Trade in Value Added, Jobs and Investment

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Abstract

Trade in Value Added, Jobs and Investment

Supply Use Tables in 21st Century Production

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The increasing international fragmentation of production that has occurred in recent decades driven by technological progress, cost, access to resources and markets, trade policy reforms, and indeed emerging economies, has challenged our conventional wisdom on how we look at and interpret trade. Traditional measures of trade, record gross flows of goods and services each and every time they cross borders leading to what many describe as a 'multiple' counting of trade, which may lead to misguided policy measures. To respond to this challenge a number of initiatives have been launched in recent years that attempt to measure, or perhaps more accurately 'estimate', what has become known as 'trade in value-added'. These have all helped to shed light on the importance of accounting for global value chains and have helped raise awareness of a growing need to mainstream the production of these estimates within the international statistics system. Responding to these challenges on 15 March 2012 the OECD and WTO undertook to collaborate on the development of estimates of trade in value-added (TiVA), resulting in a first release of a preliminary database on 16 January 2013 and a subsequent update in May 2013. This paper describes some of the key results of that work, and the methodology used. It also describes the detailed assumptions behind the methodology to necessarily deal with the treatment of data, and also the initiatives launched to improve the quality of those assumptions and the underlying data. The paper also describes extensions of the work to consider 'trade in jobs', and, proposes a framework to develop Extended national Supply Use tables that capture flows of primary/property income, so providing a mechanism to analyse the links between investment and global value chains. While TiVA estimates have been able to shed important light on our understanding of international trade and its relation to activity and competitiveness, in particular the importance of recognising the importance of imports to exports, and, so, the hitherto hidden costs of protectionism as well as the benefits of trade liberalisation, particularly in services, they do not reveal the full picture. With significant shares of exports being driven by foreign affiliates, TiVA estimates have also revealed the importance of going beyond just value-added towards income, in order to capture flows outside of conventional international trade statistics, such as the repatriation of profits related to the use of non-produced knowledge based assets (e.g. brands) and, indeed, the repatriation of profits related to the use of produced knowledge based assets (e.g. software) that are (often incorrectly) not recorded as receipts from exports of services.

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INTRODUCTION

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, access to resources and markets, and trade policy reforms, has challenged our 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 to misguided decisions being taken.

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 (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 global value chains 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 (Hummels et al. 2001; Daudin, Rifflart, and Schweisguth 2009;; 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 15 March 2012, the 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 16 January 2013, with a further update released in May 2013. Some highlights from this release are presented below. The next release, is scheduled for November 2014, with subsequent releases occurring every year thereafter, reflecting the mainstreaming of the TiVA database within the OECD and WTO core work programmes. These work programmes also envisage, as described below, on-going improvements in the quality of the estimates produced under the 'trade in value-added' umbrella, both at the national level, particularly through motivating capacity building programmes in countries where supply-use or input-output tables are not currentlty available, and the international level, through broader collaborative efforts to improve, for example, bilateral trade statistics.

Ultimately this paper acts, in some ways, as a clarion call 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, in order to understand how economies work, and how to target and create industrial policies focusing on competitiveness it is necessary to see the whole. 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.

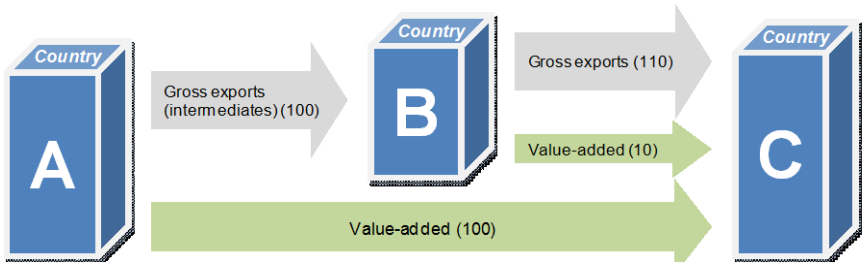
But the emergence of global value chains also raises, arguably profound, questions about the way national statistics are currently compiled. In the same way that international organisations increasingly need to think 'national' in the way they present and compile their statistics, where 'national' reflects the single economic territorty comprising the 'world' or large parts of it, national statistics institutions need to think global. In other words, in the construction of national statistics greater emphasis is needed on the role of the Rest of the World, both as a source of demand and supplier for demand but also with regards to the role of multinationals. This requires a rethink of the way that firms are currently aggregated within statistical information systems to move beyond the classic aggregation based almost exclusively on industrial classification systems towards more meaningful aggregations that better reflect today's 'global factory'. Such considerations are also essential not only to better understand the way that global production is today organised but also to better understand how investment drives global value chains, and in particular how that very same investment can lead to difficulties in interpreting trade flows as well as GDP.

This paper is an attempt to respond to these developments and growing needs. It begins by describing the policy drivers and needs that led to the TiVA initiative, as well as the underlying methodology and assumptions used to estimate TiVA, before assessing the implications for statistics offices, data collection, and national supply-use tables in particular. It ends by describing a proposal for Extended Supply Use tables that could form the basis of a fully integrated international economic accounting system.

WHAT IS TRADE IN VALUE-ADDED?

The "Trade in Value-Added" initiative addresses the double counting implicit in current gross flows of trade. Instead, 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 (Figure 1).

Figure 1 Exports: Gross and Value-Added Flows



The simple example, shown in Figure 1 above, illustrates this. Country A exports $100 of goods, produced entirely within A, to country B, which further processes them before exporting them to C, where they are consumed. 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.

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.

MOTIVATION—HOW CAN MEASURES OF TRADE IN VALUE-ADDED INFORM POLICY MAKING?

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 development strategies and industrial policies. Some countries have capitalized on global value chains 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 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 below, the 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 global value chains (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

1. See an application of international IO in Escaith et al. (2011).

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 adopting 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 CO2 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 CO2 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 CO2 emissions (Ahmad and Wyckoff 2003; Nakano et al. 2009).

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 (see Table 1 below), with data currently provided at an aggregated level of 18 industries . The following provides an overview of the key messages provided by the data.[2]

Table 1: TiVA database: Geographical Coverage

Australia	Hungary	Poland	Brunei Darussalam	Philippines
Austria	Iceland	Portugal	Bulgaria	Romania
Belgium	Ireland	Slovak Republic	Cambodia	Russian Federation
Canada	Israel	Slovenia	China	Saudi Arabia
Chile	Italy	Spain	India	Singapore
Czech Republic	Japan	Sweden	Hong Kong, China	South Africa
Denmark	Korea	Switzerland	India	Thailand
Estonia	Luxembourg	Turkey	Indonesia	Viet Nam
Finland	Mexico	United Kingdom	Latvia	Rest of the World
France	Netherlands	United States	Lithuania	
Germany	New Zealand	Argentina	Malaysia	
Greece	Norway	Brazil	Malta	

[2] For more information on the database, see OECD (2013).

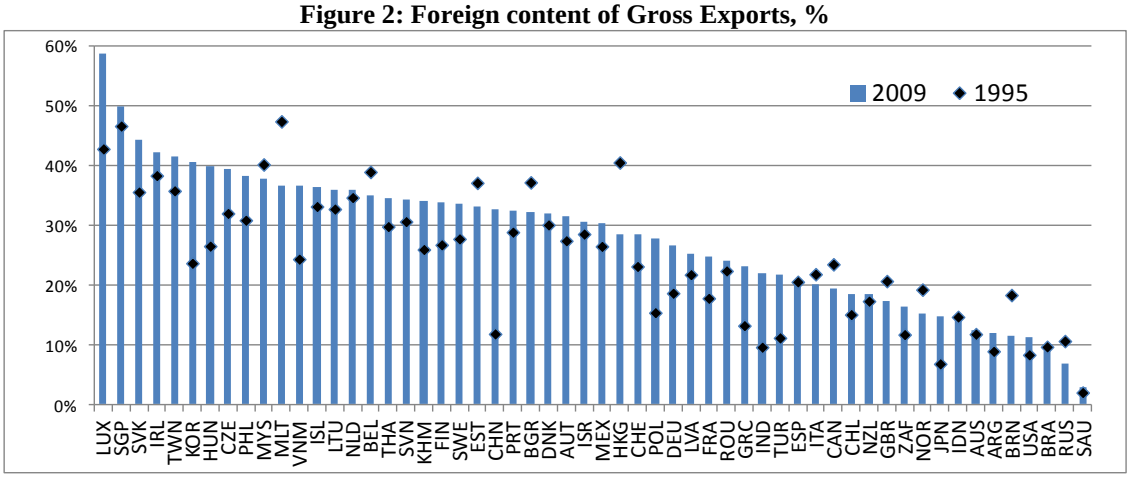
International 'Fragmentation of Production' has increased rapidly in the last two decades

Countries with relatively open and liberal trade regimes and high degrees of foreign investment will be typically expected to have higher foreign content in their exports. But a number of other factors impact on the extent of a country's integration into, and specialisation within, global value chains (GVCs). Larger economies, those with significant mineral resources, and those that are far from foreign markets and suppliers tend to have lower foreign content in their exports than smaller economies, as do those with high specialisation in services. This helps to explain the relative positions of countries shown in Figure 2 below which points to increasing foreign content in the exports of most countries in the last two decades and, so, increasing integration within GVCs.

...for example in Factory Europe and Factory Asia…

In Europe, the foreign content of exports in former transition economies, such as the Czech Republic, Hungary and Slovakia, stood at around 40% in 2009, significantly up from 1995, as these countries began to specialise in stages of the electronic and automotive value chains revolving in large part around Germany where the foreign content of exports rose from one-fifth in 1995 to nearly one-third in 2009.

Figure 2: Foreign content of Gross Exports, %



SOURCE: OECD-WTO Trade in Value-Added (TiVA) Database

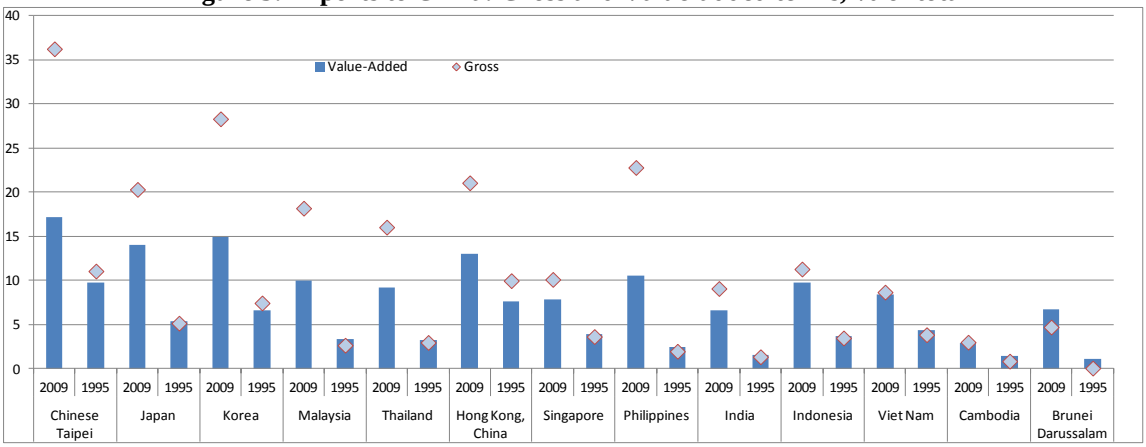
Similar patterns have emerged in Asia, reflecting in particular China's emergence and rapid integration into GVCs since its accession to the WTO in 2001. One-third of all Chinese exports in 2009 reflected foreign content, significantly up from 12% in 1995, reflecting in large part China's specialisation in the assembly and processing of electronic components. Significant changes were seen in other parts of Factory Asia too, such as Korea (41% in 2009) and Japan (15%), where the foreign content of exports doubled over the period. Data also show that the domestic value-added content of China’s exports rose between 2005 and 2009; potentially indicating a move up the value chain, with other low labour cost countries such as Vietnam and Cambodia moving into processing. The database also shows that in most countries, the foreign content of exports fell in 2009 compared to 2008, indicating that the more internationally fragmented the chain the more vulnerable production was to the synchronised slowdown in trade that occurred at the height of the crisis.

...and has changed the pattern of trade - who trades with who?

Bilateral trade balance positions can change significantly when measured in value-added terms, even though the total trade balance is unaffected. China's bilateral trade surplus with the United States was over one-third smaller in value-added terms in 2009, compared to gross based measures for example. 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 reflect 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.

Increasing fragmentation of production, driven by trade in intermediates, means that gross measures of trade may distort our interpretation of trade. Typically, gross trade statistics overstate the importance of neighbouring economies, and, so, understate the importance of distant economies driving demand at the end of the chain. In gross terms, 28% of Korea's exports in 2009 went to China (Figure 3) but in value-added terms only 14% of Korea's exports were destined for Chinese final consumers; a difference that in large part reflects China's processing of Korean intermediates for export to third countries like the US. Similar patterns exist for many other economies upstream of China in 2009, such as Malaysia and Thailand, while in Indonesia and Vietnam, which are further downstream, value-added and gross shares were relatively similar, partly reflecting their emergence as processors. Data also show that China had relatively limited integration within GVCs in 1995.

Figure 3: Exports to China: Gross and Value-added terms, % of total



SOURCE: OECD-WTO Trade in Value-Added (TiVA) Database

Value-added trade measures also reveal the growing importance of China as a final destination market. For example, Japan and Korea's value-added exports in 2009 destined for Chinese consumers were two to three times their rate in 1995. The partial corollary of this has been a decline in the importance of Japan as a final destination market, partly reflecting Japan's sluggish nominal economic growth over the 2000s. In value-added terms, 6.2% of the United States' exports in 2009 were destined for China, just shy of the 6.8% exported to Japan. The corresponding figures for 1995 were 2.3% and 12.7% respectively.

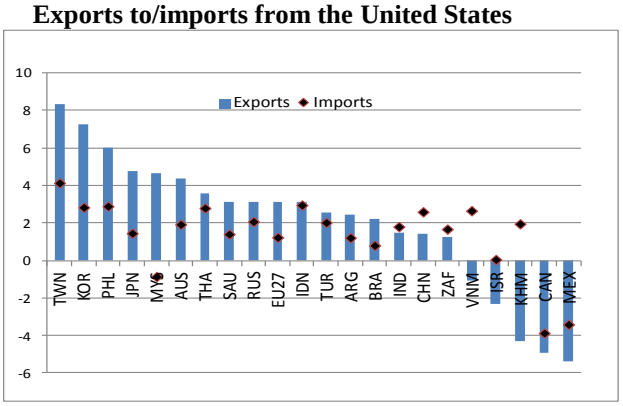
TiVA reveals more trade with the United States but also more North-South trade…

In value-added terms the importance of the United States as a source of imports and also as a destination for exports is higher than gross measures (Figure 4). Export shares, for example, were lower in value-added terms in only five countries in 2009: Vietnam, Israel, Cambodia, Canada and Mexico, partly

reflecting the relatively high degree of integration of these countries in United States production chains. The database also reveals that gross measures of trade may understate North-South trade relationships. Figure 4 for example reveals that Brazil is a more important market for OECD and ASEAN economies in value-added terms.

Figure 4: Export and Import shares (Value-added shares minus gross shares), percentage points, 2009

Exports to/imports from the United States



Exports to/imports from Brazil

SOURCE: OECD-WTO Trade in Value-Added (TiVA) Database

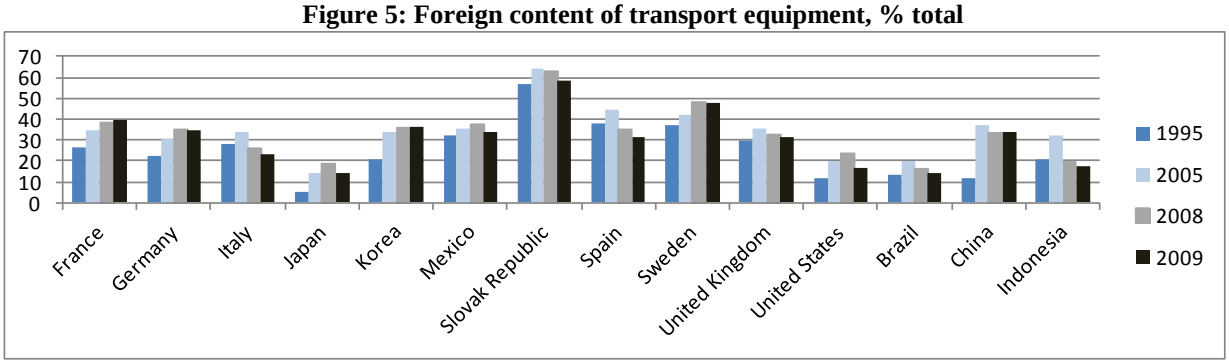
Global rankings change too

Gross trade statistics show that China's share of global exports was 9.4% in 2009, higher than Germany (8.4%) and marginally behind the United States (10.6%), and significantly up from its share in 1995 (2.5%). But its share in global exports in value-added terms, whilst still significant, was lower; rising from 2.8% to 8.3%, marginally ahead of Germany (8.0%) but 3.5 percentage points behind the United States (11.8%). In value-added terms the United Kingdom (4.5%) was the World's 5th largest exporter in 2009 displacing France (4.2%), whilst Korea fell from 8th in gross terms to 11th in value-added terms.

Competitiveness increasingly depends on access to imports

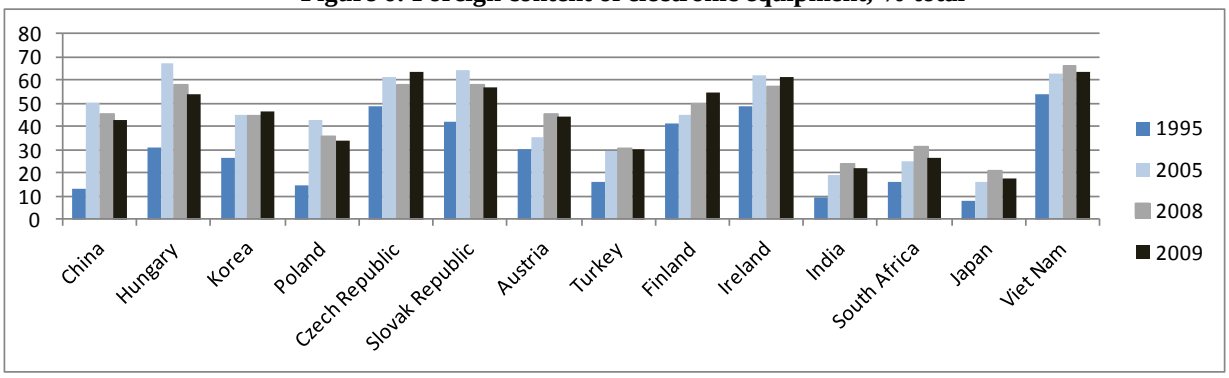
To improve productivity and remain competitive in a world dominated by GVCs requires efficient access to imports of intermediate goods. Figure 2 reveals that the trend in recent years has been for rising foreign content in exports. This comes through more clearly when looking at specific industries.

Figure 5: Foreign content of transport equipment, % total



In the transport equipment sector (Figure 5), the foreign content of exports was high and rose strongly in many countries between 1995 and 2009, nearly doubling in Germany and France.

Figure 6: Foreign content of electronic equipment, % total

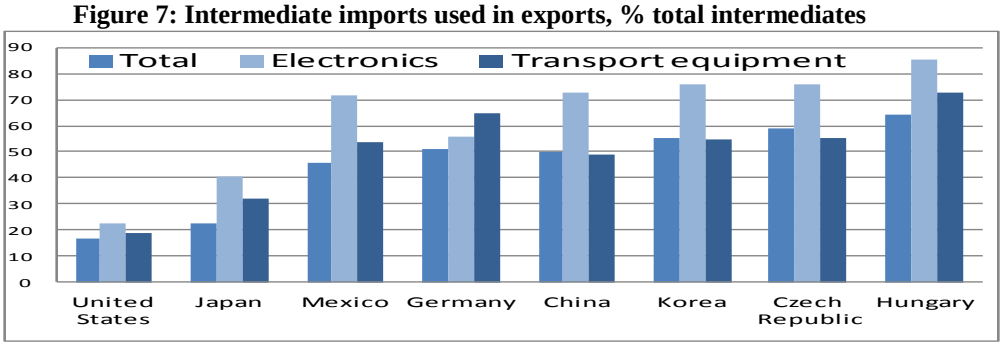


Similar patterns emerge in other industries with high international fragmentation, such as the electronic equipment industry (Figure 6). In China for example, the foreign content of exports trebled between 1995 and 2009, and in Hungary, Korea, India and Japan, it broadly doubled.

And significant shares of intermediate imports are used to produce exports

In most economies, the share of intermediate imports used to produce exports is around one-third (figure 7). But for some sectors and economies the share can be significantly higher. In Hungary, China, Korea and Mexico for example, around three-quarters of all intermediate imports of electronics are used in producing exports. Shares are generally lower the larger the economy but even in Japan 40% of total intermediate imports of transport parts are used to produce exports.

Figure 7: Intermediate imports used in exports, % total intermediates

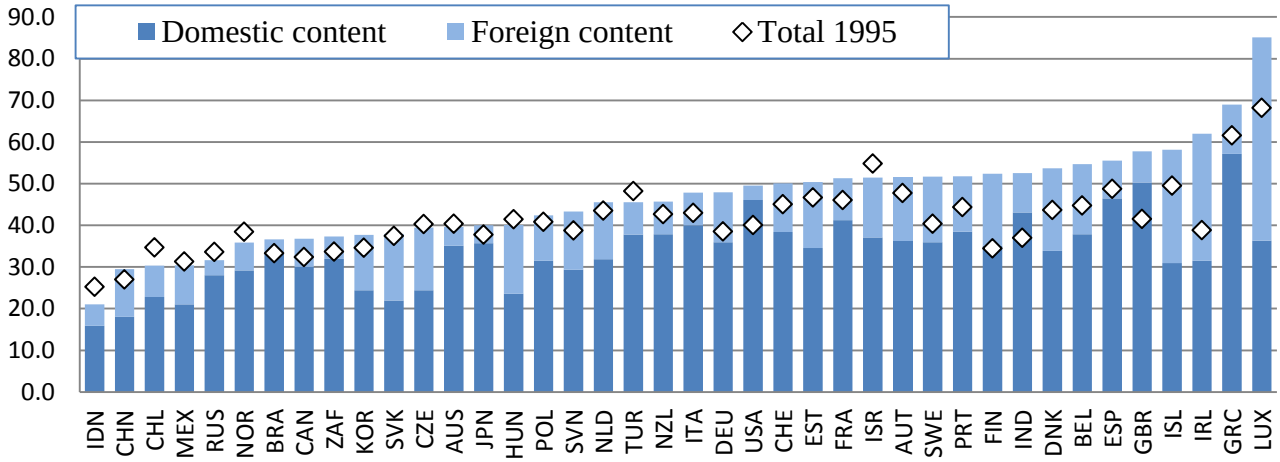


Services matter

Services comprise about two-thirds of GDP in most developed economies. However, based on gross terms, trade in services typically account for less than one-quarter of total trade. 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 accounting for the value-added by services in the production of goods shows that the service sector contributes over 50% of total exports in the United States, the United Kingdom, France, Germany and Italy and nearly one-third in China (Figure 8). A significant contribution (typically one-third in 2009) across all manufactured goods is provided by both foreign and domestic service providers, with the contribution rising between 5 and 10% in many countries since 1995. 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.

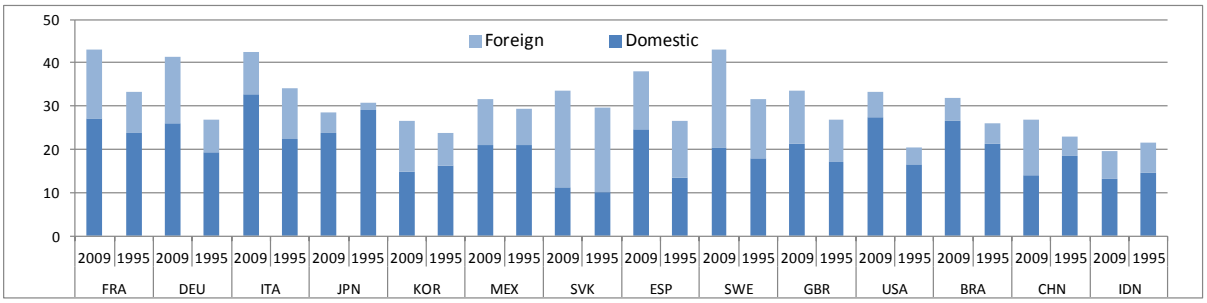
Part of the explanation for the difference between OECD countries and emerging economies can be found in the relatively higher degree of (largely domestic) outsourcing of services by manufacturers in OECD countries in recent decades, suggesting that a similar process could lead to improvements in the competitiveness of emerging economy manufacturers. Figure 8 also reveals a not insignificant contribution to exports coming from foreign service providers

Figure 8: Services content of exports, 2009



In the transport equipment sector, for example, the services content of exports was over 40% in a number of countries, partly reflecting the increased knowledge intensity (e.g. design, R&D, software) of transport equipment. But even these estimates to some extent underestimate the true services 'tasks' and knowledge content, as they only record the upstream value-added purchased, directly and indirectly, from the services sector, and, not the in-house services, including knowledge activities, produced within the transport equipment sector itself. The share of services rose in nearly all countries; indeed in France and Germany the domestic services content rose, despite the more than 10 percentage point fall in the overall domestic value-added content of exports between 1995 and 2009.

Figure 9: Services content of transport equipment



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 9), 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 to 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.

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).

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 (IO) tables for reference years, using the latest published data sources—e.g., supply-and-use tables (SUTs), 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.

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.

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 IO 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 IO tables for 57 economies (Table 1).

The IO 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 IO 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 total 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 IO database is based on the International Standard Industrial Classification of All Economic Activities, Revision 3 (ISIC Rev.3) (Table 2), 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 setion.

Table 2. 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 (non-energy)
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 exluding pharmaceuticals
2423	10	Pharmaceuticals
25	11	Rubber and plastics products
26	12	Other non-metallic mineral products
271+2731	13	Iron & steel
272+2732	14	Non-ferrous metals
28	15	Fabricated metal products, except machinery and equipment
29	16	Machinery and equipment, nec
30	17	Office, accounting and computing machinery
31	18	Electrical machinery and apparatus, nec
32	19	Radio, television and communication equipment
33	20	Medical, precision and optical instruments
34	21	Motor vehicles, trailers and semi-trailers
351	22	Building & 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 nec; recycling (include 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
62	35	Air transport
63	36	Supporting & 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 defence; 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 extra-territorial organisations

In essence, a global IO table differs little from a national IO table except that while the matrix of flows of intermediate goods and services in a national table can be industry × industry, in a global IO table, the rows and columns are country-industry combinations. In addition in a global IO table there are separate columns for each country's final demand. For illustration, Table 3 shows a two-country, two-sector representation.

Table 3. 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_2^{AB}
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_2^{BA}	F_2^{BB}
Tax less subsidy on products		NTZ_1^A	NTZ_2^A	NTZ_1^B	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-	Labor compensation	VL_1^A	VL_2^A	VL_1^B	VL_2^B		
Added	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		

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 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 content. 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 IO 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 IO 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 and industry destination of all intermediate imports, nor does it seem likely that countries will be able to show which foreign industries consume their intermediate exports. 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 IO 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 product (or industry) by 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[5] (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.

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 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)[6] (see Table 4).

5. For more details, see OECD (2012a).

[6] http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf

Table 4. Current BEC and SNA Classes of Goods

<table>
<tr><td colspan="2"></td><td colspan="4">End-use</td></tr>
<tr><td colspan="2"></td><td rowspan="2">Intermediate</td><td colspan="2">Final demand goods</td><td rowspan="2">Other</td></tr>
<tr><td colspan="2"></td><td>Household consumption</td><td>Industrial capital goods</td></tr>
<tr><td rowspan="5">Products characteristics</td><td rowspan="2">Primary products</td><td>Food and beverages (111)
Industrial supplies (21)
Fuels and lubricants (31)</td><td></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td></td><td>Food and beverages (112)</td></tr>
<tr><td rowspan="2">Processed unfinished</td><td></td><td>Food and beverages (122)</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Fuels and lubricants e.g. gasoline (32)
Food and beverages (121)
Industrial supplies (22)
Parts and components of transport equipments (53)
Parts and components of capital goods (42)</td><td></td></tr>
<tr><td rowspan="4">Processed finished</td><td colspan="2">Packed medicaments (part of 63)</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td rowspan="3"></td><td>Non-industrial transport equipments (522)
Non durable consumer goods (63)
Semi-durable consumer goods (62)
Durable consumer goods for households (61)</td></tr>
<tr><td>Durable personal consumer goods e.g. personal computers (part of 61),
Mobile phones (part of 41)
Passenger motor cars (51)
Fixed line phones (part of 62)</td><td></td></tr>
<tr><td></td><td>Capital goods (41)
Industrial transport equipments (521)</td><td></td></tr>
<tr><td>Other</td><td></td><td></td><td></td><td>Goods n.e.c (7)</td></tr>
</table>

NOTE: Numbers are in Broad Economic Categories (BEC) codes.

SOURCE: UNSD (2013).

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 IO 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 IO 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 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 COMTRADE, cannot differentiate between new and old capital goods (such as secondhand aircraft and ships). Estimating international 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.

In the absence of 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, Yamano, and Wang 2013) .

From the above, 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.

[7] Extended Balance of Payments Services Classification: see

http://unstats.un.org/unsd/servicetrade/mr/rfCommoditiesList.aspx

GOING FORWARD – IMRPOVING THE QUALITY OF THE ICIO

Taking account of Heterogeneity in TiVA

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 harmonised 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 IO 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. Indeed the changes introduced in the 2008 SNA for 'goods for processing' will mean that significant differences will arise for firms classified to the same industrial sector depending on the degree to which they own or not the intermediate goods used in production.

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 (see below), 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 inability 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 global value chains is more detail on firms trading internationally. In this sense, given a choice between doubling the number of industries available within current national IO or SU 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. Globalisation is rapidly changing long-standing assumptions about the relative homogeneity of the production functions (Input-Output technical coefficients) of units classified to a given industrial activity. Such assumptions have, of course, always been challenging when considering small and large firms, where economies of scale have always been understood to play a role. But the increasing prevalence of new types of firms such as Factoryless Producers and Processors, and the increasing tendency for horizontal, as opposed to vertical, specialisation, particularly for multinational affiliates, has fundamentally challenged these assumptions .

The ability of national (and international) Supply-Use and Input-Output tables, based on industrial groupings alone, to describe how demand and supply relationships are related has therefore become more difficult.

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 Chinese Ministry of Commerce (the latter in collaboration with the Chinese National Bureau of Statistics) in collaboration with the OECD, 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).

This general approach is being explored by the newly created OECD Expert Group on Extended supply Use tables (see below), where participating countries will explore similar approaches in constructing their

IO or SU tables, using aggregations 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 however, implementing such changes in their core statistical production systems may take some time.

Linking trade and business registers

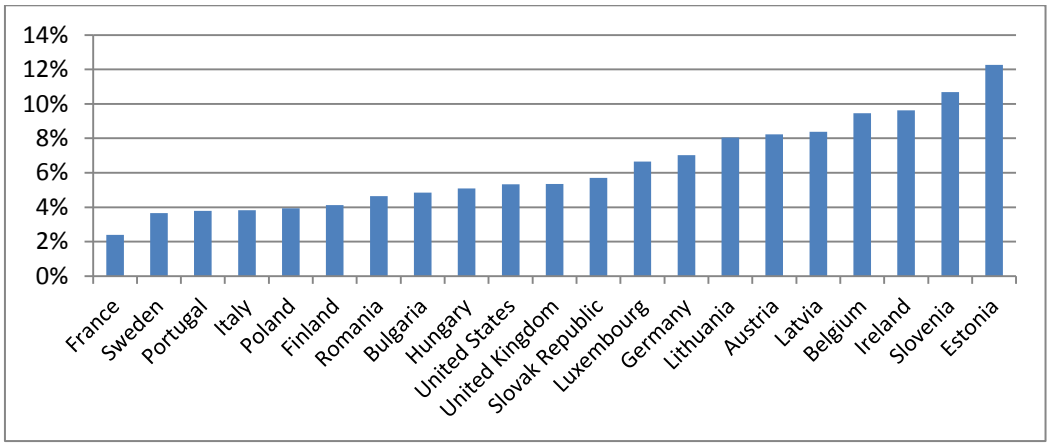
But that is not to say however that the challenges are insurmountable. In many countries significant improvements could be envisaged using readily available data sources. The key pre-requisite however is an ability to link trade and business registers. In this sense many countries have a head start. The long standing OECD-Eurostat Trade by Enterprise Characteristics (TEC) data collection exercise has for example for a number of years compiled indicators based on linked registers.

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, and so the exercise has revealed that there is scope for national statistics offices to aggregate firms, in addition to industrial classifications, on the basis of their exports and/or import intensity. Such aggregations, which could form the basis of publishable structural business statistics, embodied and reflected in official Supply-Use tables can significantly improve the quality of TiVA estimates, and at the same time provide coherent insights into drivers of competitiveness within and across countries. (see, Ahmad, Araújo, Lo Turco, and Maggioni 2011).

But the TEC exercise also reveals that such an approach to contructing Supply-Use tables need not be an 'all or nothing' approach. Significant quality improvements could be envisaged by focusing attention on only specific groups of industries, or indeed specific types of firms such as those that are large and/or foreign owned, as shown below:

Most firms don't export…..

Figure 10: Percentage of firms that export, total economy, 2011



SOURCE: Trade by Enterprise Characteristics Database.

Figure 10 above for example reveals that, in general, relatively few firms export, revealing that significant improvements to TiVA 'type' results could be achieved without necessarily collecting information on a significant number of firms. And for TiVA estimates perhaps the most important

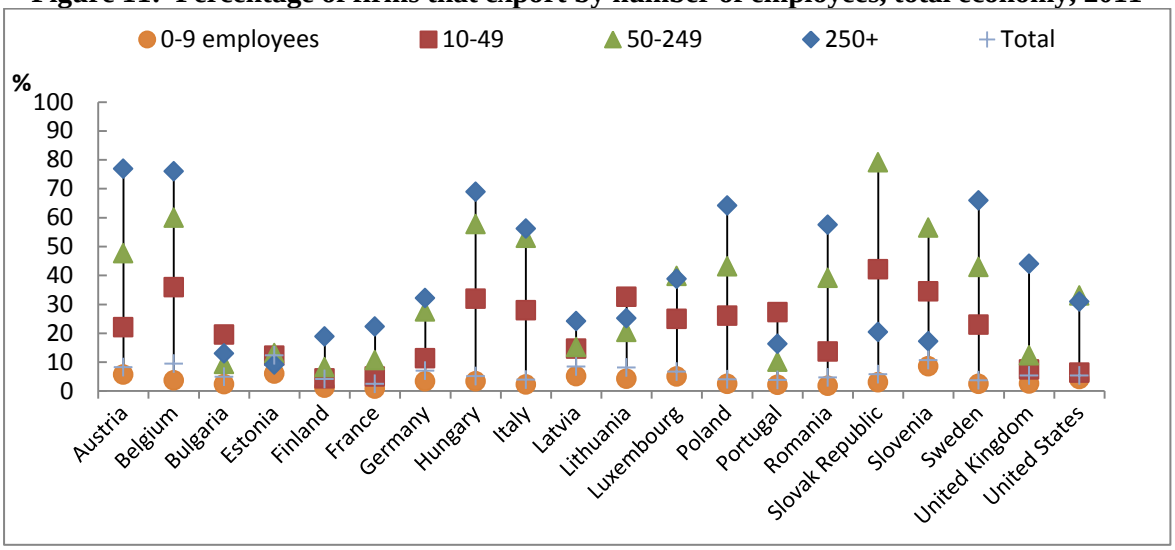
distinction for creating better quality estimates is to differentiate between those firms that export and those that do not.

Moreover, it's important to note that even in cases where a relatively high proportion of firms do export, efforts to differentiate between exporting and non-exporting firms need not target all sectors. For example if most of the output of a particular sector is exported (which can be broadly assessed by looking only at conventional trade data and conventional supply data) differentiating between exporting and non-exporting firms is unlikely to make a signficant difference.

….but large firms typically do…

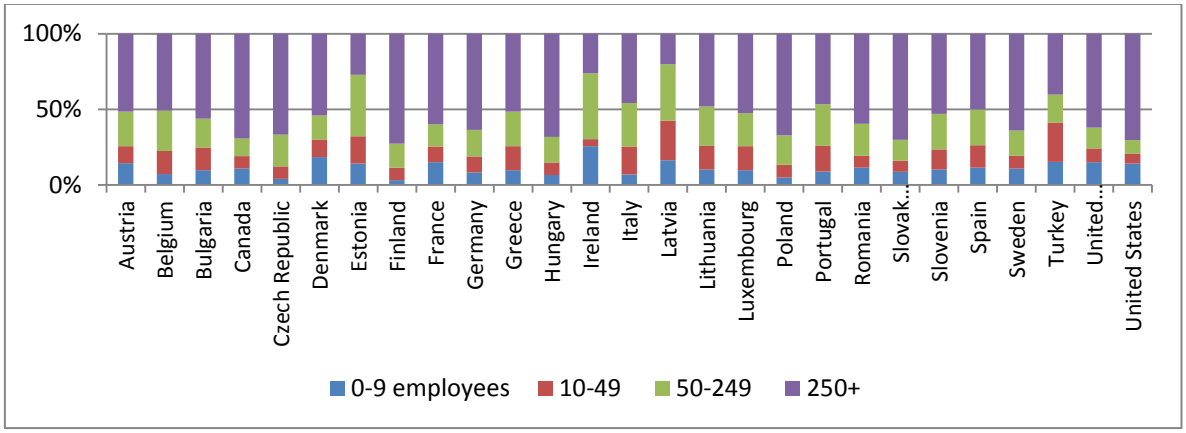
In addition the evidence suggests that targeting only large firms may achieve satisfactory results, since, as shown below (Figure 11), relatively large shares of large firms do export, and are responsible for considerable shares of total exports (Figure 12).

Figure 11: Percentage of firms that export by number of employees, total economy, 2011



SOURCE: Trade by Enterprise Characteristics Database.

Figure 12: Export value by number of employees of exporting enterprises, total economy, 2011

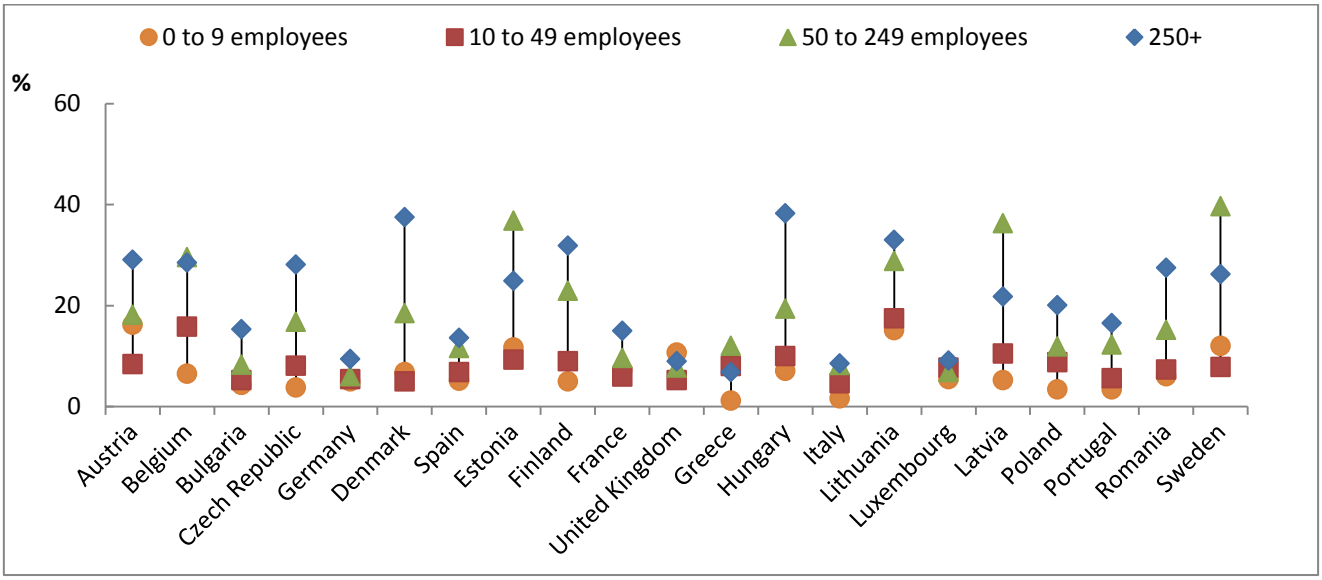


SOURCE: Trade by Enterprise Characteristics Database.

...and generally, the larger the firm the greater the share of output destined for foreign markets

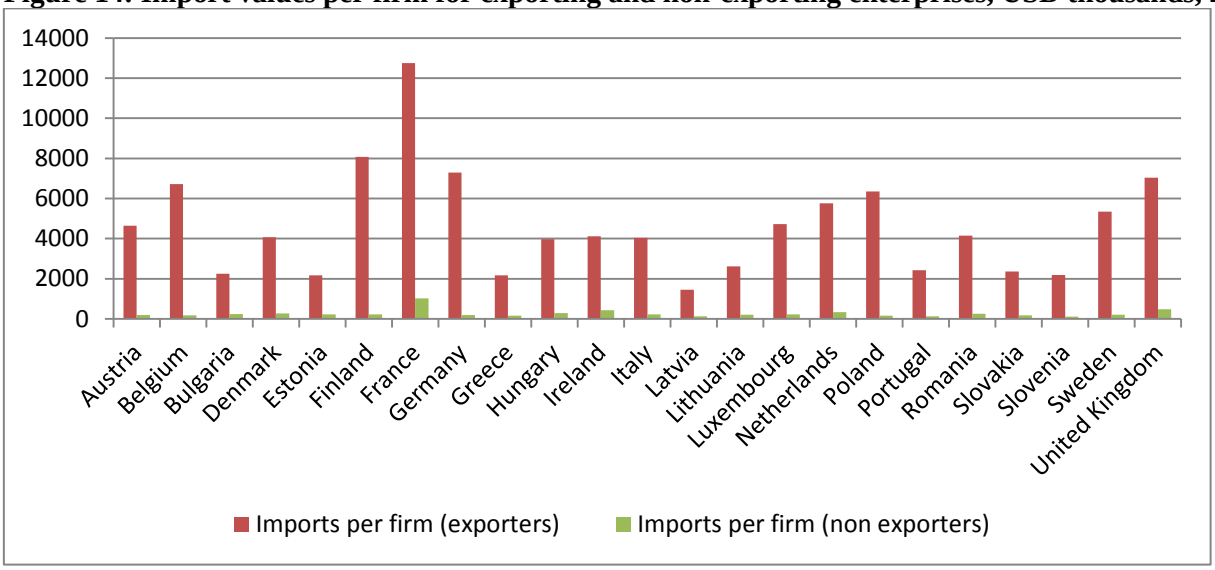
Figure 13 below further reveals that larger firms are generally also much more export intensive with Figure 14 revealing that exporting firms typically also directly import more than non-exporting firms. Despite the fact that Figure 14 does not illustrate the size of indirect imports used in production, the size of the difference (on average twenty-fold) illustrates the importance of differentiating between exporting and non-exporting firms in analyses of GVCs and the downward bias of current TiVA estimates of the import content of exports.

Figure 13: Export to turnover ratios by number of employees of exporting enterprises, total economy, 2011



SOURCE: Estimates obtained by linking data from the OECD Structural and Demographic Business Statistics Database with the Trade by Enterprise Characteristics on the basis of common industry and size classification.

Figure 14: Import values per firm for exporting and non-exporting enterprises, USD thousands, 2011



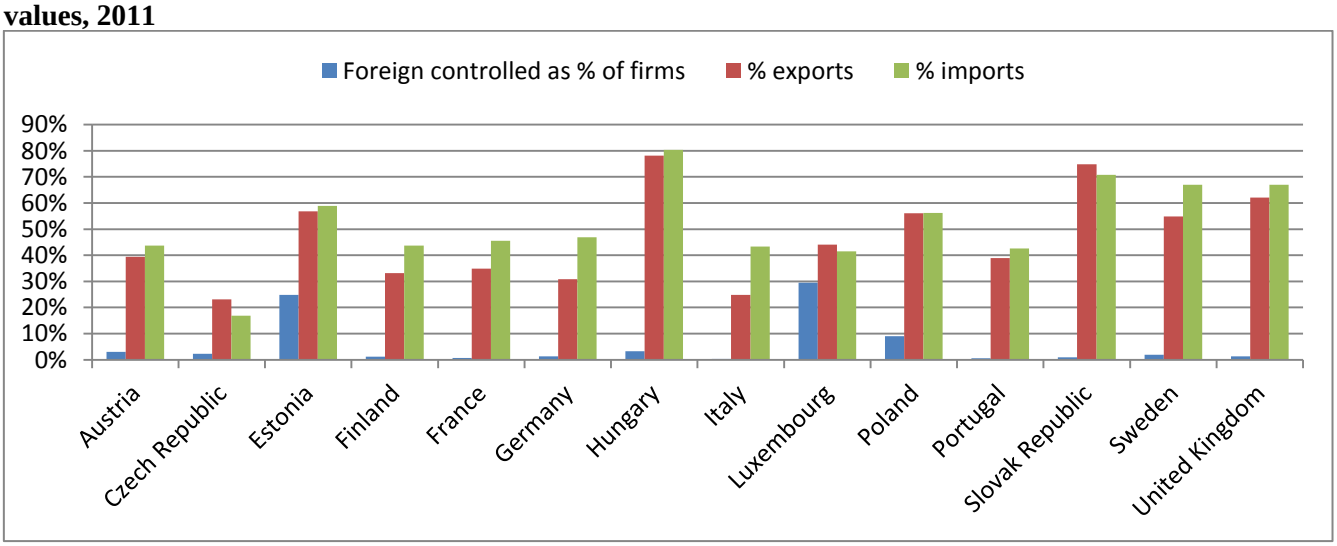
SOURCE: Trade by Enterprise Characteristics Database.

But size need not be the only determining factor

The above illustrates that significant improvements in GVC statistics and indicators can be achieved through focusing on only a small set of firms, for example by focusing on large firms but size need not be the only determining criteria that one need look at to arrive at better TiVA estimates. Another important firm characteristic is ownership. Foreign owned firms also typically import and export more than their domestic counterparts.

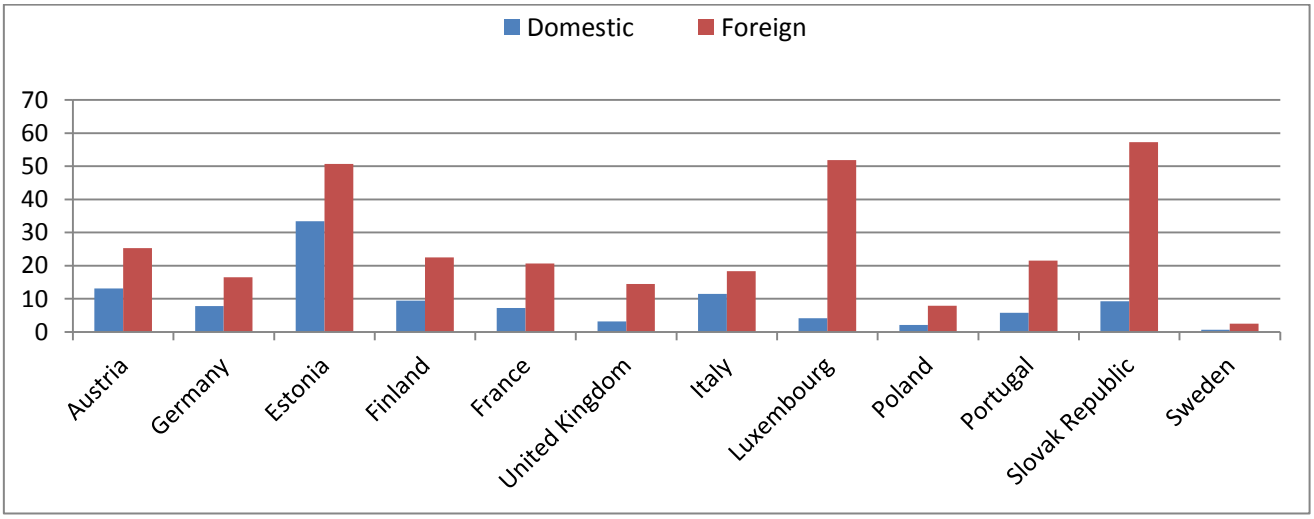
Foreign owned firms typically account for a relatively small share of overall firms but a significant share of overall exports and imports (Figure 15), and have higher export intensities than domestic owned firms (Figure 16).

Figure 15: Share of foreign owned enterprises over total number of enterprises, export and import values, 2011



SOURCE: Trade by Enterprise Characteristics Database.

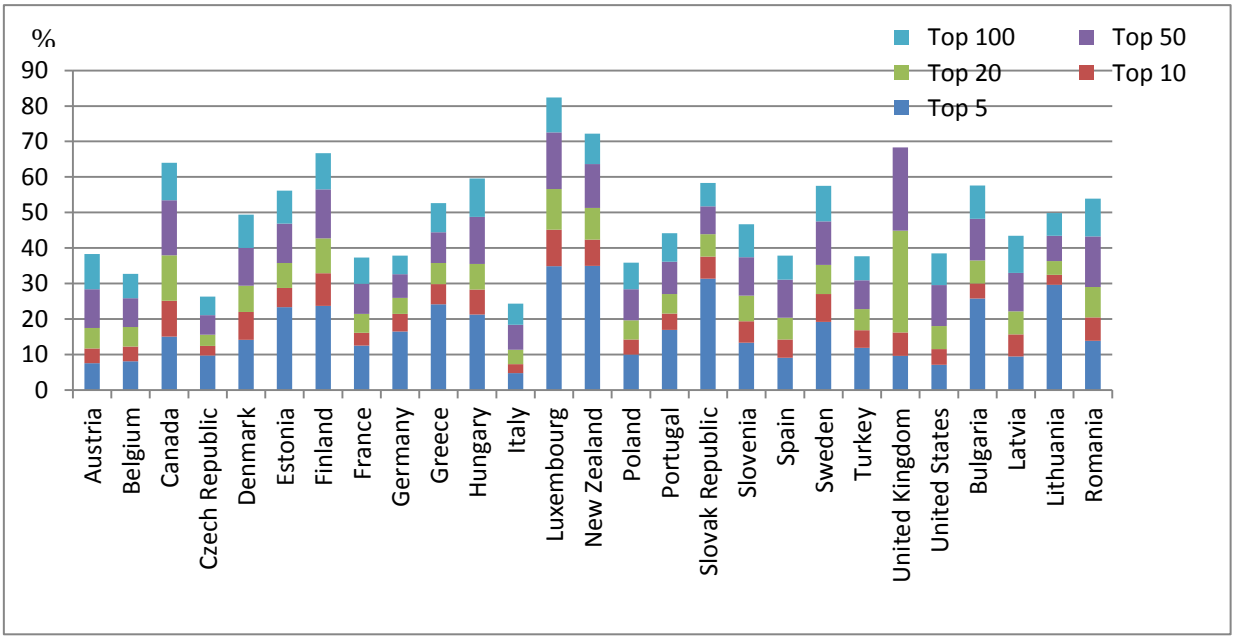
Figure 16: Export to turnover ratios for foreign and domestically owned enterprises, 2011



Source: Estimates obtained by linking turnover information from the OECD Activity of Multinational Enteprises Database (AMNE) to import and export information from the Trade by Enterprise Characteristics Database, using common industry identifier as linking information.

All of the above helps to illustrate that significant improvements in TiVA results can be achieved by focusing on only a small selection of firms. The above reveals two options: large firms and foreign owned firms but their are many other possibilities that could be explored depending on national circumstances, for example processing firms in China (reflecting their legal status and supporting available data) firms registered in export zones, factoryless producers etc. Figure 17 reinforces this point by showing that in many countries a small selection of firms are responsible for significant exports, for example in New Zealand the top 5 firms are responsible for 35% of all exports. This does of course present different challenges when considering publishing data, namely confidentiality restrictions but it is clear that a fresh look at how firms are aggregated is worthwhile.

Figure 17: Top exporting firms' share of total export value, 2011



Source: Trade by Enterprise Characteristics Database

Improving country coverage

Many developed economies now regularly develop national Supply-Use tables, on an annual basis, as recommended in the System of National Accounts (the international accounting standard for GDP estimates), and are making significant efforts to improve the coherence of their international trade statistics with trading partners. But in many developing economies, despite the importance of Supply-Use tables for coherent GDP estimation, with all of its implications for national policy making, the situation is very different. This partly explains why the TiVA database currently includes very few economies in Africa and South America.

To a large extent the absence of detailed information for this grouping of countries, described hereafter as the 'Rest of the World' (ROW), has only a limited impact on the quality of the results shown for the 57 economies in the TiVA database, particularly for OECD economies. This partly reflects the relatively low share of exports in intermediates (in value-added terms) from the ROW that are used in exports of the 57 TiVA economies but it also reflects a relatively low degree of integration in global value chains via manufacturing and services activities. Most intermediate exports (from the ROW as a whole) reflect primary production (agriculture, timber, minerals and crude oil) at the upstream part of GVCs, where the foreign content is typically negligible (and so the absence of official national input-output or supply-use tables will only have a negligible effect on TiVA estimates), (see Figures 18 and 19).

Nevertheless, there are a number of reasons why improving the quality of the information on the ROW is important:

- Countries included in the ROW show considerable diversity in their degree of integration into GVCs and in respect of their trading partners: covering countries with high dependencies on mineral exports such as Iraq through to countries with increasing downstream activities, such as

Tunisia and Costa Rica[8] (and the next release of the TiVA database will include these countries together with Colombia and Croatia).

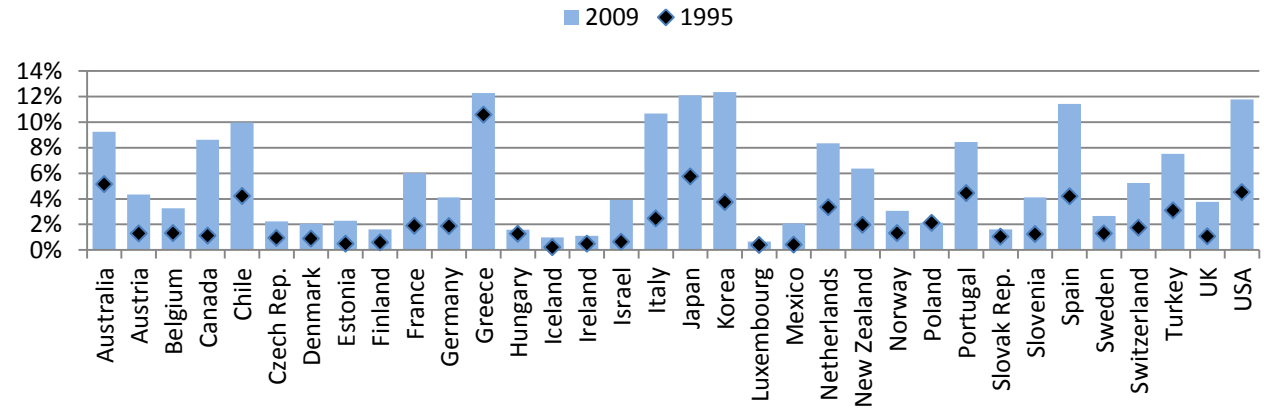
- There is significant demand for better quality information for all developing countries as part of the Aid agenda and in particular the Aid for Trade agenda.
- Although the ROW as a whole, has, to-date, shown limited integration into the secondary and tertiary parts of GVCs (Figure 19), understanding where individual countries are in the value chain is crucial to be able to inform and assess GVC policy making.
- But although current rates of integration in secondary and tertiary activities remain relatively low, consumers in the ROW are important drivers of growth and production in other economies, partly through demand from a growing middle class but also through demand for capital machinery, as the ROW seeks to integrate into GVCs. Figure 20, below, shows that the share of overall exports of domestic value-added driven by demand in the ROW increased in all OECD countries between 1995 and 2009.

But the focus on expanding the coverage of the TiVA database to countries not currently included in the database only tells one part of the story. Improving the quality of the information for countries already in the database is just as important. For example for some of the countries in the database, for example Malaysia, Philippines, Thailand and Viet Nam, official national Supply-Use and Input-Output tables can be relatively old, dating back to 2000 in some cases, requiring extrapolations for more recent years. Improving the regularity and timeliness of production of these tables can have a significant impact on quality.

Thus far the OECD has constructed the ICIO and TiVA estimates using readily available national information. But mainstreaming the process and consolidating the work done thus far requires on-going investment by national statistics agencies. As described below the TiVA strategy is to create additional regional partners and collaborations that will help consolidate the position of the TiVA database as the long term international benchmark for TiVA results and also the underlying ICIO.

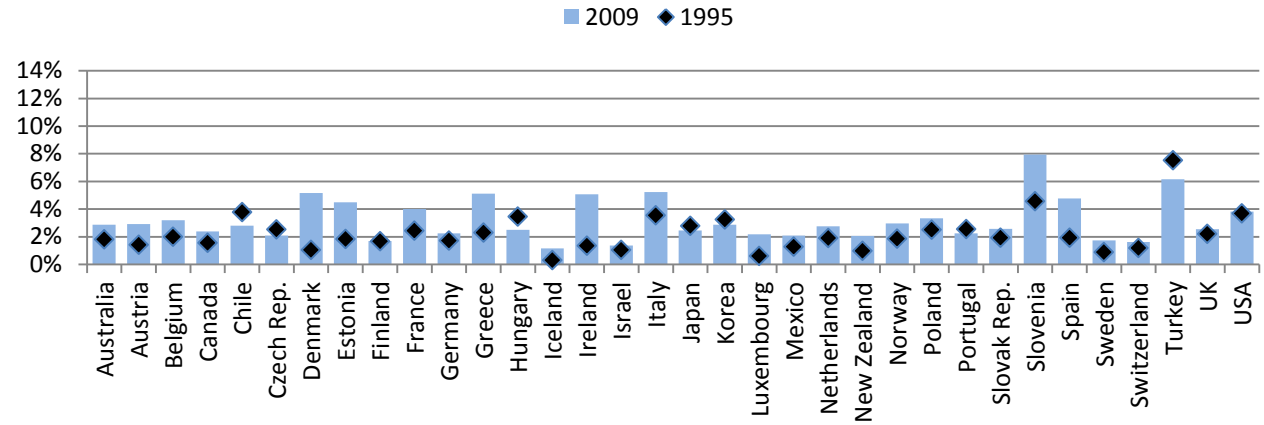
[8] The next release of TiVA scheduled for November 2014 will include Colombia, Costa Rica, Croatia and Tunisia.

Figure 18: Contribution of ROW Primary producers to Foreign Content of Gross Exports



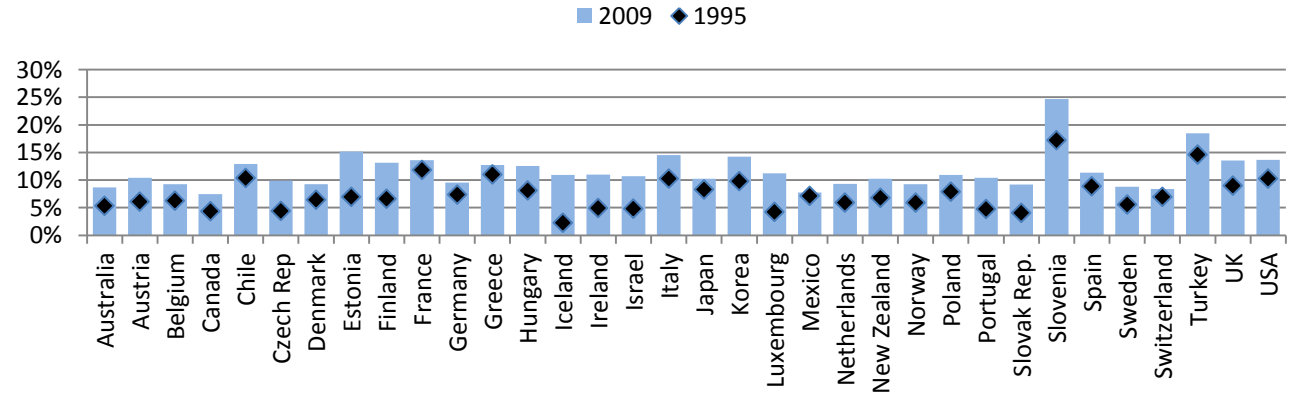
Source OECD-WTO TiVA database

Figure 19: Contribution of ROW Secondary and Tertiary producers to Foreign Content of Gross Exports



Source OECD-WTO TiVA database

Figure 20: Share of Total Domestic Value-Added Exports exported to ROW



Source OECD-WTO TiVA database

GOING BEYOND TRADE IN VALUE ADDED

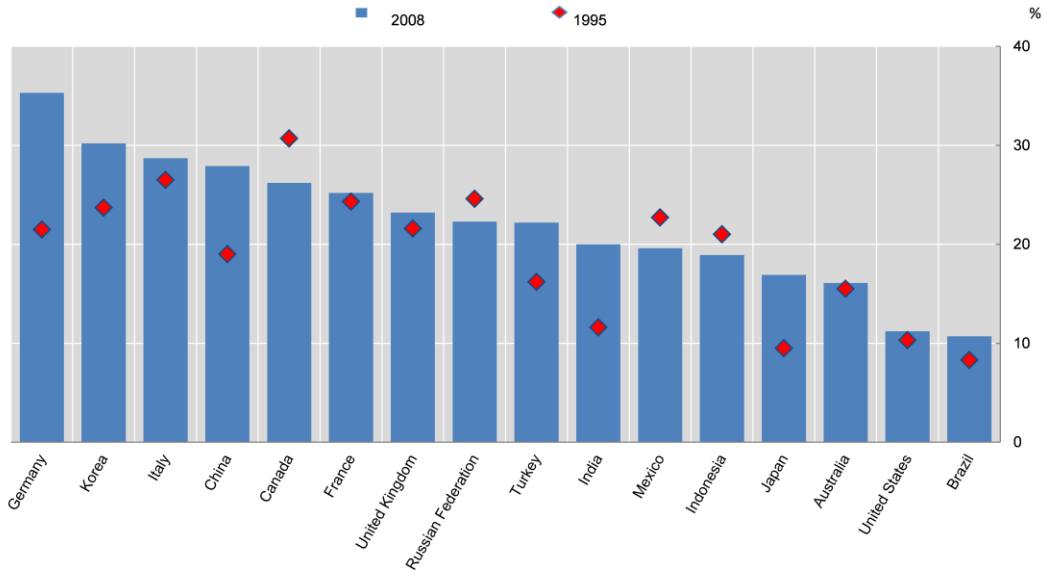
Looking at trade in value-added terms provides a valuable insight into broader notions of competitiveness (in addition to providing insights into trade policies) by illustrating interlinkages between countries and also by illustrating those activities (or tasks) that generate the most value. But additional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

Trade in jobs

Supply-Use tables do not typically include estimates of jobs by industry but they do usually contain breakdowns of value-added into its core components, including compensation of employees and mixed income, providing a mechanism (amongst others) to generate coherent 'TiVA-type' estimates for Jobs (or ideally hours worked). Data on jobs and hours worked consistent with underlying compensation of employee/mixed income data would, therefore, not only provide an important extension to TiVA to capture employment (and also future extensions that linked skills data with employment data) but would, in and of itself, help to accelerate improvements in the coherence of national employment and value-added based estimates, and, so, productivity estimates.

Estimates of jobs sustained through foreign final demand have been produced using the ICIO, used for the TiVA database, together with estimates of employment by industry (see Figure 21). Like the TiVA estimates, however, the inability to capture heterogeneity means that some caution is needed in interpretation, particularly as anecdotal evidence suggests that firms engaged in GVCs have higher labour productivity than those not engaged in GVCs.

Figure 21: Jobs in the business sector sustained by foreign final demand, 1995 and 2008



Source: OECD Science, Technology and Industry Scoreboard 2013

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, it is clear, 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), that it is increasingly becoming necessary to link jobs statistics to skills statistics.

The OECD's ANSKILL database (forthcoming) 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:

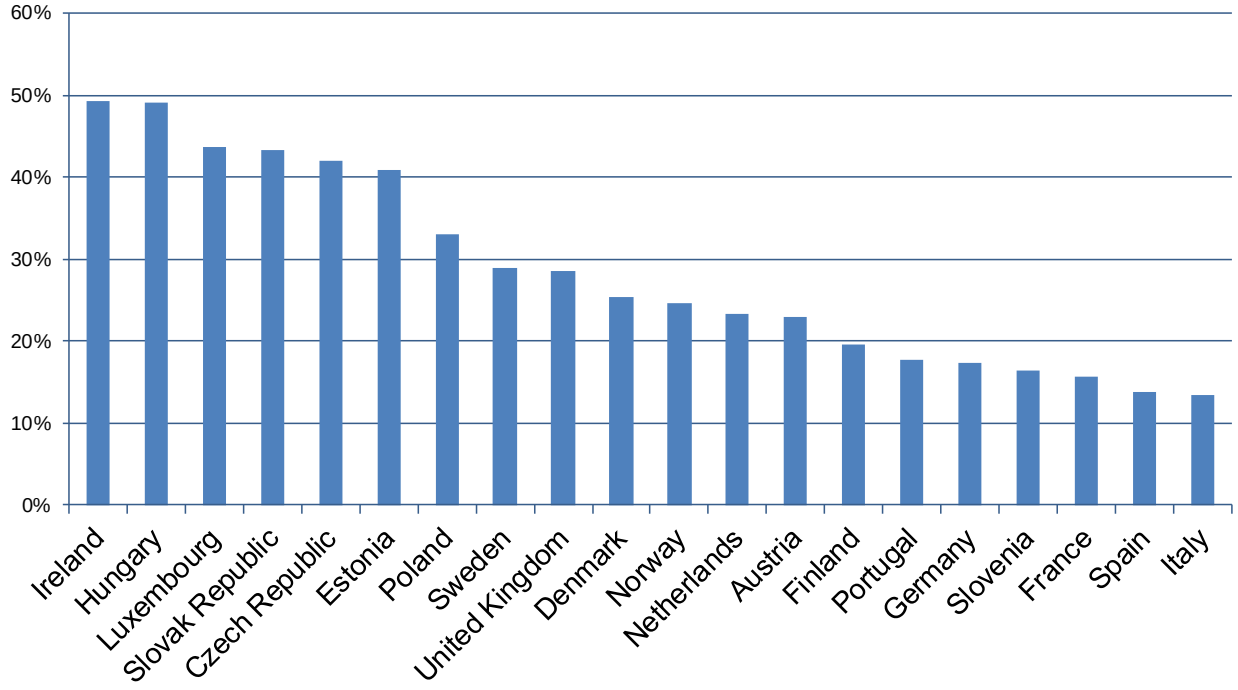
- Categories 1 (primary education) and 2 (lower secondary/second stage of basic education) are regarded as low-skilled.
- Categories 3 (upper secondary education) and 4 (postsecondary nontertiary education) are regarded as medium-skilled.
- Categories 5 (first stage of tertiary education) and 6 (second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

Accounting for FDI in TiVA

Thus far the TiVA database has been able to provide insights into GVC policy making by creating a narrative around trade. However to fully undertand the nature of GVCs and indeed their drivers, it is important to create a trade-investment story. Multinationals (MNEs) have been important drivers of the growth in GVCs with estimates pointing to around three quarters of total international trade being driven by the top 500 MNEs[9]. Moreover the share of value-added generated by foreign affiliates approaches nearly half of all business sector value-added in some ccountries (Figure 22).

[9] Source: Corpwatch.org

Figure 22: Value-Added of Foreign Affiliates – share of national total, 2009 (ISIC B-N, ex K)



Indeed in many countries the share of income generated by foreign affiliates exceeds that from total exports of services (Figure 23, which compares total primary income with total trade in services).

Figure 23: Primary Income receipts versus Exports of Trade in Services (average 2010-2012) USD millions

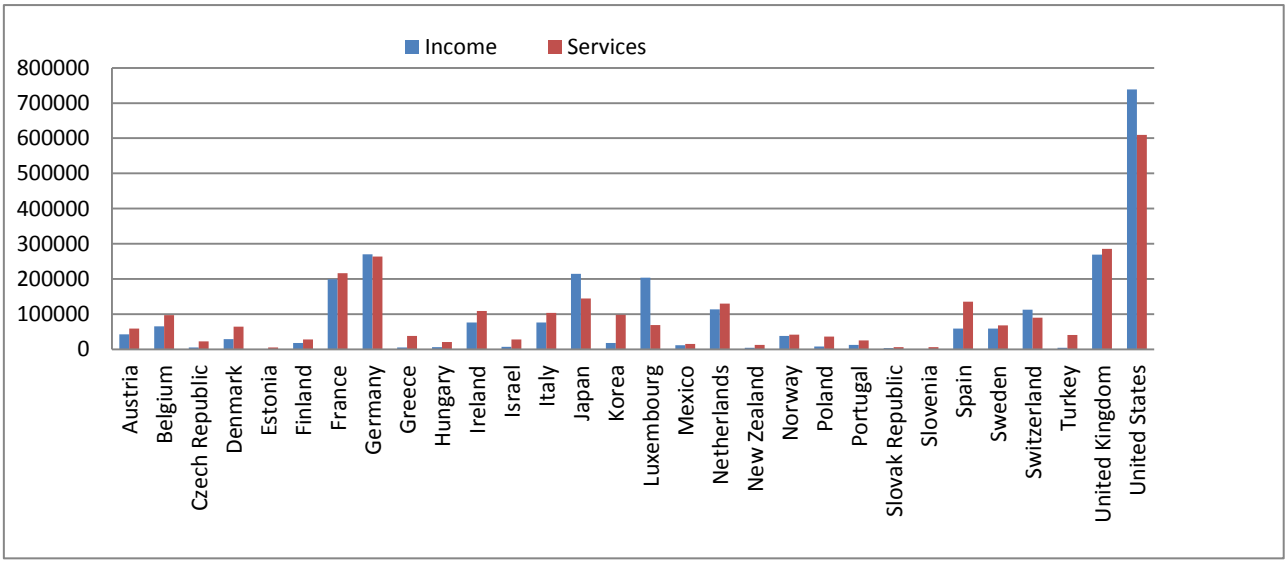
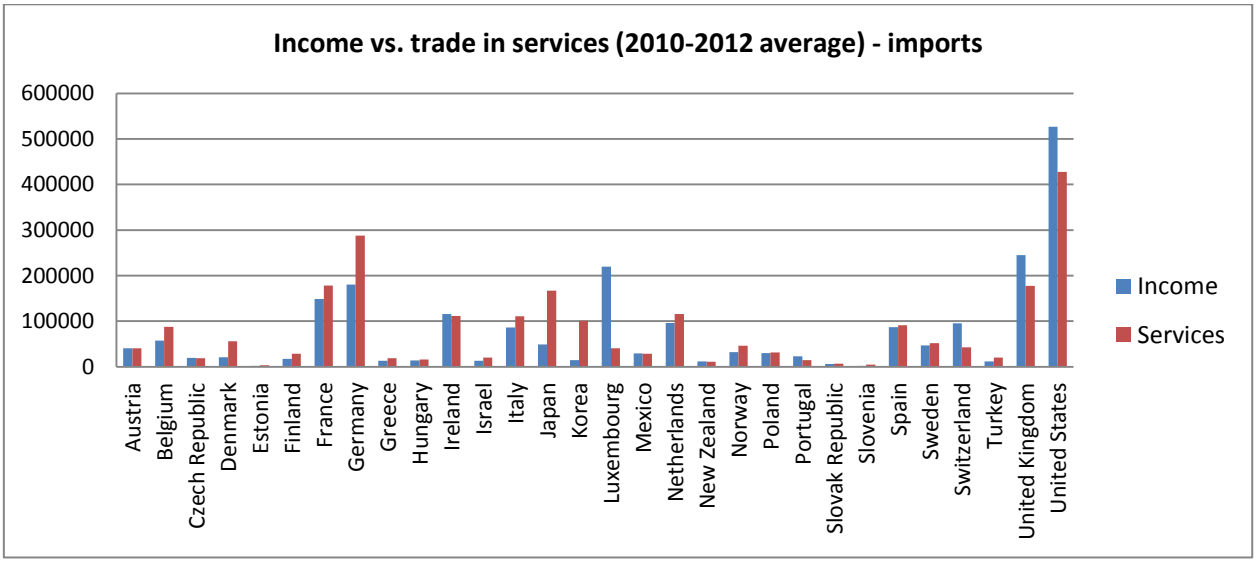


Figure 24: Primary Income payments versus Imports of Trade in Services (average 2010-2012) USD millions



To date the TiVA database does not differentiate value-added generated in an economy's exports between foreign owned and domestically owned firms. But the ability to do this forms an important strand of the future work-programme of the TiVA initiative[10].

Value-added essentially reflects two main components[11] - (i) operating surplus (including mixed income), or compensation for capital, and (ii) compensation for employment. While the latter component largely reflects the direct benefits that accrue and 'stick' within the economy through production[12], the case is not so clear for the former, where foreign affiliates are concerned.

In perfect markets the operating surplus generated by foreign affiliates is equivalent to the return on produced 'tangible' and 'intangible' capital and also non-produced assets used in production[13]. While the National Accounts of countries attribute the ownership of this capital to the affiliated enterprise the ultimate beneficiary of the operating surplus is not necessarily the affiliate but its parent. This has raised questions – often in emerging economies but also in developed economies- about the actual benefits of foreign MNEs to the host economy.

Particularly important in this regard are transactions in intangible assets: those recognised as produced in the System of National Accounts (such as research and development, software, etc.) non-produced (such as brands) and also other knowledge-based capital (such as organisational capital, e.g. management competencies). Often, in international trade in services statistics, payments for the use of these produced and non-produced assets are recorded as purchases (intermediate consumption) by one affiliated enterprise from another. But often they are not, and instead they are implicitly recorded under primary income payments (such as investment income, or reinvested earnings in the Balance of Payments). In the former case, the value-added of the affiliate using the assets is lower, as the value-added generated through ownership of the asset appears on the accounts of the affiliate that owns it. In the latter case, however, the value-added of the affiliate using the asset is higher (as there is no intermediate consumption)

[10] See also OECD-WTO TiVA concept note http://www.oecd.org/sti/ind/49894138.pdf

[11] It also includes taxes and subsidies on production.

[12] Not all labour compensation will necessarily stick in the economy, for example for cross-border workers.

[13] Such as land and other intangible assets not recognised as Intellectual Property Products in the SNA.

with the 'ultimate' beneficiary (the owning affiliate) recording no value-added but instead recieving primary income from the using affiliate. In both cases, however, the ultimate 'income' generated by the asset ends up on the books of the owner.

Furthermore, the distinction between the two scenarios above is often clouded by (a) the ability of the statistical information system to record the flows and (b) transfer pricing and tax incentives of MNEs. So, while the TiVA estimates consistently reflect the way these flows are recorded in a country's national accounts and, so, accurately reflect the share of a country's recorded overall value-added that is generated by its exports, they do not necessarily entirely reflect how countries truly benefit from GVCs, since part of the value-added that is generated does not remain in the economy but is repatriated to parent enterprises. Indeed, in some countries where foreign affiliates generate significant value-added and repatriate significant profits back to parent companies, such as Ireland, the policy focus has switched from GDP to GNI.

This is not however an issue singularly related to knowledge-based assets. Transfer pricing is also prevalent in transactions related to goods. Moreoever, notwithstanding these issues, significant income flows generated by an affiliate can be repatratied to parents via other means, for example as interest payments.

Measuring these flows can provide an important narrative on the links between GVCs and foreign direct investment (as well as providing for estimates that overcome differences in statistical practices for recording trade related to knowledge-based assets). This requires more detailed data beyond the current purely industry-level information in the TiVA database. What is required are additional breakdowns of firms classified on the basis of their ownership (e.g. domestic firms and foreign affiliates), but also exporters and non-exporters.

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.

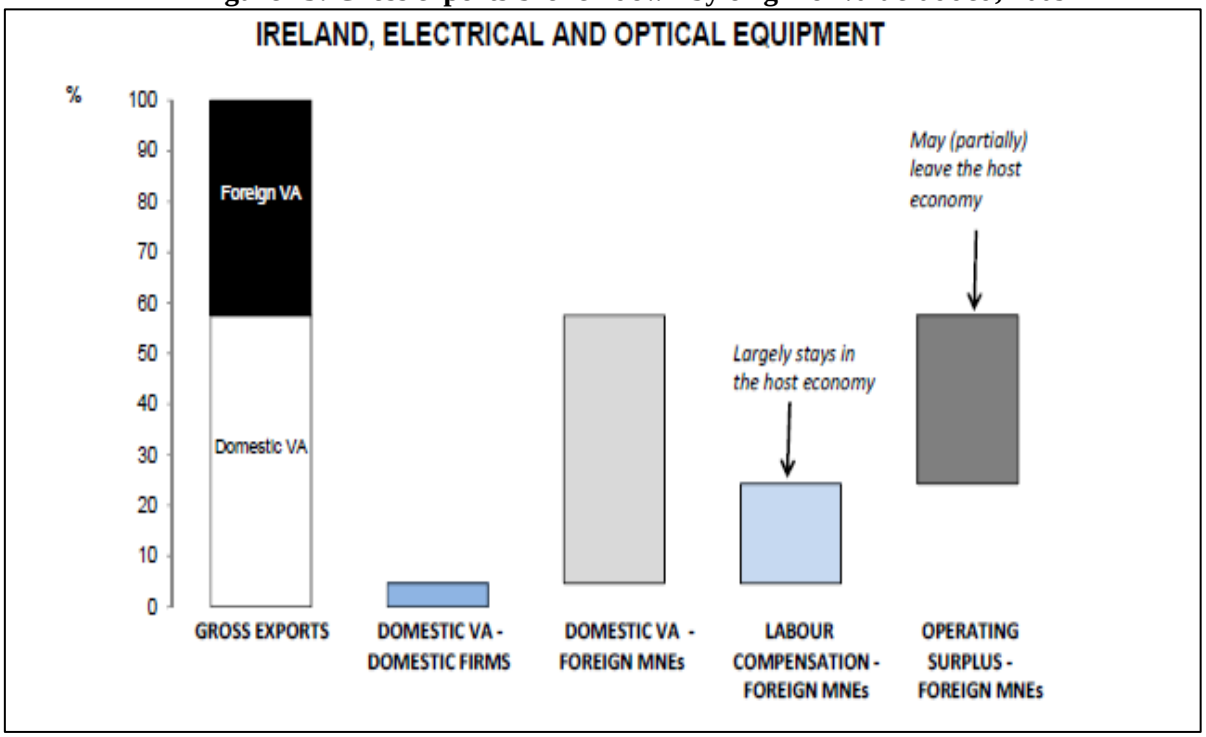
Recording these flows, therefore, is crucial. Part of the solution lies in producing supply-use tables (or indicators) that capture foreign ownership. Clearly it is unlikely that it will be feasible to produce supply-use tables that capture foreign ownership by country for all of the owners of the affiliates. 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 parent companies.

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 Expert Group on Extenddd Supply Use tables will be exploring these issues (see below).

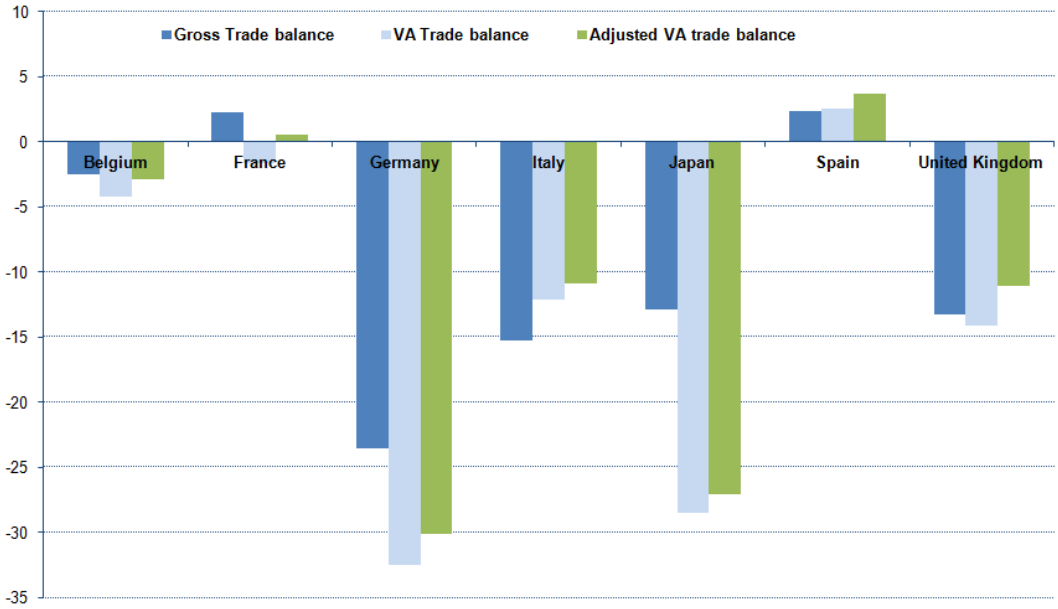
Figures 25 and 26 below provide an illustration of the potential impact this may have on our understanding of trade relationships and indeed investment. Figure 25 breaks down exports of electrical and optical equipment in Ireland into their source components, illustrating the significant differences that could arise in estimates of the domestic content of a country’s exports when one takes an income as opposed to a pure value-added perspective.

Figure 25: Gross exports broken down by origin of value-added, 2009



For illustrative purposes only, Figure 26 reflects the impact such an approach could have on our understanding of trade relationships. It assumes that the operating surplus generated by US owned affiliates in Ireland is considered as being equivalent to 'value-added' generated by US firms. These flows are then treated as exports from the US to those countries consuming the US 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.

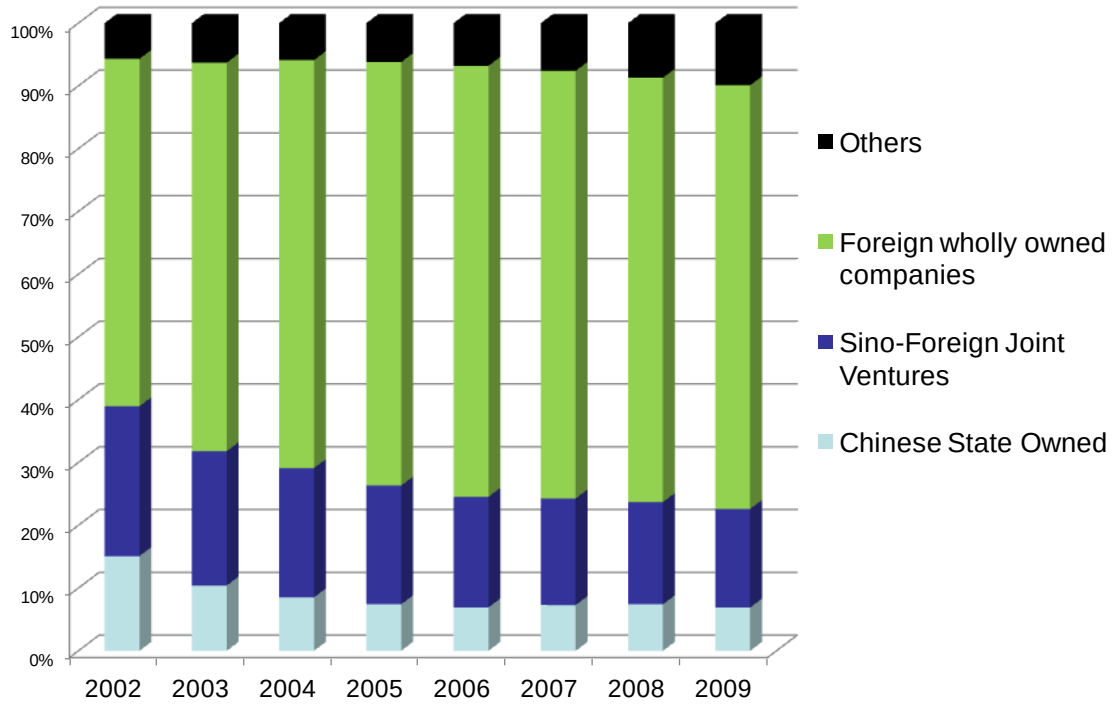
Figure 26: 'Trade balance' adjusted for US affiliates' exports from Ireland, $US bn, 2009



Source: OECD calculations based on the OECD/WTO TiVA database and the OECD AMNE database

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 (Figure 27). Further between 1995 and 2007, Japanese foreign affiliates increased their employment in China eightfold, from just over 100,000 employees to more than 1,000,0000, and in Thailand fourfold, from over 100,000 to over 400,000; 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.

Figure 27: Chinese High Tech Exports by Ownership (%)



SOURCE: Ministry of Commerce, China.

SUPPLY USE TABLES FOR 21ST CENTURY PRODUCTION

As illustrated above the increasing globalisation of production raises some challenging questions for national statistics, and fundamental and long-standing axioms regarding the nature of production and the way that statistics are necessarily compiled may warrant a rethink. Certainly the evidence suggests that long-standing assumptions concerning homogeneity of firms within industry classifications could be reviewed. The evidence also suggests, particularly for those countries with FATS and TEC data, that an optimal level of aggregation may be achivebale without any significant increase in compilation and reporting burden. But of course such reconsiderations need also take into account constraints such as burdens and confidentiality.

From the evidence presented above however there appears to be sufficient scope to consider, at the very least, aggregating firms on the basis of their degree of integrations within GVCs, whether the defining charactertistics takes some pratical form that specifically groups firms on the basis of their production model (e.g. processing firm, factoryless production), their import/export intensity, or indeed other more general administrative characteristic (such as size, ownership), each of which designed with a view to improving homogeneity.

Suply-Use tables have become the conventional route with which coherent estimates of the national accounts, trade and production are now systematically compiled in many countries and lend themselves as being the ideal way in which to explore these issues. To respond to these challenges the OECD has created an Expert Group on Extended Supply-Use tables, who will be expected to deliver their findings in the next two years.

An extended framework for Supply-Use tables (see the tables below) that would address the various issues raised above can be summarised as follows – it would entail a breakdown of current industry classifications (2-digit ISIC Rev 3) into one/some/all of new sub categories that aggregate firms on the basis of (a) ownership, (b) export intensity and (c) size. Further breakdowns to be explored could include import intensities. Similar breakdowns to those adopted for industries will also be required for the product (rows) of the Supply-Use tables, which will be non-trivial.

While large parts of the extended Supply-Use tables could be created within the OECD using information currently available from AMNE and TEC statistics, together with detailed structural business statistics, this could only be done with a number of assumptions, and only for a limited set of countries. Moreover, as described above, the challenges presented by globalisation for statistics have ramifications that go beyond international statistics, such as TiVA, but they also impact on national statistics, where extended Supply-Use tables could play a significant role in creating a fully coherent picture of official statistics on production, trade and foreign direct investment.

The format of the extended Supply-Use tables shown below are illustrative, and an optimal breakdown need not be the same for all countries. As highlighted above and stressed here again, different criteria could be used to aggregate units based on the underlying statistical information system and prevalence of the types of firms engaged in GVCs. For example, as part of the TiVA initiative, a consortium of institutions led by the Chinese Ministry of Commerce has developed Input-Output tables for China that break down industries into three additional categories: *Processing firms*, *Other Exporters*, and *Firms producing goods and services for domestic markets*. More recently work has been conducted to extend this to looking at ownership[14]. Mexico has also recently extended its Supply-Use tables by

[14] Ma, Hong, Zhi Wang and Kunfu Zhu, 2013, "Domestic Value-added in China's Exports and its Distribution by Firm Ownership," paper presented at the AEA meetings in San Diego.

including a new category of *Global Manufacturing* and Costa Rica is considering the possibility of producing extended tables that separately categorise firms operating from Export Zones.

One additional point is worth making here. TEC and AMNE data use the 'enterprise' as the statistical unit. By contrast, the 2008 SNA still gives preference to establishments when compiling the supply-use or IO statistics. There is however an increasing recognition that the arguments for such a preference have been weakened because of the changing nature of production and indeed because of the changes made in the SNA itself regarding economic ownership. This is further recognised in the 2008 SNA Research Agenda, where explicit references are made for the need to reconsider the establishment preference, taking into account the 'basic source information' and changes in the underlying accounting principles of 'Input-Output' tables, whose emphasis has moved from a *physical* perspective to an *economic* perspective. Such a view is further strengthened with the increasing tendency to develop *industry by industry* Input-Output tables, which forms the basis of the TiVA initiative.

Supply Table

An illustrative example of an extended Supply table is shown below. It follows the standard presentation for conventional Supply tables. The key difference reflects the criteria used to aggregate firms. Conventional Supply tables aggregate firms according to their industry classification, partly reflecting the assumption that these firms are broadly homogeneous. Attempts to better capture heterogeneity typically proceed by having more refined aggregations of industries (i.e. 3- or 4-digit ISIC rather than 2-digit). However, an objective of the Expert Group on Extended Supply Use tables will be to determine whether this is necessarily optimal, particularly with regards to the challenges, described above, presented by global production.

The example continues to aggregate firms using the conventional manner of industrial classifications systems (ISIC or equivalent) but tackle 'heterogeneity' by adopting additional aggregation criteria that focus on a firm's 'exposure' to global production, such as: ownership - foreign or domestic; export intensity; size; and also although this is not described below for simplicity, a firms' import intensities.

Table 5. Example of an extended supply table

			Domestic		Foreign		Imports fob: Domestic		Imports fob: Foreign						
			Exporter	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter					
			Size		Size		Size		Size		*of which*	**Margin**	Import duties		Total supply
Domestic	Exporter										*Residents expenditure abroad*	By margin industry: whoelsale, retail, transport etc	By importing unit characteristic	Taxes and subsidies on products	
	Non-exporter	Size													
Foreign	Exporter														
	Non-exporter	Size													

Use Table

Similarly, an extended Use table could be explored using the same classification criteria, as shown below.

The table includes a number of additional items that could be incorporated and that could provide evidence for other policy issues (discussed above), such as Jobs, and Trade in Income related to Foreign Direct Investment, and also Base Erosion rofit Shifting (BEPS) and Environmental Issues.

Table 6. Example of an extended use table

			Domestic		Foreign						Exports		
			Exporter	Non-exporter	Exporter	Non-exporter					Domestic	Foreign	
			Size		Size		HHFC+ NPISH	GGFC	GFCF	Inventories	Size		*of which*
Domestic	Exporter	Size	**USE - broken down by domestic and imports**										
	Non-exporter												
Foreign	Exporter	Size											
	Non-exporter												

			Exports	
			of which	
			non-residents expenditure	*merchanting*

Value added
of which *C of E* *GOS*
Output
Property income payments to abroad
of which *Interest,* *Distributed income of corporations* *Reinvested earnings on FDI,* *Investment income disbursements*
Property income receipts from abroad
of which *Interest,* *distributed income of corporations* *Reinvested earnings on FDI,* *Investment income disbursements*
Current taxes on income, wealth etc
Employment
Hours worked
Emissions

Naturally, the more detailed the breakdowns of firms the greater the likelihood that confidentiality constraints may be breached. Hence, the importance to arrive at an optimal level of disaggregation that satisfies confidentiality constraints. For example, while size class dimensions are particularly important to understand how small and medium enterprises integrate (indirectly) within GVCs, it seems more likely than not that for most countries such information will be too demanding, particularly as information on the intermediate consumption of the output of small firms by large firms will not be typically available without specialised surveys. Challenges are also likely to be faced by countries in developing aggregations based on the import intensities of firms, where data are currently scarce, but the approach used by TEC to link trade and business registers has demonstrated that this situation could be improved. Additional challenges arise for recording transactions between domestic and foreign owned firms.

Annex B provides a number of additional issues that will be explored by the Expert Group on Extended Supply Use tables.

MAINSTREAMING ICIO AND TIVA

From the very beginning one of the key objectives of the TiVA initiative has been to raise awareness of the importance of new statistics that are better able to reflect the increasingly global nature of production, driven by what is often characterised as the 'international fragmentation of production' or more commonly, Global Value Chains (GVCs). But a second, and equally important, objective has been to mainstream the production of TiVA indicators into the global statistical information system and in turn to reinforce the significance attached to improving national capacities to develop the core national inputs needed to produce TiVA estimates of the highest quality.

Whilst this first objective has been largely met, the second will take some time. However, with high-level ministerial support[15], and strong backing from national statistics institutions at the OECD's 2014 Committee for Statistics and Statistical Policy, the OECD and WTO have dedicated resources to continue to produce the TiVA database and the underlying ICIO on a permanent basis. The next release of the TiVA database is scheduled for November 2014, at which point the underlying ICIO will also be released. Thereafter the TiVA database and the ICIOs will be updated every year, with continuous improvements for quality (timeliness, country coverage, homogeneity, bilateral trade, jobs, skills and 'income').

This is a big undertaking but the momentum of the TiVA agenda has helped to highlight the importance of moving in this direction and has helped build momentum at the national level and other international organisations, such as APEC, Eurostat UNECLAC, UNESCWA, and USND, amongst others, who have expressed strong interest in collaborating with the OECD-WTO TiVA initiative, in addition to those agencies and bodies who have provided strong support and assistance to the initiative thus far, such as USITC, IDE-JETRO, WIOD and MOFCOM, as well as scores of national agencies.

The Extended Supply-Use table presented above will form an important driver of this work going forward but notwithstanding these developments much can be done by countries now to improve quality and to facilitate their inclusion in the TiVA database and the ICIO. Annex A provides an overview of the type of information required, and countries are invited to contact tiva.contact@oecd.org or the authors if they require more information on how this could be achieved.

15 http://www.oecd.org/mcm/2014-ministerial-council-statement.htm, http://mddb.apec.org/Documents/2014/SOM/SOM2/14_som2_049anx05.pdf http://www.oecd.org/about/Stocktaking%20Seminar%20on%20GVCs_Outcomes.pdf

ANNEX A

National Data Requirements: Ideal data set <u>for current TiVA requirements</u>

In an ideal environment countries would be able to provide the following annual data, on a timely basis (preferably one to two years after the reference period to which the data refer), with data going back to 1995.

- An annual time series of Supply-Use tables, with **at least** the industry (and equivalent product) coverage described above in Table 2.
    - The tables should be compiled in accordance with the 1993 or 2008 SNA. If data are compiled according to the 2008 SNA countries should provide supplementary information describing how merchandise trade statistics have been adjusted to reflect the recent changes introduced in the 2008 SNA for 'Goods for Processing'. Additional information should also be provided describing adjustments made for 'Merchanting'.
    - The SNA recommends that all Intermediate Consumption transactions in Use tables are recorded on a "Purchasers Price' basis. For the purposes of TiVA all intermediate consumption transactions should also be made available on a "Basic Prices' basis, with complementary tables showing the difference between Basic Prices, split into a "Distribution Margin' component and a "Taxes and Subsidies' component. Ideally these two sub-components should be made available at a detailed as level as possible. So, for example, the Distribution component can be split separately into Margins provided by Wholesalers, Retailers, Transport and Other industries as relevant. Similarly Taxes and Subsidies could be split by the specific type of tax or subsidy, in particular any import taxes.
    - Similar breakdowns of Purchasers Price transactions – into at least a Margin and Taxes/Subsidies component - should also be provided for all categories of Final Demand (Household Final Consumption, General Government Final Consumption, Non-Profit Institutions Serving Households, Gross Fixed Capital Formation, Valuables, Changes in Inventories and Exports).
    - The Use table should be split into two components: A domestic component showing all purchases of goods and services provided directly by domestic industries; and an Import component, showing all purchases of imported goods and services.
    - Within the Supply-Use table: Residents expenditure abroad should be shown separately as part of total imports and broken down into specific products. Non-Residents expenditure in the host economy should also be shown separately and also broken down by specific products.
    - The Supply part of the Supply-Use table must include the "Make' matrix which shows the types of products produced by industries in Basic Prices. Supplementary columns for Imports, Distribution margins, and Taxes and Subsidies should also be included, as specified in the SNA.
    - Imports in the Supply column should be provided on both a *C.I.F* basis, with total imports on a F.O.B basis. The *C.I.F F.O.B* adjustment should be broken down into a complementary column allocated to each specific product such that all transactions in

goods are shown on a F.O.B basis. If possible any information on the country source of the C.I.F. component should be provided.

- Bilateral Trade in Goods (Merchandise Trade Statistics) should be produced on a detailed HS 6 digit basis. Transactions should be shown on both an F.O.B and C.I.F. basis.

    - Data should be made as coherent as possible with partner countries.
    - Data should also be made available on an aggregated basis at the same product level used in the Supply-Use tables. The concordance relationship used to aggregate HS products to the more detailed product groupings in the Supply Use tables should also be provided.
    - A description of any adjustments made to HS import and export merchandise trade data to arrive at the Import and Export column data used in the Supply Use tables should be provided, in particular for transactions concerning 'Goods for Processing' and 'Merchanting' if relevant.
    - Confidential trade: In some countries, disclosure rules suppress six-digit HS components in 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.
    - Information on Re-export data should also be provided - by product, origin and destination - differentiating between transit trade and trade passing through entrepots where distribution margins are often incurred.
    - HS codes, and thus reported trade in COMTRADE, cannot differentiate between new and old capital goods (such as second-hand aircraft, ships, and cars). Any additional information that can be provided to identify these flows should be provided.
    - 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. Any additional information that can be provided to identify these flows should be provided

- Bilateral Trade in Services data, at least at the 2-digit level described in the Extended Balance of Payments Services Classification (EBOPS 2010) should be provided.

    - Data should be made as coherent as possible with partner countries.
    - Additional information should specify whether data follow the Sixth Edition of the Balance of Payments and International Investment Position Manual (BPM6) or BPM5.

- Industry by Industry Input-Output tables on at least a five yearly basis.

    - The tables should be compiled in basic prices and provided with a separate Import flow matrix, consistent with the Import matrix derived from the Use tables above.

- All data should be consistent with published National Accounts at the time of their release. Any significant revisions made to the National Accounts but not to the Supply-Use or Input-Output tables should be flagged-up.

National Data Requirements: Minimum data set <u>for current TiVA requirements</u>

The bare minimum for a country's integration into the TiVA dataset is the existence of an official national Supply-Use or Input-Output table.

- Tables should be made available using the industry breakdown shown in Table 1. Where this is not possible every attempt must be made to ensure that industries at the 2 digit ISIC level of classification are not grouped together when both industries are significant exporters (more than 5% of total exports).
- To supplement the table, countries should also provide a time-series of value-added and gross output by industry at as detailed a level as possible. This information should be at basic prices.
- The table(s) must be for a relatively recent period. No later than 2000.

It is important to note that whilst the minimum data requirements will allow inclusion in the TiVA database, the more data provided, and the closer to the ideal data requirements, the greater the quality of TiVA data for the country in question.

ANNEX B

Trade in CO2 (and other emissions)

One additional extension that follows from the accounting framework presented above and that is included in the Extended Supply Use table is carbon footprints. Carbon footprint calculations are typically estimated using IO 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.

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