has challenged the conventional wisdom on how we look at and interpret trade and, in particular, the policies that we develop around it. Indeed, taken by themselves, traditional measures of trade, which record gross flows of goods and services each and every time they cross borders, may lead policymakers to make misguided decisions.

In practice, two main approaches (micro and macro) have been used to shed light on this issue. The former is perhaps best characterized by the well-known Apple iPod example (Dedrick, Kraemer, and Linden 2010), which showed that of the $144 factory-gate price of an iPod dispatched from China, less than 10 percent represented Chinese value-added, with the bulk of the components (costing about $100) being imported from Japan and much of the rest coming from the United States and Korea.

But this stylized approach can generally only be conducted for specific products and, even then, only reveals part of the story related to who benefits from trade and how GVCs work, as it is typically unable to reveal how the intermediate parts are created. For example, the message would be significantly different if, for sake of argument, the imported parts from Japan used to make the iPod required significant Chinese content. To deal with the bigger picture and also to capture all of the upstream effects, a number of studies have adopted a macro approach based on the construction of intercountry or world input-output tables (Daudin, Rifflart, and Schweisguth 2009; Hummels, Ishii, and Yi 2001;

Johnson and Noguera 2012; Koopman et al. 2011). And a number of pioneering initiatives, such as those of the Global Trade Analysis Project (GTAP), collaborative efforts between the World Trade Organization (WTO) and the Institute of Developing Economies–Japan External Trade Organization (IDE-JETRO), and the World Input-Output Database (WIOD), have helped accelerate improvements in the underlying statistics used to construct the results.

But these studies and initiatives have generally been one-off in nature and often require the use of nonofficial statistical data. What has been lacking thus far has been a systematic attempt to mainstream the development of statistics in this area. In response to this need, on March 15, 2012, the Organisation for Economic Co-operation and Development (OECD) and WTO joined forces to develop a database of Trade in Value-Added (TiVA) indicators and to mainstream their production within the international statistics system. The first preliminary results from this intiative were released on January 16, 2013, and some highlights from this first release are presented in the following sections of this chapter. But, as described below, further work is needed (and can be done) in order to improve the quality of the estimates produced under the "trade in value-added" umbrella.

Ultimately this chapter acts, in some ways, as a clarion call to statistical agencies to alert them that the world is increasingly interconnected and that conventional approaches used to understand how economies work can no longer rely solely on national statistics. Increasingly, it is necessary to see the whole in order to understand how economies work and, for example, how to target and create industrial policies focusing on competitiveness (notwithstanding trade policies and the implications and importance of trade). National statistics build pictures based on interrelationships between producers and consumers and the rest of the world. But these relationships, particularly those with the rest of the world, have become increasingly more complex, and, as such, there is an increasing need to consider global production within a global accounting framework. This implies a departure from the traditional role of international organizations as compilers of internationally comparable national statistics, such as national input-output or supply-use tables. Instead, it requires that they bring together these national tables to create a global table.

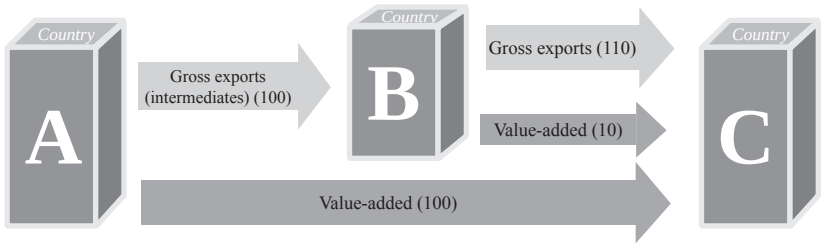
The remainder of this chapter describes the policy drivers and needs for such a framework, as well as the underlying methodology and assumptions used to estimate trade in value-added, before assessing the implications for statistics offices, data collection, and national input-output tables in particular. It ends by describing longer-term future avenues of research.

WHAT IS TRADE IN VALUE-ADDED?

The "trade in value-added" initiative addresses the double counting implicit in current gross flows of trade. Instead of using that method, it measures flows related to the value that is added (labor compensation, other taxes on production, and operating surplus, or profits) by a country in the production of any good or service that is exported.

The simple example shown in Figure 6.1, below, illustrates this. Country A exports $100 of goods, produced entirely within A, to Country B, which further processes them before exporting them to Country C, where they are consumed. Country B adds value of $10 to the goods and so exports $110 to C. Conventional measures of trade show total global exports and imports of $210, but only $110 of value-added has been generated in their production. Conventional measures also show that C has a trade deficit of $110 with B, and no trade at all with A, despite the fact that A is the chief beneficiary of C's consumption.

Figure 6.1 Exports: Gross and Value-Added Flows, in US$



SOURCE: Author's composition.

If instead we track flows in value-added, one can recalculate C's trade deficit with B on the basis of the value-added it "purchases" from B as final demand, which reduces its deficit on this basis to $10, and apply the same approach to A's value-added to show C running a deficit of $100 with A. Note that C's overall trade deficit with the world remains at $110. All that has changed is its bilateral positions. This simple illustration reveals how output in one country can be affected by consumers in another, and by how much. (An example of this is C's consumers driving A's output.) However, it can also reveal many other important insights into global value chains. For example, it shows that B's exports depend significantly on intermediate imports from A, and so reveals that protectionist measures on imports from A could harm its own exporters and hence competitiveness. Indeed, by providing information at the level of specific industries, it is possible to provide insights in other areas, too, such as the contribution of the service sector to international trade.

HOW CAN MEASURES OF TRADE IN VALUE-ADDED INFORM POLICYMAKING?

Even though the literature on trade in value-added is quite technical, it has attracted a lot of attention from policymakers. What initially seemed a concern for trade statisticians is now understood as a key issue for the policy debate. For example, Pascal Lamy, the director-general of the World Trade Organization (WTO), noted that "the statistical bias created by attributing commercial value to the last country of origin perverts the true economic dimension of the bilateral trade imbalances. This affects the political debate, and leads to misguided perceptions" (Lamy 2011). Recently, the French Senate devoted a special seminar to the related statistical and policy issues (WTO and Sénat 2011). There are a number of areas where measuring trade in value-added terms brings a new perspective and is likely to have an impact on policies. Seven key areas are described below:

1) **Trade, growth, and competitiveness.** A better understanding of how much domestic value-added is generated by the export of a good or service in a country is crucial for devel-

opment strategies and industrial policies. Some countries have capitalized on GVCs by developing comparative advantages in specific parts of the value chain. For example, in China, many of its exports involve assembly work, where the foreign content is high. Access to efficient imports therefore matters as much in a world of international fragmentation as access to markets. Conventional gross trade statistics, however, are not able to reveal the foreign content of exports, and so there is a risk that policies to protect industries where gross statistics reveal a comparative advantage may decrease the competitiveness of those very same domestic industries. Because of this, mercantilist-style "beggar thy neighbor" strategies can turn out to be "beggar thyself" miscalculations.

2) **Domestic value-added in imports**. Domestic value-added is found not only in exports but also in imports: Goods and services produced in one domestic industry are intermediates shipped abroad whose value comes back to the domestic economy embodied in the imports of other, and often the same, industries. As a consequence, tariffs, nontariff barriers, and trade measures—such as antidumping rights—can also affect the competitiveness of domestic upstream producers (as well as the competitiveness of downstream producers, as mentioned above), in addition to foreign producers. For example, a study on the European shoe industry undertaken by the Swedish National Board of Trade highlights that shoes "manufactured in Asia" incorporate between 50 and 80 percent of European Union (EU) value-added. In 2006, antidumping rights were introduced by the European Commission on shoes imported from China and Vietnam. An analysis in value-added terms would have revealed that EU value-added was in fact subject to the antidumping rights (Isakson and Verrips 2012).

3) **Improving competitiveness in upstream domestic industries can boost exports**. Looking at trade from a value-added perspective is also a way to better reveal how upstream domestic industries contribute to exports, even if those same industries have little direct international exposure. Gross trade statistics, for example, reveal that less than one-quarter of total global

trade is in services. But in value-added terms the share is significantly higher. Goods industries require significant intermediate inputs of services, both from foreign and also from domestic suppliers. Looking at trade in value-added terms therefore can reveal that policies to encourage services trade liberalization and more foreign direct investment (and so policies designed to improve access to more efficient services) can improve the export competitiveness of goods industries.

4) **Global imbalances**. Accounting for trade in value-added (specifically accounting for trade in intermediate parts and components), and taking into account "trade in tasks," does not change the overall trade balance of a country with the rest of the world—rather, it redistributes the surpluses and deficits across partner countries. When bilateral trade balances are measured in gross terms, the deficit with final goods producers (or the surplus of exporters of final products) is exaggerated because it incorporates the value of foreign inputs. The underlying imbalance is in fact with the countries who supplied inputs to the final producer. As pressure for rebalancing increases in the context of persistent deficits, there is a risk of protectionist responses that target countries at the end of global value chains on the basis of an inaccurate perception of the origin of trade imbalances. As shown in the section starting on p. 172, the preliminary results from the OECD-WTO database point to significant changes.

5) **The impact of macroeconomic shocks**. The 2008–2009 financial crisis was characterized by a synchronized trade collapse in all economies. Authors have discussed the role of global supply chains in the transmission of what was initially a shock on demand in markets affected by a credit shortage. In particular, the literature has emphasized the "bullwhip effect" of GVCs (Escaith, Lindenberg, and Miroudot 2010; Lee, Padmanabhan, and Whang 1997). When there is a sudden drop in demand, firms delay orders and run down inventories, with the consequence that the fall in demand is amplified along the supply chain and can translate into a standstill for companies located upstream. A better understanding of value-added trade flows would provide tools for policymakers to anticipate the impact

of macroeconomic shocks and adopt the right policy responses. Any analysis of the impact of trade on short-term demand is likely to be biased when looking only at gross trade flows. This was recently demonstrated in the aftermath of the natural disaster that hit Japan in March 2011.[1]

6) **Trade and employment**. Several studies on the impact of trade liberalization on labor markets try to estimate the "job content" of trade. Such analysis is only relevant if one looks at the value-added of trade. What the value-added figures can tell us is where exactly jobs are created. Decomposing the value of imports into the contribution of each economy (including the domestic one) can give an idea of who benefits from trade. The EU shoe industry example given above can be interpreted in terms of jobs. Traditional thinking in gross terms would regard imports of shoes manufactured in China and Vietnam by EU shoe retailers as EU jobs lost and transferred to these countries. But in value-added terms, one would have to account for the EU value-added, and while workers may have indeed lost their jobs in the EU at the assembly stage, value-added-based measures would have highlighted the important contribution made by those working in the research, development, design, and marketing activities that exist because of trade (and the fact that this fragmented production process keeps costs low and EU companies competitive). When comparative advantages apply to "tasks" rather than to "final products," the skill composition of labor embedded in the domestic content of exports reflects the relative development level of participating countries. Industrialized countries tend to specialize in high-skilled tasks, which are better paid and capture a larger share of the total value added. A WTO and IDE-JETRO study on global value chains in East Asia shows that China specializes in low-skilled types of jobs. Japan, on the other hand, has been focusing on export activities intensive in medium- and high-skilled labor while importing goods produced by low-skilled workers. The study also shows that in 2006 the Republic of Korea was adopt-

ing a middle-ground position but was also moving closer to the pattern found in Japan (WTO and IDE-JETRO 2011).

7) **Trade and the environment.** Another area where the measurement of trade flows in value-added terms would support policymaking is in the assessment of the environmental impact of trade. For example, concerns over greenhouse gas emissions and their potential role in climate change have triggered research on how trade openness affects CO_2 emissions. The unbundling of production and consumption and the international fragmentation of production require a value-added view of trade to understand where imported goods are produced (and hence where CO_2 is produced as a consequence of trade). Various OECD studies note that the relocation of industrial activities can have a significant impact on differences in consumption-based and production-based measures of CO_2 emissions (Ahmad and Wyckoff 2003; Nakano et al. 2009).

EARLY EVIDENCE FROM THE OECD-WTO DATABASE

Currently, the database is based on a global input-output table that brings together national input-output tables for 57 economies, combined with bilateral trade data on goods and services broken down into 37 industries aggregated from a 48-industry list (see Table 6.1). The following provides an overview of the key messages provided by the data.[2]

Exports Require Imports

The data reveal that the import content of exports—the share of value added by the export of a given product that originates abroad—is significant in all countries for which data are presented (40 at the time of this writing: all 34 OECD countries, Brazil, China, India, Indonesia, the Russian Federation, and South Africa—see Figure 6.2).

Typically, the larger a country, the lower the overall foreign content; this reflects, in part, scale and cost. But a number of smaller economies also have relatively low foreign content in their exports, such as Aus-

Table 6.1 OECD Input-Output Industry Classification and Concordance with ISIC

ISIC Rev. 3 code		Description
1 + 2 + 5	1	Agriculture, hunting, forestry, and fishing
10 + 11 + 12	2	Mining and quarrying (energy)
13 + 14	3	Mining and quarrying (nonenergy)
15 + 16	4	Food products, beverages, and tobacco
17 + 18 + 19	5	Textiles, textile products, leather, and footwear
20	6	Wood and products of wood and cork
21 + 22	7	Pulp, paper, paper products, printing, and publishing
23	8	Coke, refined petroleum products, and nuclear fuel
24ex2423	9	Chemicals, excluding pharmaceuticals
2423	10	Pharmaceuticals
25	11	Rubber and plastics products
26	12	Other nonmetallic mineral products
271 + 2731	13	Iron and steel
272 + 2732	14	Nonferrous metals
28	15	Fabricated metal products, except machinery and equip.
29	16	Machinery and equipment, n.e.c.
30	17	Office, accounting and computing machinery
31	18	Electrical machinery and apparatus, n.e.c.
32	19	Radio, television, and communication equipment
33	20	Medical, precision, and optical instruments
34	21	Motor vehicles, trailers, and semitrailers
351	22	Building and repairing of ships and boats
353	23	Aircraft and spacecraft
352 + 359	24	Railroad equipment and transport equipment, n.e.c.
36 + 37	25	Manufacturing, n.e.c.; recycling (including furniture)
401	26	Production, collection, and distribution of electricity
402	27	Manufacture of gas; distribution of gaseous fuels through mains
403	28	Steam and hot water supply
41	29	Collection, purification, and distribution of water
45	30	Construction
50 + 51 + 52	31	Wholesale and retail trade; repairs
55	32	Hotels and restaurants
60	33	Land transport; transport via pipelines
61	34	Water transport

(continued)

Table 6.1 (continued)

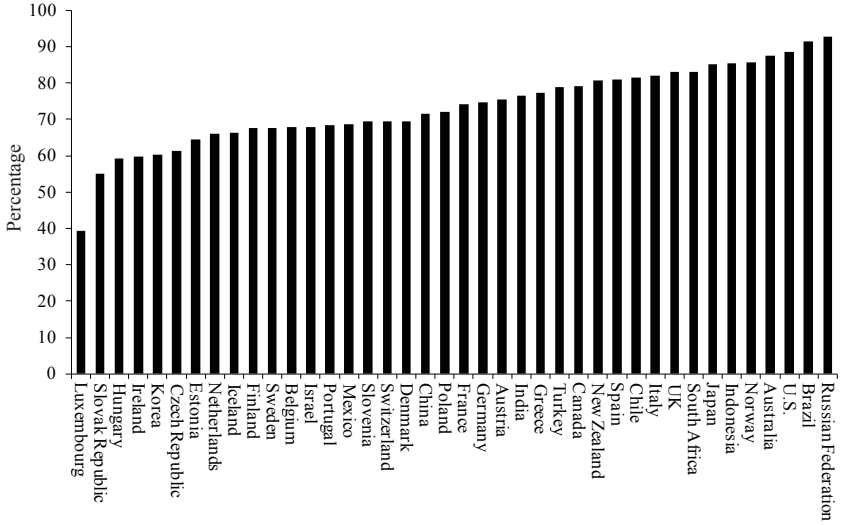
ISIC Rev. 3 code		Description
62	35	Air transport
63	36	Supporting and auxiliary transport activities; activities of travel agencies
64	37	Post and telecommunications
65 + 66 + 67	38	Finance and insurance
70	39	Real estate activities
71	40	Renting of machinery and equipment
72	41	Computer and related activities
73	42	Research and development
74	43	Other business activities
75	44	Public administration and defense; compulsory social security
80	45	Education
85	46	Health and social work
90–93	47	Other community, social, and personal services
95 + 99	48	Private households and extraterritorial organizations

NOTE: "n.e.c." stands for "not elsewhere classified."
SOURCE: Author's compilation.

tralia, Chile, and Norway. This can be explained by their high share of exports of natural resource goods, such as ores, oil, and copper, which have, not surprisingly, a low foreign content. Geography also plays a role; this helps to explain New Zealand's relatively low ratio, as well as its relatively high dependency on agricultural exports, which also have a low foreign content. For midsize economies, however, particularly those in Eastern Europe, the norm is that around one-third of the value of exports reflects foreign content.

Notwithstanding some of the interpretative caveats above, the ratio is perhaps the single most digestible indicator of the propensity of a country to engage in global value chains. It reveals the existence of European, Asian, and North American production hubs and also the significant dependency many countries have on imports to generate exports. In Mexico, with its maquiladoras, and in China, with its processors/assemblers, about one-third of overall exports reflect foreign content (and, as described below, these are considered to be conservative estimates).

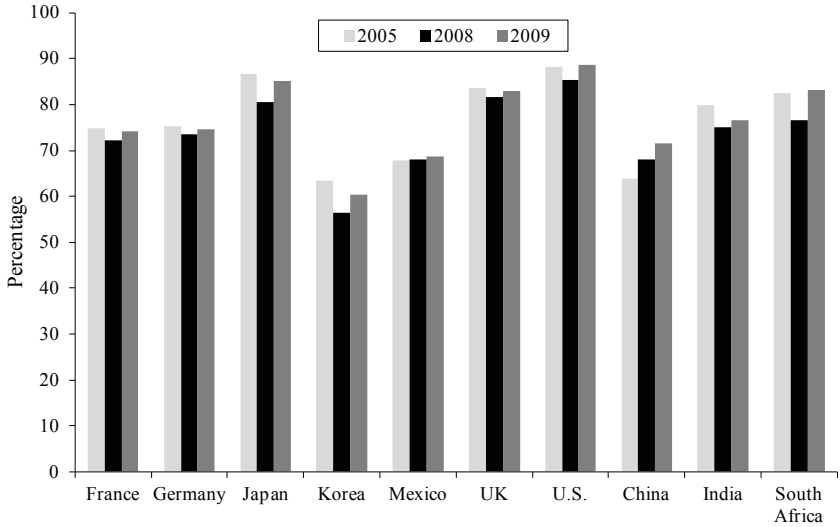
Figure 6.2 Domestic Content of Exports: Percentage of Total Gross Exports Represented by Domestic Value-Added Exports, 2009



SOURCE: OECD-WTO Trade in Value-Added (TiVA) indicators, preliminary results from OECD, January 2013, http://stats.oecd.org.

Some care is needed in interpreting the results, however: 2009 was an exceptional year, the year that signified perhaps the nadir of the recent financial crisis. As such, it was partly characterized by an unprecedented slowdown in global trade. Although the database only provides data as far back as 2005, illustrative data going back to 1995 suggest that international fragmentation of production (in other words, the import content of exports) had been steadily rising in most countries over recent decades, which continued over the period 2005–2008 (Figure 6.3), despite the slowdown that began in many countries in 2008. But 2009 saw drops in the import content of exports, an indication that the greater the fragmentation of a good or service, the more likely it was to be affected by the synchronized slowdown in trade. In most countries, therefore, the import content of overall exports in 2009 returned to around the ratios seen in 2005, but in China the data point to a steady rise over the period, suggesting developments that saw China begin to move up the value-added chain.

Figure 6.3 Domestic Content of Exports: Percentage of Total Gross Exports Represented by Domestic Value-Added Exports, 2005, 2008, and 2009

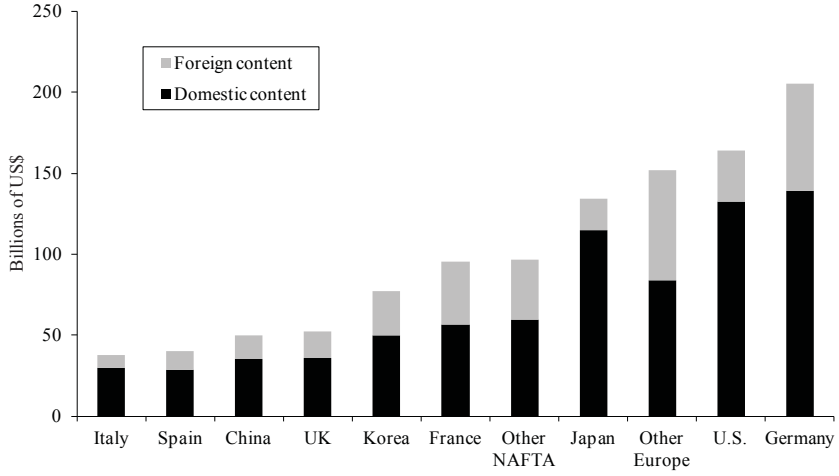


SOURCE: OECD-WTO Trade in Value-Added (TiVA) indicators, preliminary results, OECD, January 2013.

Tangible evidence of the scale of global value chains emerges more clearly when considering specific sectors. For example, between one-third and one-half of the total value of exports of transport parts and equipment by most major producers originated abroad in 2009 (Figure 6.4), driven by regional production hubs. In the United States and Japan, the shares were only about one-fifth, reflecting the larger scope in those countries of source inputs from domestic providers. However, this was also the case for Italy, and there it may have reflected efficient upstream domestic networks of small and medium enterprises. Interestingly, in 2009, Germany exported 25 percent more transport parts and equipment output than the United States in gross terms but only 5 percent more in value-added terms.

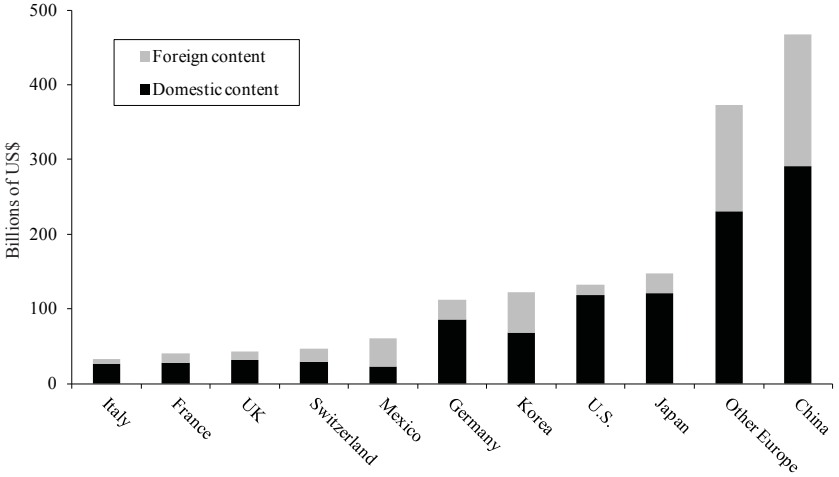
Similar patterns emerge in other sectors with a high degree of international fragmentation. For example, in China and Korea, in 2009, the

Figure 6.4 Transport Equipment, Gross Exports Decomposed by Source, 2009 (billions of US$)



SOURCE: OECD-WTO TiVA indicators, preliminary results, OECD, January 2013.

Figure 6.5 Electronic Equipment, Gross Exports Decomposed by Source, 2009 (billions of US$)



SOURCE: OECD-WTO TiVA indicators, preliminary results, OECD, January 2013.

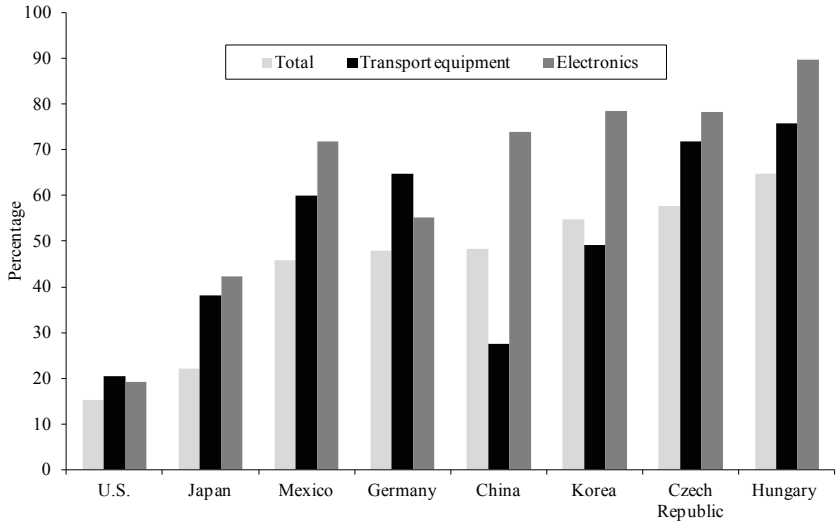
foreign content of exports of electronic products was about 40 percent, and in Mexico, the share was over 60 percent (Figure 6.5).

High Shares of Intermediate Imports Are Used to Serve Export Markets

The figures above reveal that exporting firms require access to efficient imports in order to be competitive, and so highlight the potential counterproductive effects of protectionist measures. But an alternative way of indicating the adverse effects of such policies can be seen when looking at the overall share of intermediate imports that are used to serve export markets.

In most economies, around one-third of intermediate imports are destined for the export market. Not surprisingly, typically, the smaller the economy the higher the share, but even in the United States and Japan these shares are 15 and 20 percent, respectively, at the total economy level, with a higher incidence of intermediate imports in some

Figure 6.6 Intermediate Imports Embodied in Exports: Percentage of Total Intermediate Imports, 2009



SOURCE: OECD-WTO TiVA indicators, preliminary results, OECD, January 2013.

highly integrated industries (Figure 6.6). In Japan, for example, nearly 40 percent of all intermediate imports of transport equipment end up in exports.

In many other countries, the share of intermediate imports embodied in exports is significantly higher. In Hungary, two-thirds of all intermediate imports are destined for the export market after further processing, and the share reaches 90 percent for electronic intermediate imports. In China, Korea, and Mexico, around three-quarters of all intermediate imports of electronics are embodied in exports. The database also shows that close to 85 percent of China's intermediate imports of textile products end up in exports.

Open and Efficient Service Markets Matter

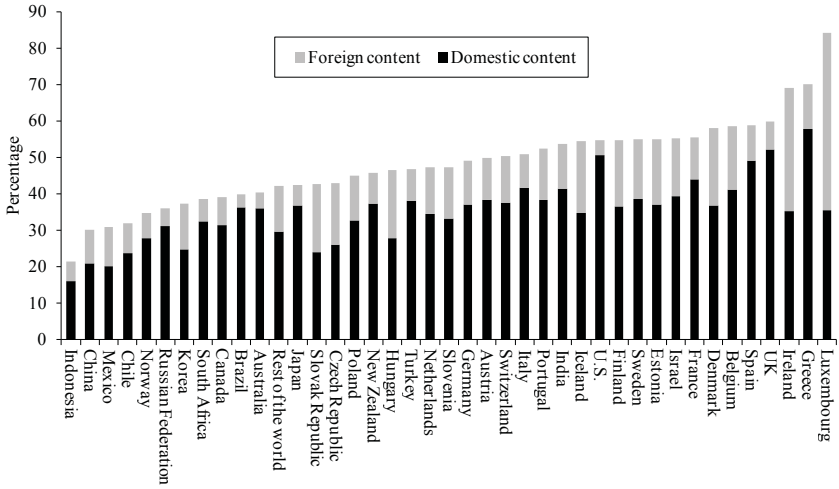
Services make up about two-thirds of gross domestic product (GDP) in most developed economies, but in gross terms, trade in services typically accounts for less than one-quarter of their exports This partly reflects the fact that significant shares of services output are generally not tradable—e.g., government services, many personal services, and imputations such as those made in GDP calculations to reflect the rent homeowners are assumed to pay themselves (between 6 and 10 percent of GDP in most developed economies). But it also reflects the fact that the service sector provides significant intermediate inputs to domestic goods manufacturers.

Accounting for the value-added produced by the service sector in the production of goods shows that the service content of total gross exports is over 50 percent in many OECD economies, and it approaches two-thirds of the total in the United Kingdom (Figure 6.7). Canada, because of its significant exports of natural resources, which typically have low service content, has the lowest service content of its exports in the G7—but even here the share is close to 40 percent.

Typically, emerging economies and other large exporters of natural assets, such as Norway, Chile, and Australia, have the lowest shares of services. But in India, over half of the value of its gross exports originates in the service sector. Indonesia has the lowest share of the 40 countries in the database at around 20 percent.

Part of the explanation for the difference between OECD countries and emerging economies can be found in the relatively higher degree of

Figure 6.7 Services Value-Added: Percentage of Total Exports, 2009

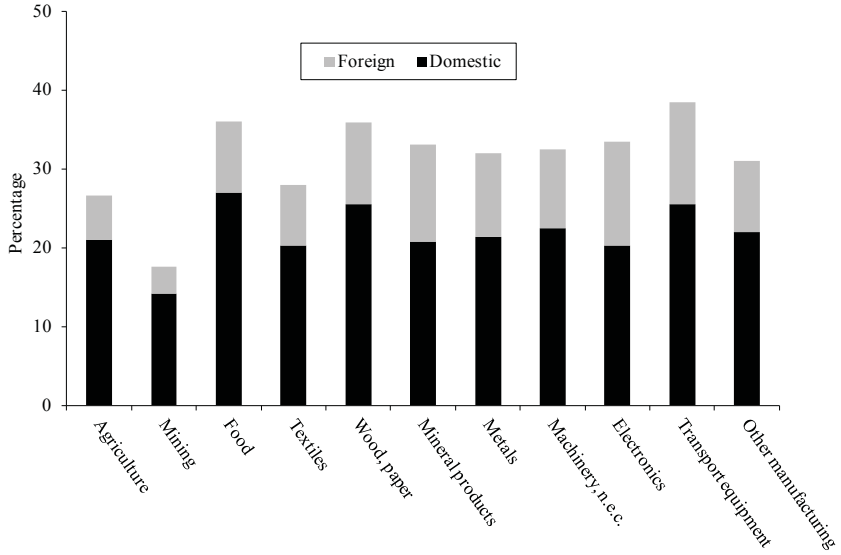


SOURCE: OECD-WTO Trade in Value-Added (TiVA) indicators, preliminary results, OECD, January 2013.

(largely domestic) outsourcing of services by manufacturers in OECD countries in recent decades, suggesting that a similar process could lead to improvements in the competitiveness of emerging economy manufacturers. Figure 6.7 also reveals a not insignificant contribution to exports coming from foreign service providers.

Another, perhaps clearer way of illustrating the importance of services to exports is to consider the services content of specific exports in goods-producing sectors. Figure 6.8 takes an average of all 40 countries in the database and shows that services make a significant contribution (typically one-third) across all manufacturing sectors, with significant shares provided by both foreign and domestic service providers. For individual sectors in specific countries the importance of the service sector is often starker. In France, for example, the data reveal that over half of the domestic value-added generated in producing transport equipment originates in the French service sector.

Figure 6.8 Services Value-Added: Percentage of Total Exports of Goods, 2009

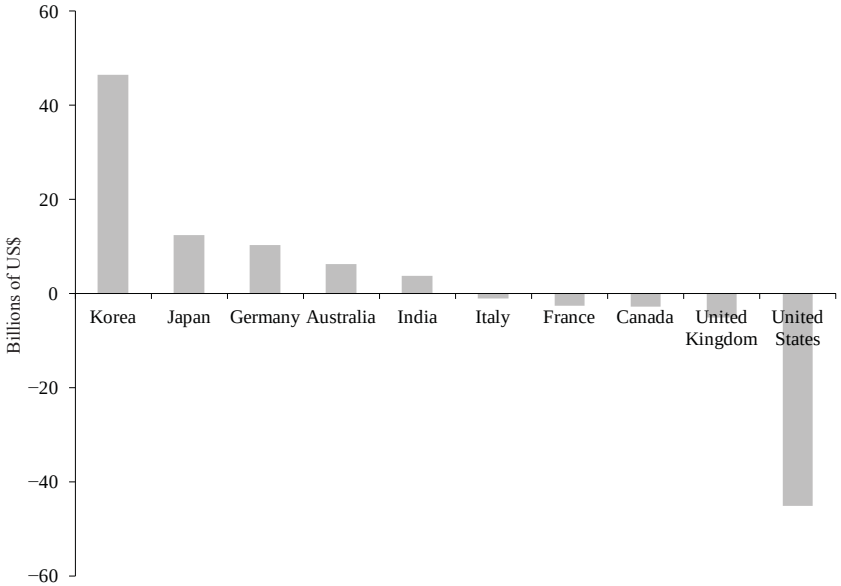


NOTE: "n.e.c." stands for "not elsewhere classified."
SOURCE: OECD-WTO Trade in Value-Added (TiVA) indicators, preliminary results, OECD, January 2013.

Intermediate Imports Often Embody a Country's Own (Returned) Domestic Value-Added

Imports can also contain "returned" value-added, which is value-added that originated in the importing country. The preliminary—and, one should stress, conservative—estimates in the OECD-WTO database show that in the United States, for example, nearly 5 percent of the total value of imported intermediate goods reflects U.S. value-added, and in China the equivalent shares are close to 7 percent. For electronic goods, Chinese intermediate imports contain over 12 percent of returned Chinese domestic value-added, and Korean intermediate imports contain close to 5 percent of returned Korean domestic value-added.

Figure 6.9 Difference between China's Value-Added and Gross Trade Balances, 2009 (billions of US$)



SOURCE: OECD-WTO TiVA indicators, preliminary results, OECD, January 2013.

What You See Is Not What You Get: Trade Patterns Change

Bilateral trade balance positions can change significantly when measured in value-added terms, even though the total trade balance is unaffected. Figure 6.9 shows that China's bilateral trade surplus with the United States was over US$40 billion (25 percent) smaller in value-added terms in 2009. (It was 30 percent smaller in 2005.) This partly reflects the higher share of U.S. value-added imports in Chinese final demand but also the fact that a significant share (one-third) of China's exports reflects foreign content—the "Factory Asia" phenomenon. The data illustrate that significant exports of value-added from Korea and Japan pass through China on their way to final consumers, resulting in significantly smaller Chinese trade deficits with these countries but also typically higher Japanese and Korean trade surpluses with other countries. Similarly, the database shows that Korea's significant trade

deficit with Japan in gross terms almost disappears when measured in value-added terms.

ESTIMATING TRADE IN VALUE-ADDED

Creating a Multiregional Input-Output Table

As mentioned above, several initiatives have tried to address the issue of the measurement of trade flows in the context of the fragmentation of world production.[3] The most commonly used approach to develop a macro picture is based on global input-output tables, using simple standard Leontief inverses. More detail can be found in a joint report by the OECD and WTO (2012) and in an online appendix to this chapter, "Appendix 6A: Indicator Descriptions and Definitions," which can be found at http://www.upjohn.org/MEG/ahmad-appendix.pdf.

Constructing a global table is a data-intensive process and presents numerous challenges. The key challenge is to identify and create links between exports in one country and the purchasing industries (as intermediate consumers) or final-demand consumers in the importing country. In this respect, it is important to note that the data issues faced by the OECD are similar to those confronted by other initiatives, such as IDE-JETRO (which has produced intercountry input-output tables for Asia) or the World Input-Output Database project, with whom (along with the U.S. International Trade Commission) the OECD and WTO have been actively coordinating in order to share experiences and derive a set of best practices.

The data sources at OECD are harmonized input-output tables and bilateral trade coefficients in goods and services, derived from official sources.[4] The model specification and estimation procedures can be summarized as follows:

- Preparation of input-output (I-O) tables for reference years, using the latest published data sources—e.g., supply-and-use tables, national accounts, and trade statistics.
- Preparation of bilateral merchandise data by end-use categories for reference years. The published trade statistics are adjusted

for analytical purposes (such as confidential flows, reexports, waste and scrap products, and valuables). Trade coefficients of utility services are estimated based on cross-border energy transfers. Other trade coefficients of service sectors are based on the OECD Statistics on International Trade in Services and the United Nations (UN) Service Trade statistics. However, many missing flows are currently estimated using econometric model estimates.

- Conversion of "cost, insurance, and freight" (CIF) price-based import figures to "free on board" (FOB) price-based imports to reduce the inconsistency issues of mirror trade. (Because of asymmetry in reporting exports and imports in national trade statistics, imports of Country A from Country B often differ significantly from the exports reported from Country B to Country A). In an international I-O system, trade flows need to be perfectly symmetrical (i.e., the bilateral trade flows should be consistent at the highest relevant level of disaggregation) and consistent with the supply-utilization tables' trade data.
- Creation of import matrices.
- Total adjustment (missing sectors, trade with rest of the world, and other factors) and minimization of discrepancy columns using biproportional methods.

The OECD has been updating and maintaining harmonized I-O tables—that is, splitting intermediate flows into tables of domestic origin and imports—since the mid-1990s. Usually this process follows the rhythm of national releases of benchmark I-O tables. The first edition of the OECD Input-Output Database came out in 1995. It covered 10 OECD countries, and its I-O tables spanned the period from the early 1970s to the early 1990s. The first updated edition of this database, released in 2002, increased the country coverage to 18 OECD countries, China, and Brazil, and introduced harmonized tables for the mid-1990s. The database now includes national I-O tables for 34 OECD member countries and 18 non-OECD countries.[5]

The I-O tables show transactions between domestic industries but, as a complement, also include supplementary tables, which break down total imports by user (industry and category of final demand). Some

countries provide these import tables in conjunction with their I-O tables, but in other cases they are derived from calculations by the OECD.

The OECD's input-output tables are based on an industry-by-industry basis, reflecting the fact that the underlying source data measure both the activities and production of industries. This means that the relationships between value-added and industrial output are unaffected by the statistical manipulations that will be required to build product-by-product-based input-output tables. The industry classification used in the current version of OECD's I-O database is based on the International Standard Industrial Classification of All Economic Activities, Revision 3 (ISIC Rev. 3) (Table 6.1), meaning that it is compatible with other industry-based analytical data sets, and in particular with the OECD bilateral trade in goods by industry data set (derived from merchandise trade statistics through the standard Harmonized System to ISIC conversion keys). The system, by necessity (in other words, to maximize cross-country comparability), is relatively aggregated. Differentiating between types of companies within a given sector is essential, however, to improve the quality of trade in value-added results (particularly in the context of exporting and nonexporting companies), and so part of future work will be to explore ways to do this, using microdata that could improve the quality of results (which is discussed in more detail in the following section).

In essence, a global I-O table is little different from a national I-O table except that while the matrix of flows of intermediate goods and services in a national table can be industry × industry, in a global I-O table, the rows and columns are country-industry combinations. In addition, in a global I-O table there are separate columns for each country's final demand. For illustration, Table 6.2 shows a two-country, two-sector representation.

Most of the components intuitively follow from the row and column headings, but by way of explanation, Z_{12}^{AB} = intermediate purchase by Sector 2 of Country B from Sector 1 of Country A; F_1^{AB} = final demand of consumers in Country B of output of Sector 1 in Country A.

Typically in the above matrix, statistics offices are able to provide most of the blocks required (recalling that supply-use tables can be readily converted to the above format and, moreover, that the above format can be initially constructed as a global supply-use table, which

Table 6.2 A Simplified ICIO System

	Country A		Country B		Final demand	
	Sector 1	Sector 2	Sector 1	Sector 2	Country A	Country B
Country A						
Sector 1: Goods	Z_{11}^{AA}	Z_{12}^{AA}	Z_{11}^{AB}	Z_{12}^{AB}	F_{1}^{AA}	F_{1}^{AB}
Sector 2: Services	Z_{21}^{AA}	Z_{22}^{AA}	Z_{21}^{AB}	Z_{22}^{AB}	F_{2}^{AA}	F_{2AB}
Country B						
Sector 1: Goods	Z_{11}^{BA}	Z_{12}^{BA}	Z_{11}^{BB}	Z_{12}^{BB}	F_{1}^{BA}	F_{1}^{BB}
Sector 2: Services	Z_{21}^{BA}	Z_{22}^{BA}	Z_{21}^{BB}	Z_{22}^{BB}	F_{2BA}	F_{2}^{BB}
Tax less subsidy on products	NTZ_{1}^{A}	NTZ_{2}^{A}	NTZ^{1B}	NTZ_{2}^{B}	NTF^{A}	NTF^{B}
International trade margin and insurance	TIZ_{1}^{A}	TIZ_{2}^{A}	TIZ_{1}^{B}	TIZ_{2}^{B}	TIF^{A}	TIF^{B}
Value-added						
Labor compensation	VL_{1}^{A}	VL_{2}^{A}	VL_{1}^{B}	VL_{2}^{B}		
Operating surplus	VO_{1}^{A}	VO_{2}^{A}	VO_{1}^{B}	VO_{2}^{B}		
Tax less subsidy on production	VT_{1}^{A}	VT_{2}^{A}	VT_{1}^{B}	VT_{2}^{B}		
Output	X_{1}^{A}	X_{2}^{A}	X_{1}^{B}	X_{2}^{B}		

SOURCE: Author's compilation.

will form the long-term approach to be used by the OECD). But even though some countries are able to estimate the overall import of a given product used by a particular industry, many are not, and none are able to show, systematically, the source of that import (by originating country and industry) by the using industry (or "final demand" category).

Central to the construction of a global input-output table, therefore, is the estimation of trade flows between industries and consumers across countries. Indeed, these trade flows in intermediate goods and services are the glue that binds together the national individual input-output tables. A positive spin-off of the work is worth mentioning in this context. National estimates of trade (exports and imports) are not coherent across countries, even after adjusting for price differences, CIF, and FOB. The process of constructing a global I-O table confronts this issue head-on. The spin-off to the work is therefore a mechanism to reveal where global imbalances lie. The results and policy implications of the work highlight the importance that should be attached to reconciling these flows at the national level. Over the coming years, this will form an important part of the OECD's work program, through its Working Party on Trade in Goods and Services.

Bilateral trade in goods and services and I-O balancing

Given the fact that many imports enter countries through intermediaries (wholesalers), it is highly unlikely that countries will ever be able to collect statistics that systematically show the country source of all imports consumed by all industries, nor does it seem likely that countries will be able to show which foreign industries consume their products. But, as shown below, it is possible, at least in the medium term, for countries to do more in this field by capitalizing on microdata and links between trade and business registers.

In the short term, however, more can be—and is being—done to improve how imports are allocated to using industries. Most countries are able to produce estimates of bilateral trade in goods and services showing the export of a given good or service to a given partner country. And indeed, most countries are able to further reveal whether any particular import or export of a good (at least, for most imports and exports) was intermediate, an investment, or a consumer good.

In constructing the import (and export) flows of its global I-O table, the OECD necessarily uses a number of assumptions. The main assumption used in creating these import matrices is the "proportionality" assumption, which assumes that the country-of-origin share of a given import consumed by a given industry in a given country is the same for all industries in that country. For countries that are not able to provide any "import-flow" matrices at all—i.e., the intermediate consumption of imports by origin and destination industries—the OECD necessarily assumes that the share of intermediate imports in total intermediate consumption for a given imported product is the same for all using industries. Furthermore, the OECD assumes that this share is equivalent to the overall share of intermediate imports to total intermediates supplied for that product. In all cases, the OECD has been able to significantly improve the quality of the assumptions it necessarily uses by creating a new database of bilateral trade (for goods) that breaks down imports (and exports) on the basis of the nature of the traded product (intermediate, household, investment, other). This database is called the Bilateral Trade Database by Industry and End-Use category (BTDIxE), and is derived from the United Nations Statistics Division (UNSD) UN Comtrade database, where values and quantities of imports and exports are compiled according to product classifications and by partner.[6]

UN Comtrade data are classified by declaring country (the country supplying the information), by partner country (the origin of imports or destination of exports), and by product (according to Harmonized System, or HS). Trade flows are stored according to the product classification used by the declaring country at the time of data collection. In general, source data are held according to Standard International Trade Classification (SITC) Revision 2 (Rev. 2) for the time period 1978–1987, the Harmonized System (1988) for 1988–1995, HS Rev. 1 (1996) for 1996–2001, HS Rev. 2 (2002) for 2002–2006, and HS Rev. 3 (2007) from 2007 onwards.

To generate estimates of trade in goods by industry and by end-use category, six-digit product codes from each version of HS from UN Comtrade are assigned to a unique ISIC Rev. 3 industry and a unique end-use category—and hence, assigned to a basic class of goods as specified in the System of National Accounts (SNA) (European Commission et al. 2009; see Table 6.3).

Notwithstanding the known problems relating to the asymmetries that exist within bilateral trade statistics (i.e., global exports do not equal global imports), these bilateral statistics form the basis for populating the international flows in goods used in the OECD's global input-output tables, before balancing.

The approach used for bilateral trade in services statistics is in essence similar: Estimates based on official bilateral statistics form the basis for the original estimates of exports and imports by country. However, the quality of bilateral trade in services statistics is notoriously poor, and so the original partner-share coefficients used to populate I-O cells of international trade in services are based on gravity model techniques (see Miroudot, Lanz, and Ragoussis 2009), which are subsequently balanced within the overall system.

Only very few countries have a consistency between bilateral trade flows (imports and exports) by partner country and the corresponding flows shown in their supply-use tables (the basis for the creation of national I-O tables), reflecting the fact that, for goods at least, bilateral trade flows follow merchandise trade accounting standards. As such, there are a number of recommendations that follow for official statisticians:

Coherent bilateral trade and national accounts data. Producing bilateral trade flows that are consistent with underlying supply-use tables should form a high priority of national statistics offices.

Confidential trade. In some countries, disclosure rules suppress six-digit HS components in UN Comtrade and also higher two-digit HS chapter levels. This should be avoided where possible by adopting other forms of preserving confidentiality, such as suppressing another six-digit category.

Reexports. Adjustments are required for reexports—and, for major continental trading hubs, these adjustments can be significant. Sufficient data are available to adjust for reported trade between China and the rest of the world via Hong Kong, but not currently for other major hubs such as Belgium, the Netherlands, and Singapore.

Identifying used capital goods. HS codes, and thus reported trade in UN Comtrade, cannot differentiate between new and old capital goods (such as secondhand aircraft and ships). Estimating international

Table 6.3 Current BEC and SNA Classes of Goods

	End-use			
		Final-demand goods		
Product characteristics	Intermediate	Household consumption	Industrial capital goods	Other
Primary products	Food and beverages (111)	Food and beverages (112)		
	Industrial supplies (21)			
	Fuels and lubricants (31)			
Processed unfinished	Fuels and lubricants (32)	Fuels and lubricants (32)		
	Industrial supplies (22)	Food and beverages (122)		
	Parts and components of transport equipment (53)			
	Parts and components of capital goods (42)			
Processed finished	Packed medicaments (part of 63)	Packed medicaments (part of 63)	Capital goods (41)	
		Nonindustrial transport equipment (522)	Industrial transport equipment (521)	
		Nondurable consumer goods (63)		
		Semidurable consumer goods (62)		
		Durable consumer goods for households (61)		
		Durable personal consumer goods, e.g., personal computers (part of 61)	Durable personal consumer goods, e.g., personal computers (part of 61)	
		Mobile phones (part of 41)	Mobile phones (part of 41)	

	Passenger motor cars (51) Fixed-line phones (part of 62)	Passenger motor cars (51) Fixed-line phones (part of 62)	
Other			Goods n.e.c. (7)

NOTE: Numbers are in Broad Economic Categories (BEC) codes. "SNA" stands for "System of National Accounts." "n.e.c." stands for "not elsewhere classified."
SOURCE: United Nations Statistics Division (2013).

trade in these flows in a value-added context requires an elaboration on the input-output framework that allows these flows to be recorded in a way that aligns with total global value-added produced in a given period.

Unidentified scrap and waste. Certain types of waste and scrap do not have separate six-digit HS codes—e.g., PCs and other electrical equipment exported (often to developing countries) for recycling.

Better services data. Moreover, for services, countries are encouraged to provide more detail on partner countries and also on the type of products (following EBOPS 2010).[7]

Coherent international trade data. Greater efforts are needed to reconcile asymmetries in international trade flows.

Without the issues outlined above being resolved, the OECD's global input-output table must necessarily balance global discrepancies in trade using a quasi automatic (RAS) balancing procedure. This process constrains each country's exports and imports to published national accounts totals, while also constraining estimates of national GDP. Resolving these asymmetries in bilateral trade statistics is a work in progress, and efforts to improve the nature of the balancing process are ongoing (Ahmad, Wang, and Yamano 2013).

Given the assumptions and balancing adjustments necessarily used, it is important to stress that the indicators shown in the database are *estimates*. Official gross statistics on international trade produced by national statistics institutions result in inconsistent figures for total global exports and total global imports, inconsistencies that are magnified when bilateral partner country positions are considered. The global input-output tables from which trade in value-added indicators are derived necessarily eliminate these inconsistencies, such as those that reflect different national treatments of reexports and transit trade (e.g., going through hubs such as the Netherlands), to achieve a coherent picture of global trade. For the countries for which data are presented, total exports and imports are consistent with official national accounts estimates.

Level of detail in national supply-use and input-output (I-O) tables—future improvements

Indicators created by input-output techniques are limited by the degree of industry disaggregation that the tables provide. The national input-output tables used by the OECD are based on a harmonized set of 37 industries. In simple terms, therefore, any given indicator for a particular industry assumes that all consumers of that industry's output purchase exactly the same shares of products produced by all of the firms allocated to that industry.

In practice, this boils down to (but is not the same thing as) assuming that there exists only one single production technique for all of the firms (and all of the products) in the industry grouping. We know that this is not true and that different firms, even those producing the same products, will have different production techniques (and so technical I-O coefficients), and we also know that different firms produce different products and that these products will be destined for different types of consumers and markets.

Of chief concern in this respect is the evidence that points to exports having very different coefficients from the coefficients of goods and services produced for domestic markets, particularly when the exports (typically intermediate) are produced by foreign-owned affiliates in a global value chain. Because exporting firms are generally more integrated into value-added chains, they will typically have higher foreign content ratios, particularly when they are foreign-owned. Generally, therefore, an ability to account for this heterogeneity in producing trade in value-added estimates will result in lower shares of foreign content than might be recorded if more detailed input-output tables were available.

It is important to note, however, that more detail does not necessarily translate into more disaggregated industries. What matters for developing indicators on GVCs is more detail on firms trading internationally. In this sense, given a choice between doubling the number of industries available within current national I-O or supply-and-use tables or providing a split of existing industries into one group of exporting firms and another of nonexporting firms, the latter may, arguably, be preferable.

Ideally, therefore, countries should attempt to construct supply-use or input-output tables that better respond to the challenges presented by GVCs. In a project coordinated by the OECD and the Chinese Ministry of Commerce (the latter in collaboration with the Chinese National Bureau of Statistics), an input-output table for China was created that split all of its industrial sectors into three categories: 1) processing firms, 2) other exporting firms, and 3) all other firms (Cuihong et al 2013).

Ideally, countries could adopt similar approaches in constructing their I-O or supply-and-use tables, using splits based on national circumstances. Processing firms form a significant part of China's exporters, so such a classification made sense in the case of China, but this may not be optimal for all countries. For most countries, achieving changes to national I-O or supply-and-use tables may take some time.

Other, potentially simpler, approaches, however, could be used to significantly improve the quality of the information I-O tables are able to produce for analyzing GVCs.

In October 2012, the OECD and Eurostat launched one such approach by building on the OECD-Eurostat Trade by Enterprise Characteristics (TEC) data collection. The TEC exercise collects information on the turnover generated through exports broken down by size class, industry, and partner country. For imports, similar information is provided but with a more limited breakdown on the importing industry. But these indicators only begin to scratch the surface of the potential, if researchers can make links to structural business statistics (Ahmad et al. 2011). With these further links, they can create information on the direct value-added of exporting firms, as well as information on employment. In addition, they can create indicators broken down by whether the firms are foreign or domestically owned, an important additional breakdown required for analyses of "trade in income." (This topic of trade in income is further addressed under the subsection heading of that name, below.) Moreover, information that links the data on importing firms with those on exporting firms can provide vital insights into the nature of global production chains. Importantly, for those countries that already produce TEC statistics, researchers could develop this information without necessarily using links to structural business statistics, although they would have to do so on the basis of turnover flows. This information could form the basis for disaggregating I-O or supply-and-use industries into characteristics required to better measure GVCs.

The questionnaire that was circulated to test the feasible and practical level of detail that could be collected, bearing in mind disclosure rules, focused only on export intensities (rather than on import intensities, where it was recognized that other steps would need to precede development of a questionnaire on that aspect). The primary purpose of the questionnaire was to categorize firms on the basis of their share of output generated by exports (i.e., export intensities). The form provided for three different levels of breakdown; it asked countries to use the level of breakdown that best suited their disclosure rules and resources:

1) Firms that export (i.e., more than 0 percent of output is made up by exports) and firms that don't (0 percent of output is exported).
2) A breakdown of firms by export-intensity quartiles, with a separate category for nonexporting firms: 0 percent, between >0 and 25 percent, between >25 and 50 percent, between >50 and 75 percent, and greater than 75 percent.
3) A more aggregated breakdown of export intensity into three categories: a) nonexporting firms, b) firms with exports between >0 and 50 percent, and c) firms with exports greater than 50 percent.

Seven variables, described below, were requested in the exercise, and each was broken down by industry, size class, and ownership. However, recognizing that disclosure rules would restrict what could realistically be produced for public consumption, the distributors of the survey asked countries to prioritize their information along the following lines:

- Priority 1: Industries (preferably, ISIC Rev. 4) for two-digit groupings
- Priority 2: Export intensities (exports as a percentage of output)
- Priority 3: Ownership (a breakdown into foreign/domestic ownership)
- Priority 4: Size class (a breakdown preferably done by number of employees)

The seven variables requested were as follows:

1) The number of statistical units, participating or otherwise, in exports, ideally using a concept consistent with that used in preparing supply-use and input-output tables.

2) The value-added generated by firms in national currency units, ideally at basic prices.
3) The value of exports generated by firms in national currency units, ideally at FOB (free on board) prices.
4) The output generated by firms in national currency units, ideally at basic prices.
5) The total employment of firms, ideally on a full-time equivalent basis.
6) The total compensation of employees of firms.
7) Direct imports of firms in national currency units, ideally at CIF (cost, insurance, and freight) prices.

Going beyond Trade in Value-Added

Looking at trade in value-added terms provides a valuable insight into broader notions of competitiveness (in addition to providing insights into trade policies) by illustrating interlinkages between countries and also by illustrating those activities (or tasks) that generate the most value. But additional indicators and insights can be gained by considering extensions to the accounting framework.

Trade in jobs

One immediate area relates to jobs. This requires consistent estimates of employment measures (employment, employees, actual hours worked) using the underlying value-added estimates produced by national statistics offices in their supply-use tables.

Countries have already begun to make improvements in this area, driven by a need to produce coherent productivity estimates by industry, and it is hoped that highlighting the important insights that can be gained by looking at trade in jobs will reinforce and support these national initiatives aimed at improving coherence. Going a step further, we can state that, particularly because international fragmentation has meant industries across countries are less comparable than they used to be (as countries specialize in those stages of the underlying activity where they have a comparative advantage), it is increasingly becoming necessary to link jobs statistics to skills statistics.

The OECD's ANSKILL database (in the process of being updated) provides information on employment and skill composition at the industry level. The database matches industry data at the two-digit level (classified according to the ISIC Rev. 3) to occupations at the two-digit level (classified according to International Standard Classification of Occupations [ISCO]-88). It also includes an additional proxy for skills, in the form of data on the educational attainment of employees (classified on the basis of International Standard Classification of Education [ISCED]-97). The database covers 26 countries, mostly for 1997–2005, although coverage of seven of the countries is much more limited.

For ANSKILL, the ISCO-88 occupation classification corresponds to high-, medium-, and low-skilled levels, as follows:

- Categories 1 (legislators, senior officials, managers), 2 (professionals), and 3 (technicians and associate professionals) are regarded as high-skilled.
- Categories 4 (clerks), 5 (service workers and shop and market sale workers), 6 (skilled agricultural and fishery workers), and 7 (craft and related trade workers) are regarded as medium-skilled.
- Categories 8 (plant and machine operators and assemblers) and 9 (elementary occupations) are regarded as low-skilled.

The ISCED-97 educational classification maps to high, medium, and low skill levels in ANSKILL as follows:

- Categories 1 (primary education) and 2 (lower secondary/second stage of basic education) are regarded as low-skilled.
- Categories 3 (upper secondary education) and 4 (postsecondary nontertiary education) are regarded as medium-skilled.
- Categories 5 (first stage of tertiary education) and 6 (second stage of tertiary education) are regarded as high-skilled.

Trade in income

Conventional trade statistics do not always record transactions between affiliates as sales or purchases of goods and services. This is especially true of intellectual property products (IPPs).

Consider, for example, an affiliate enterprise, recognized in the national accounts of its resident economy as the economic owner of an

IPP that it uses to produce goods, which it sells. The affiliate's value-added would reflect in part the return on this underlying asset, realized as profits (operating surplus). These profits would subsequently be recorded as reinvested earnings, whether or not any actual flows occur between the parent and its affiliate. Ultimately, therefore, it is the parent (often the entity that finances the underlying IPP) that benefits from the use of the IPP. (Indeed, this in itself raises questions about how economic ownership of IPPs should be considered with respect to multinationals—an issue that is currently being tackled by the international statistics community.)

However, the difficulties raised by the current recording of IPPs in the balance of payments and national accounts of countries extend beyond this simple example (which correctly records flows in line with current standards and guidelines). Often, for example, the national accounts in the economy of the parent company will record the asset, but there will not be any flows related to the use the owner makes of its affiliates, which use is frequently driven by tax minimization purposes. Often, as well, the owner may transfer the asset to an affiliate (such as a special purpose enterprise, or SPE), with the parent and other affiliates making explicit payments to the SPE, again driven to do so by tax minimization purposes.

What is clear from the above, therefore, is that flows related to IPPs require an extension of accounting systems beyond looking merely at value-added flows in order to fully understand who benefits from trade and indeed trade liberalization (and investment). Sometimes these flows will increase value-added, sometimes they will not. But in both cases the beneficiary is arguably the same (the parent company).

But the flows merely illustrate a wider issue, notwithstanding the obvious implications they raise for multifactor productivity calculations. First, they illustrate the potential distortions that may arise when one factors in the scope for transfer pricing manipulations. Second, such interpretations extend beyond looking only at the conventional set of assets recognized as such in the 2008 SNA. Other knowledge-based assets, such as brands and organizational capital, can also increase an affiliate's value-added, and even though these assets are not recognized in the SNA, the profits recorded by the affiliate compensate for their use, and these still flow back to the parent, eventually, as reinvested earnings flows in the accounts. But these flows are typically not available

on a bilateral partner country basis, let alone a partner country–industry basis, which is what is needed to analyze trade in income analogously with trade in value-added.

Recording these flows, therefore, is crucial. Part of the solution lies in producing supply-use tables (or indicators) that capture foreign ownership. Clearly, it is unlikely that it will be feasible to produce supply-use tables that capture foreign ownership by country for all of the owners of the affiliates. But a separate breakdown of activities in a supply-use table that differentiates between foreign- and domestic-owned firms should be feasible, as it relates to confidentiality rules and burdens.

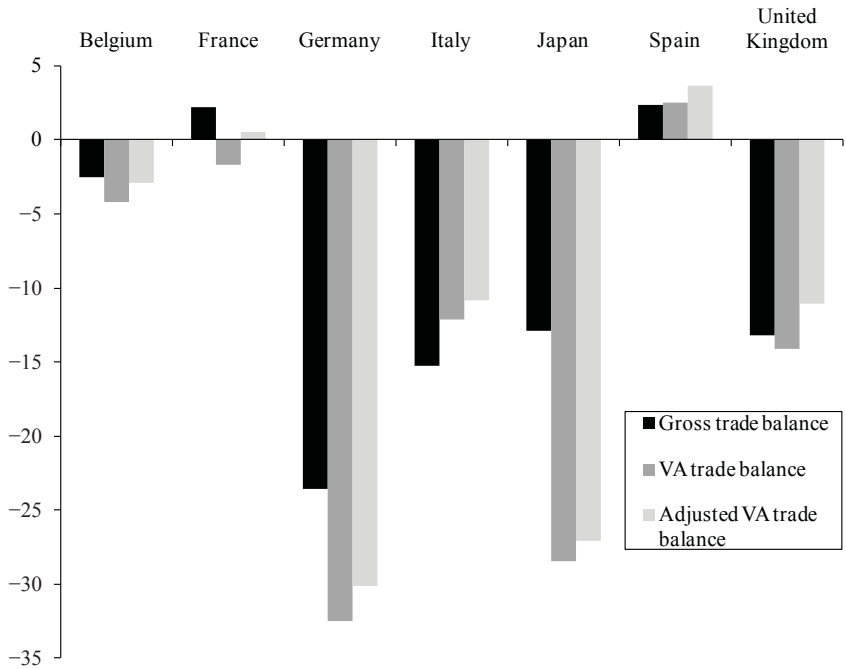
By supplementing this with bilateral trade in primary income statistics (a from-whom-to-whom framework) broken down by type of income (in particular, reinvested earnings and interest), it should be possible to create extensions to the trade-in-value-added accounting framework by treating the primary income flows (and components) as if they were services produced by artificial industries in the host country of the parent company.

Some of the tools to do this already exist. Foreign affiliate trade statistics (FATS) can be combined, for example, with information in supply-use tables that shows breakdowns based on ownership. And there is also scope to link this further to balance-of-payment (BoP) data flows. The OECD is looking at developing a more detailed accounting framework and set of recommendations in this area, which could form the basis for estimating flows of trade in income.

Figure 6.10 provides an illustration of the potential impact this may have on our understanding of trade relationships. For illustrative purposes only, the operating surplus generated by U.S.-owned affiliates in the "Chemicals and electronics" sector in Ireland (available from FATS) is considered to be equivalent to value-added generated by U.S. firms. These flows can then be treated as exports from the United States to those countries consuming the U.S. affiliate exports from Ireland, revealing not insignificant changes in bilateral trade positions. For example, for France the trade deficit in value-added terms becomes a trade surplus again, which is what gross flows show.

To further illustrate the potential impact of accounting for these flows between multinationals, about 70 percent of China's gross high-tech exports were made by foreign affiliates in 2009, according to data

Figure 6.10 U.S. Trade Balance, Adjusted for U.S. Affiliates' Exports from Ireland, $US Billions, 2009



NOTE: "VA" stands for "value-added."
SOURCE: OECD calculations, based on the OECD-WTO Trade in Value-Added (TiVA) database and the OECD Activity of Multinational Enterprises (AMNE) database.

supplied by the Chinese Ministry of Commerce. Furthermore, between 1995 and 2007, Japanese foreign affiliates increased their employment in China eightfold, from just over one hundred thousand employees to more than one million, and in Thailand fourfold, from over one hundred thousand to over four hundred thousand; the pattern was similar in other Association of Southeast Asian Nations (ASEAN) countries, such as the Philippines, Malaysia, and Indonesia. And from 1995 to 2009, Japan's primary income trade surplus increased by around $100 billion, more than offsetting the $50 billion reduction in its gross trade surplus over the same period.

Trade in CO_2 (and other emissions)

One additional extension that follows from the accounting framework for trade in value-added (and trade in jobs) is carbon footprints. Carbon footprint calculations are typically estimated using I-O tables (Ahmad and Wyckoff 2003).

Incorporating capital flows

Other areas where extensions to the accounting framework would be desirable include the contribution made by capital more generally. Because of the way capital (gross fixed capital formation) is recorded in the accounting system, analyses that look at trade in value-added do not fully capture how production across countries is linked and how capital goods (and services) produced in one country contribute to the value-added in another. For example, all the value-added exported by Japan in producing machinery for manufacturers in China will be recorded as Chinese imports from Japan. But, arguably, the capital service values embodied in the goods produced and exported by China should show Japan as the beneficiary. This requires high-quality capital flow (and capital stock) matrices.

Distribution sectors and trade

One final area of work that merits attention concerns the value added by distributors through sales of final imported goods. The estimates of trade in value-added do not reveal how cheap imports are also important to retailers, who are able to generate domestic value-added through sales to consumers. Tariff measures will necessarily impose additional costs on these goods which, all other things being equal, could suppress demand and so in turn lead to lower value-added in the distribution sectors. The OECD is also considering how these estimates could be incorporated within its accounting framework, using margin rates for all products in national supply-use tables, and through this usage motivating the further development of such data.

Notes

1. See an application of international I-O in Escaith et al. (2011).
2. For more information on the database, see OECD (2013).
3. An OECD–World Bank workshop on "New Metrics for Global Value Chains" was held on September 21, 2010. WTO hosted a "Global Forum on Trade Statistics" on February 2–4, 2011, in collaboration with Eurostat, the United Nations Statistics Division (UNSD), and the United Nations Conference on Trade and Development (UNCTAD).
4. Some research-oriented initiatives have been using the GTAP database for international input-output data. This database is not, however, based on official sources of statistics.
5. For more details, see OECD (2012b). The list of countries includes Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, Argentina, Brazil, China, Chinese Taipei, Cyprus, India, Indonesia, Latvia, Lithuania, Malaysia, Malta, Romania, the Russian Federation, Singapore, South Africa, Thailand, and Vietnam.
6. For more details, see OECD (2012a).
7. EBOPS stands for Extended Balance of Payments Services Classification; see the service list of EBOPS items at http://unstats.un.org/unsd/servicetrade/mr/rfCommoditiesList.aspx.

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Measuring Globalization

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Volume 2

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and
Michael Mandel
Editors

2015

W.E. Upjohn Institute for Employment Research
Kalamazoo, Michigan

Library of Congress Cataloging-in-Publication Data

Measuring globalization : better trade statistics for better policy / Susan N. Houseman and Michael Mandel, editors.
volumes cm
Includes bibliographical references and indexes.
ISBN 978-0-88099-488-0 (v. 1 : pbk. : alk. paper) — ISBN 0-88099-488-6 (v. 1 : pbk. : alk. paper) —ISBN 978-0-88099-489-7 (v. 1 : hardcover : alk. paper) — ISBN 0-88099-489-4 (v. 1 : hardcover : alk. paper)
1. Commercial statistics. I. Houseman, Susan N., 1956- II. Mandel, Michael J.
HF1016.M44 2015
382.01’5195—dc23

2014047579

W.E. Upjohn Institute for Employment Research
300 S. Westnedge Avenue
Kalamazoo, Michigan 49007-4686

Cover design by Alcorn Publication Design.
Index prepared by Diane Worden.
Printed in the United States of America.
Printed on recycled paper.