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Accounting for Global Value Chains

GVC Satellite Accounts and Integrated Business Statistics

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Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics

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Preface

The present publication of *Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics* (hereinafter referred to as the Guidelines) provides a framework for the measurement of global value chains (GVCs), which consists of a multi-country supply and use tables and related institutional sector accounts, and a framework for integrated business, trade and investment statistics. It outlines how economic statistics can be made more accurate and relevant in measuring the effects of globalization in national accounts, business and trade statistics. It builds on existing standards, guidelines and research, in particular the work undertaken by the United Nations Economic Commission for Europe (UNECE), the Organization for Economic Cooperation and Development (OECD) and the Statistical Office of the European Union (Eurostat).

The global economy is increasingly structured around GVCs that account for a sizeable share of international trade, global gross domestic product (GDP) and employment in both developed and developing countries. The evolution of GVCs in diverse industries, such as agrifood, textiles and apparel, automotive, electronics, tourism and business services, has significant implications for cross-border trade, production and employment arrangements. These Guidelines provide a national perspective on globalization on the basis of a GVC accounting framework that describes the regionally integrated decomposition of industry-specific GVCs in a multi-country supply chain of goods, services and institutional arrangements. Doing so allows for an integrated presentation of production, income, assets and liabilities by partner country for those GVC industries that play a significant role in the national economy, resulting in GVC-specific, multi-country supply and use tables and related institutional sector accounts.

Acknowledgements

The Guidelines on *Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics* were prepared by the United Nations Expert Group on International Trade and Economic Globalization Statistics. The Expert Group was established by the United Nations Statistical Commission in 2015 to prepare a handbook on a system of extended national accounts and integrated business statistics to address the challenges that globalization and emerging complex production arrangements pose to compiling macroeconomic and business statistics, including the supporting business registers (see E/2015/24, chap. I.C., decision 46/107).

The work actually began in 2013 during the forty-fourth session of the United Nations Statistical Commission, when the United Nations Statistics Division presented an overview report (Report of the Secretary-General, E/CN.3/2013/7) on the work undertaken in the field of international trade statistics, on topics such as integrated economic statistics, linking trade and business statistics, trade and global production, trade in value-added, statistics of multinational enterprises and foreign direct investment. This report highlighted the growing concerns regarding the limitations of current trade and business statistics to inform the policy debate. While there were many international task teams working on these measurement problems in various areas of international trade and economic globalization, the United Nations Statistical Commission recognized (see decision 44/106 in E/2013/24) the need for an overarching framework and systematic coordination and agreed to the creation of a "Friends of the Chair" group tasked with preparing a concept paper on the scope and content of the framework and on the appropriate mechanism for coordination, which resulted in the decision of the United Nations Statistical Commission (see E/2015/24, chap. I.C., decision 46/107) to establish the Expert Group on International Trade and Economic Globalization Statistics, and task it with preparing a handbook on a measurement framework to address the challenges posed by globalization.

The Expert Group was chaired by Michael Connolly of the Central Statistics Office of Ireland and included the following members: André Loranger (Statistics Canada), João Cardoso (Instituto Nacional de Estatística de Cabo Verde), Huaju Li (National Bureau of Statistics of China), Lilian Navas (National Administrative Department of Statistics of Colombia), Hugo Mora (Central Bank of Costa Rica), Peter Bøegh-Nielsen (Statistics Denmark), Shri Sudipta Bhattacharya (Directorate General of Commercial Intelligence and Statistics of India), Stefano Menghinello (Italian National Institute of Statistics), Hyun Jeong Hong (Statistics Korea), Arturo Blancas (National Institute of Statistics and Geography of Mexico), Gerardo Durand (National Institute of Statistics and Geography of Mexico), Houssein Ouljour (Office des Changes of Morocco), Martin Luppes (Statistics Netherlands), George Djolov (Statistics South Africa), Wirongrong Niamthanom (Ministry of Commerce of Thailand), Bright Richard Kimuli (Uganda Bureau of Statistics), Sanjiv Mahajan (Office for National Statistics of the United Kingdom), Michael Hardie (Office for National Statistics of the United Kingdom), Erich Strassner (Bureau of Economic Analysis of the United States of America), Tjeerd Jellema (European Central Bank), Isabelle Remond-Tiedrez (Eurostat), José Rueda Cantuche (Euro-

pean Commission), Daria Taglioni (International Finance Corporation), Manpreet Singh (International Labour Organization), Cornelia Hammer (International Monetary Fund), Thomas Alexander (International Monetary Fund), Nadim Ahmad (OECD), Elena Borushko (Eurasian Economic Commission), Deborah Winkler (The World Bank), Melise Jaud (World Bank), Ivo Havinga (United Nations Statistics Division), Ronald Jansen (United Nations Statistics Division), Nancy Snyder (United Nations Statistics Division), Andreas Maurer (World Trade Organization), Timothy Sturgeon (Massachusetts Institute of Technology Industrial Performance Center), Gary Gereffi and Stacey Frederick (Duke Center on Globalization, Governance & Competitiveness), and Steve Landefeld (consultant to the United Nations Statistics Division).

Special acknowledgement goes to Timothy Sturgeon (Massachusetts Institute of Technology Industrial Performance Center), and Gary Gereffi and Stacey Frederick (Duke Center on Globalization, Governance & Competitiveness), who contributed to the development of the GVC model approach as presented in the Guidelines, including definitions of concepts and terminology, and mappings of GVC product codes. Special acknowledgement also goes to Michael Connolly and Steve Landefeld, who guided the Expert Group in its discussions of the GVC approach and overall preparation of the Guidelines.

For the drafting of the Guidelines, an editorial board was established, comprising the Chair of the Expert Group (Michael Connolly, Central Statistics Office, Ireland), a lead editor (Steve Landefeld, UNSD consultant) and staff of the Statistics Division. Initial drafts of the chapters were prepared by the editor, members of the Expert Group, and other contributors; in particular: André Loranger (Statistics Canada), Peter Bøegh-Nielsen (Statistics Denmark), Michael Connolly (Central Statistics Office of Ireland), Stefano Menghinello (Italian National Institute of Statistics), Martin Luppes (Statistics Netherlands), Sanjiv Mahajan (Office for National Statistics of the United Kingdom), Michael Hardie (Office for National Statistics of the United Kingdom), Erich Strassner (Bureau of Economic Analysis of the United States of America), Tjeerd Jellema (European Central Bank), Axel Behrens (Eurostat), Isabelle Remond-Tiedrez (Eurostat), Pekka Alajaasko (Eurostat), José Rueda Cantuche (European Commission), Daria Taglioni (International Finance Corporation), Cornelia Hammer (International Monetary Fund), Nadim Ahmad (OECD), Deborah Winkler (World Bank), Rami Peltola (UNECE), Tihomira Dimova (UNECE), Ivo Havinga (United Nations Statistics Division), Ronald Jansen (United Nations Statistics Division), Ilaria DiMatteo (United Nations Statistics Division), and Nancy Snyder (United Nations Statistics Division).

The original draft chapters represent the foundational elements of the Guidelines and are made available online as a compendium with a view to providing further reference material on certain topics that are addressed in greater detail in those original chapters.

The Guidelines are a result of extensive consultations with the Expert Group, through both virtual forums and face-to-face meetings. Two meetings of the Expert Group in New York in 2016, a meeting in Luxembourg in 2017 and a meeting in Rome in 2018 were organized to discuss the Guidelines.

The Guidelines were circulated for a global consultation with national statistical offices and relevant international organizations in February 2019. The draft Guidelines were then submitted to the United Nations Statistical Commission in March 2019, together with the results of the global consultation. The United Nations Statistical Commission took note of the Guidelines and encouraged countries to implement the

global value chain satellite accounts. The United Nations Statistical Commission also commended the Expert Group on International Trade and Economic Globalization Statistics on the work carried out.

The Guidelines were prepared by a team within the United Nations Statistics Division, consisting of Ronald Jansen, Ilaria DiMatteo, and Nancy Snyder, and under the overall responsibility of Ivo Havinga.

Acronyms and abbreviations

APEC	Asia-Pacific Economic Cooperation
BOP	balance of payments
BPM6	Balance of Payments and International Investment Position Manual, sixth edition
CIF	cost, insurance and freight
CPC	Central Product Classification
DGI	Data Gaps Initiative
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
EGR	EuroGroups Register
E-SUT	Extended supply-use table
FIGARO	Full International and Global Accounts for Research in Input-Output Analysis project
FOB	free on board
GDP	gross domestic product
GNI	gross national income
GVC	global value chain
HS	Harmonized System
ICIO	inter-country input-output
IIP	international investment position
IMF	International Monetary Fund
IMTS	international merchandise trade statistics
IMTS 2010	*International Merchandise Trade Statistics: Concepts and Definitions 2010*
IOT	input-output table
IPP	intellectual property products
ISCED	International Standard Classification of Education
ISIC	International Standard Industrial Classification of All Economic Activities
KLEMS	Capital (K), labour (L), energy (E), materials (M), service inputs (S)
LCU	large cases unit
MNE	multinational enterprise
NACE	Statistical classification of economic activities in the European Community
OECD	Organisation for Economic Co-operation and Development
NSI	national statistical institute

NSO	national statistical organization
OEM	original equipment manufacturers
OIF	other intercompany financing
PLI	price level index
PPP	purchasing power parities
SDMX	Statistical Data and Metadata Exchange
SDR	special drawing right
SNA	System of National Accounts
SUIOT	supply-use and input-output tables
SUT	supply-use table
TiVA	trade in value-added
UNECE	United Nations Economic Commission for Europe
WIOD	World Input-Output Database

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Part I
Accounting for global value chains

A. Introduction to global value chains

1. Globalization is a centuries-old phenomenon of growing interactions between countries. In recent decades, the traditional interrelations have grown considerably. Owing to reductions in transportation costs, the information technological revolution, and more open economic policies, production processes of a final product are increasingly fragmented across national economies in a production chain between resident and non-resident firms. The parts and components that now make up a final product, being either a good or service, are produced in different countries, what has been termed the "unbundling" of production. Therefore, intermediate goods and associated services may cross national borders several times before they are assembled and sold as a final product in the market or delivered to a third party. Moreover, international trade in goods and services is increasingly intra-firm trade, often organized and led by large multinational enterprises (MNEs) or enterprise groups. These interlinked core production activities and supporting services activities to produce a final product, coordinated and led by a lead firm, are commonly referred to as global value chains (GVCs).

2. Along with the emergence of the GVCs in the structures of domestic industries, new enterprise networks of affiliated and non-affiliated enterprises are established, characterized by MNEs or enterprise groups that take various levels of control and ownership through foreign direct investment to coordinate and continuously optimize their domestic and cross border business activities. As a result, heterogeneous production processes for industrial sectors are now predominant in the national economies for those firms inside and outside the GVC network, as higher levels of specialization and productivity are generally observed in the production process of those firms inside the GVC network. The firms within the GVC network not only dominate the overall industrial sector in terms of value-added, income, productivity, and related assets and liability measures in many countries, but also differ in their dynamics, as measured in terms of rates of growth in key variables of business and macroeconomic statistics. Moreover, owing to their continuous process of optimization of revenues and profits for the enterprise group within and across economic jurisdictions, their underlying legal structures measured in statistical units often witness remarkable changes on an annual basis, raising new challenges for statistical measurement of the firms within the GVC networks.

3. Given this new understanding of globalized production, tax and financing arrangements, the term "GVC" has emerged. As defined by Gereffi, and others[1]:

> The value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as research and development (R&D), design, production, marketing, distribution and support to the final consumer. The activities that comprise

[1] Gary Gereffi and Karina Fernandez-Stark, *Global Value Chain Analysis: A Primer,* Second Edition, The Duke Center on Globalization, Governance & Competitiveness, July 2016. *Last phrase:* "in a local economy, or among a group of countries" *was added by Handbook authors.* Available from https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/12488/2016-07-28_GVC%20Primer%202016_2nd%20edition.pdf?sequence=1

a value chain can be contained within a single firm or divided among different firms in a local economy, or among a group of countries.

4. A GVC network of firms can be described by following the dimensions that determine the structure, dynamics and relationships among stakeholders in a GVC:

- **Business functions:** These functions describe the core and support business functions. The core business function comprises the production of final and intermediate goods and services for the market/third party and for generating income for the enterprise. The supporting business functions are services from ancillary activities like research and development, IT services, marketing and after-sale support services that facilitate the production of goods and services from the core business function of which the products are not directly generating revenues.
- **Income, investment and financing:** Beyond business functions related to the real sector dimension are transactions and positions related to the investment and financing of the GVC operations, as well as those geared towards the allocation of income to investors.
- **Geography:** The business functions are often carried out/outsourced in different countries that participate in the GVC by leveraging their competitive advantage. Usually the optimization process of the GVC firm network is based on cost considerations related to factors of production (labour and capital, transportation, etc.) and proximity to markets of primary, intermediate and final goods and services from supporting business functions.
- **Governance:** is about the ability of a lead firm to exert control along the value chain by setting and/or enforcing parameters under which affiliate and non-affiliate firms in the chain operate.
- **Institutional context:** identifies how local, national and international conditions and policies shape the globalization of each stage of the value chain. GVCs are embedded within economic, social and environmental institutional dynamics.

5. With the increasing dominance of GVCs in the level and growth rates of macroeconomic and business statistics indicators in almost each national economy, compiling countries are increasingly assessing their level of engagement in GVC-specific industries and their related international trade and investment relationships with partner countries. GVCs have led to the integration of developing and developed economies in a global economy through international trade and foreign direct investment, both of which have grown rapidly in recent decades and impacted the generation of income, jobs, investment, saving and consumption, and ultimately well-being.

6. Globalization also has cross-country effects on business cycles through the integration of economies. During the recent financial crises, the integration of financial markets resulted in the transmission of the financial crisis in the United States of America to Europe and other nations. Later as the "great recession" developed, the real sectors of the world economy were affected, as global supply chains transmitted the recession in the United States and resulting fall in production in the United States to other countries that supply the United States with intermediate inputs and final goods. What is unclear is the extent to which diversification of trade and production across countries and industries associated with financial and non-financial GVCs offset some of the impact of integration.

7. Moreover, while many studies have investigated the economic and trade dimensions of GVCs, less attention has been paid to the implications for employ-

ment, working conditions and labour rights, including the rights to freedom of association and collective bargaining. The employment challenge to decent work arises from the need to not only create jobs, but also to provide employment of quality that ensures workers' rights.[2]

8. Governance gaps in GVCs provide both challenges to decent work, but GVCs also create opportunities for building inclusive and sustainable growth. Understanding the dynamics under which participation in global production systems contributes to decent work and positive economic outcomes has important implications for governments, business and the community at the national, regional and international levels.

9. Given the emerging cross-border production arrangements between lead and specialized supplier firms and their impact on both levels and growth rates of employment, income, trade and productivity, there is a need for the current macroeconomic, business and trade statistical frameworks to better capture those complex cross-border activities and risks associated with the growing interconnectedness of national economies, as described in the following sections.

B. Background: the development of these guidelines

10. These guidelines build on a significant body of research by the statistical and academic community to delineate globalization and to meet the statistical challenges in measuring the impact of the GVCs on macroeconomic, business and international trade statistics. Noteworthy progress has been made towards a better understanding of the nature of global production and the complex measurement issues that need to be considered. Namely, in April 2007, an Expert Group on the Impact of Globalization on National Accounts led by the United Nations Economic Commission for Europe (UNECE) was established, following a decision of the Conference of European Statisticians (CES). The Group was organized jointly with OECD and Eurostat and published the guide, "The Impact of Globalization on National Accounts",[3] which focuses on the main aspects of globalization and recommends solutions and best practices aimed at improving the design, processing and use of the data, and achieving better international consistency in the identified problem areas.

11. Furthermore, in 2015, the UNECE/Eurostat/OECD Group of Experts on National Accounts published its "Guide to Measuring Global Production"[4] in 2015. The Guide has a greater focus on the behaviour of MNEs that engage in global production, providing a conceptual framework for understanding the structures, ownership and, in particular the significance of intangibles such as intellectual property products (IPP) and the related royalty service flows. It also provides comprehensive guidance to compilers of national accounts, balance of payments and related economic statistics, as well as to data users, on the challenges in collection, production and analysis of data related to global production arrangements.

12. Another initiative is the WTO Made in the World initiative,[5] launched in 2011. It is a project to support the exchange of experiences and practical approaches in measuring and analysing trade in value-added and GVCs. It collects and publishes articles from WTO delegates, non-governmental organizations, academic experts, WTO staff, and others.

13. Building on these initiatives, the Friends of the Chair Group on the Measurement of International Trade and Economic Globalization was established by the United Nations Statistical Commission at its forty-fourth session, in 2014. It was tasked with preparing a concept paper on the measurement framework for international trade and economic globalization. That report provided an overview and assessment

[2] International Labour Organization: Decent work for all in a global economy: An ILO perspective. Available from www.ilo.org/public/english/bureau/dgo/speeches/somavia/1999/seattle.htm

[3] UNECE, Eurostat, and OECD. *The Impact of Globalization on National Accounts*, 2012. Available from www.unece.org/fileadmin/DAM/stats/publications/Guide_on_Impact_of_globalization_on_national_accounts__web_.pdf.

[4] UNECE. *Guide to Measuring Global Production*, 2015. Available from www.unece.org/fileadmin/DAM/stats/publications/2015/Guide_to_Measuring_Global_Production__2015_.pdf.

[5] See www.wto.org/english/res_e/statis_e/miwi_e/miwi_e.htm.

of the conceptual, compilation and analytical issues that have emerged in respect of the prominence and governance of GVCs in international production and trade, which has culminated in these guidelines. At its forty-sixth session, the United Nations Statistical Commission established the Expert Group on International Trade and Economic Globalization Statistics[6] to develop a handbook that will address the GVC-related classifications and the integration of the economic, environmental and social dimensions of trade and globalization as an extension of the System of National Accounts 2008 (2008 SNA)[7] supported by an integrated framework of business and trade statistics. The United Nations Statistical Commission also agreed with the proposed development of a global enterprise group register to assist national statisticians to better understand business strategies and the international trade and foreign direct investment relations between enterprises in compiling cross-border macroeconomic, trade and business statistics.

[6] United Nations Statistical Commission decision 46/107.

[7] United Nations publication, Sales No. E.08.XVII.29.

14. The United Nations Statistical Commission[8] further agreed that the Guidelines will build on existing work by the Economic Commission for Europe, OECD, WTO, Eurostat, and others. Thus, these guidelines incorporate and build on the work of those initiatives. Moreover, the Guidelines, building on the integrated economic statistics framework and setting forth a GVC satellite accounts approach based on information centred on national, firm and GVC industry, complement other initiatives undertaken at the regional and international levels, such as the extensive work by the OECD-WTO Trade in Value-Added (TiVA) project and the Eurostat "Full International and Global Accounts for Research in Input-Output Analysis (FIGARO)"[9] project and Framework Regulation Integrating Business Statistics (FRIBS).[10] Other initiatives brought into view are the World Input-Output Database initiative, Asian input-output table (of IDE-JETRO), the environmental-economic extensions (EE-MRIO), such as EXIOPOL and Eora, and the Data Gaps Initiative on global economic and financial interdependencies and vulnerabilities led by the International Monetary Fund (IMF), among others.

[8] As described in previous reports to the Commission on this topic in the past four years (E/CN.3/2013/7, E/CN.3/2014/7, E/CN.3/2015/12 and E/CN.3/2016/23).

[9] See https://ec.europa.eu/eurostat/web/economic-globalisation/globalisation-macroeconomic-statistics/multi-country-supply-use-and-input-output-tables/figaro.

[10] See https://ec.europa.eu/eurostat/about/opportunities/consultations/fribs.

C. Key measurement issues related to globalization

15. While national statistical organizations (NSOs) currently produce a wealth of information on international trade, economic performance, foreign investment, and employment – all of which encompass the activities of the economic actors participating in GVCs – such information is not often assembled or presented in a way that permits an understanding of the role and impact that GVCs have within a given economy and within the broader global economy. Existing macroeconomic accounting frameworks, such as supply-use tables (SUTs) and national accounts effectively describe the relationship between one industry and another within a given economic territory but are not able to illustrate the international linkages that are essential in analysing the impact and importance of GVCs. In addition, standard macroeconomic accounting tools are organized around products, industries and sectors, while the more applicable organizing framework to explain a GVC are business processes and activities.

16. Moreover, where firms organize their activities on an international basis, national statistical compilers will see only parts of their global activities. To arrive at a whole and consistent view of how business inputs relate to outputs requires the ability to view parts of the MNE in relation to each other. The treatment of local entities in countries as individual enterprises can hide the real relationships between units within MNEs. Furthermore, while most national business registers identify membership of foreign-controlled enterprise groups and the country from which the control is exercised, few capture economic data on activities outside the domestic economy.

17. One of the most basic challenges of globalization, and the fragmentation of production that accompanies it, has led to an increasing volume of double counting in the real and financial sector. In the real sector, traditional trade measures count gross flows of goods and services as exports and imports each time they cross international borders. As a result, basic raw materials and intermediate products made in one country are counted as exports when they are shipped to a second country to be used as inputs along with inputs from other countries in the assembly of those products into a finished product, which is in turn shipped a third country, where it is subject to quality control, repackaging, distribution and final sales. Rather than counting only the value-added by each country in each stage of the production process or valuing only the final value of the goods – as is done to avoid double counting in gross domestic product (GDP) – the gross value of the export sales (and the imports) are counted, which results in a misleading picture of the economic contribution of countries to trade flows and the contribution of foreign value-added to domestic GDP. For instance, countries that may make only a small value-added contribution to the final value of a product from the final assembly of parts will have the entire value of the gross export recorded in its statistics, rather than the value-added of the gross exports less intermediate inputs from other countries. Those flows, therefore, do not reflect the value-added of the exporting country in the production of the goods or services.

18. Similarly, in the financial sector, the increasing complexity and global nature of financial transactions has resulted in a system in which official statistics may provide a misleading picture of the ultimate cross-country financial risk. A much-cited example was the absence of clear information during the unfolding financial crisis in the United States and recession regarding the extent of European exposure to the financial crisis through holdings of sub-prime mortgage-backed securities.

19. Moreover, the overall rise in trade associated with GVCs, combined with long-standing problems in the consistent recording of trade and investment flows across countries, have resulted in large asymmetries in bilateral trade and investment flows. Important trading partners can record sharply divergent estimates of what should be mirror estimates of exports and imports and bilateral trade balances. Difference in trade data across countries can be much larger, especially for countries involved in global supply chains and transportation hubs where there is significant assembly and re-exports of goods. Such discrepancies undermine confidence in the statistics and can mislead policymakers and business decision makers.

20. Those asymmetries have long been of concern to statisticians and policymakers. They are due to differences in the actual classification of the traded goods on the export declaration versus the import declaration, difference in the time of recording (leaving the exporting country and entering the importing country), and conceptual differences, notably in the valuation, trade system and partner attribution of imports and exports.[11] As is further discussed in Part III, for the purposes of analysing GVCs, bilateral trade asymmetries need to be reconciled between partner countries. Those reconciled bilateral data will not only improve the data used for policy and business decisions, but significantly improve the input-output (I-O) coefficients used to produce global SUTs, which are also important for trade, investment, tax and other policies.

21. The main measurement problems posed by GVCs include the following, as noted in the UNECE Guide on the Impact of Globalization on the National Accounts:

- Business processes are organized across national boundaries to maximize production efficiency and minimize their global tax burden.
- Foreign direct investment relationships in the global business processes require identification and allocation of direct investment flows.

[11] For a description of asymmetries in international statistics and their importance for measuring globalization, see: United Nations Statistics Division, Vladimir Markhonko, "Asymmetries in Official International Trade Statistics and Analysis of Globalization", International Conference on Trade and Economic Globalization, 29 September – 1 October 2014, Aguascalientes, Mexico.

- Transfer prices that differ from market prices and distort official statistics and the underlying pattern of economic activity across countries presented by those statistics.
- Special purposes entities established by firms for financing and tax purposes obscure the underlying pattern of economic activity.
- International trade in services, including the practice of sending goods abroad for processing with no change in ownership, are often difficult to measure.
- International merchanting, wherein the merchant arranges the export of goods from country A to country B, without the goods ever crossing the borders of the country where the merchant is resident, is often difficult to measure.
- Trade and investment in intellectual property is hard to measure and is particularly sensitive to distortion using transfer pricing, and its ownership and valuation may be partly driven by tax incentives.
- Any one nation's statistical system is limited to its ability to capture the value of international transactions that take place across a number of countries as part of today's complex global production chains.
- International labour movement, and the labour income arising from it, and remittances and other flows to the country of origin of the non-resident workers are often difficult to measure.
- Household travel and investment abroad (including in residential property) are often difficult to measure.
- International trade through the Internet is difficult to capture by existing national data-collection systems.
- Asymmetries in the recording of bilateral trade and investment statistics caused by the use of different prices for exports and imports, differences in the time of recording of transactions, differences in the recording of country of origin for imports and country of last known destination for exports, re-exports, and exchange rate fluctuations.

22. There are several ways that NSOs could measure GVCs within the context of the existing SNA. One approach is to extend the existing SNA production, distribution and use of income, capital, financial, and price and volume accounts to detail the international contributions to the national economy, both in the aggregate and by industry. And indeed, many countries are now beginning to develop those competencies through the introduction of extended supply-use tables (E-SUTs) and extended institutional sector accounts.

23. E-SUTs build on national supply-use and input-output tables (SUIOTs), through the integration of more detailed data provided via MNE surveys, surveys for balance of payments (BOP) purposes, tax data non-financial flows and ownership, integrated business statistics, and reconciled trade statistics, among others, providing, in turn, this more holistic and integrated view required to better understand the complexities and interactions of globalization. In doing so, they provide both more detailed and homogenous information, such as breakdowns by type of ownership (e.g., foreign or domestically owned MNEs and foreign or domestic affiliates) and possibly by trading status (e.g., export orientation), thereby capturing important differences in the input structure of different types of producers in the same industry that are currently absent from conventional input-output tables (IOTs). Under this approach, as with other satellite accounts, countries would implement them according to their own priorities and resources.

24. Integrating this information directly into multi-country IOTs, such as the OECD's TiVA accounts or the World Input-Output Database, provides a mechanism to better understand the nature of these more granular interactions within a global system; indeed, the OECD TiVA database already incorporates this form of granularity for data on Mexico and China. Multi-country IOTs provide a comprehensive map of international transactions of goods and services in a massive data set that combines the national IOTs of various countries at a given point of time. Moreover, input-output analysis covers an entire set of industries that make up an economic system, thus enabling the measurement of cross-border value flows for a country or region and provides scope to track the value-added generation process of every product in every country at every production stage. A limitation of input-output-based analyses however, and in particular global IOTs, as noted by Sturgeon and others (2013), is the relatively high levels of aggregation in industries, largely due to confidentiality constraints, which necessarily limits their ability to provide granular insights on the underlying tasks involved in production, which may differ considerably within the same industry classification.

25. Addressing these shortcomings in national statistical information systems, and in turn, global IOTs, is a primary factor for the development of E-SUTs; which require NSOs to look again at how they integrate data sources (and indeed classify and identify firms in statistical business registers) and develop tables from the ground up, using firm-level data on specific industries and final products of an MNE, which can, in turn, form the basis for benchmark macro-based GVC extensions.

26. Complementary to this and focusing on questions of the generation and allocation of income, investment and financing, extended institutional sector accounts contribute to the understanding of the financial interactions of MNEs with the host economy and the linkages with the home economy of the MNE. Moreover, complementing global IOTs, these extended institutional sector accounts can be brought together in multi-country, or global, from whom-to-whom frameworks, comprehensively detailing international income flows and financing flows and positions.

27. Integrating E-SUTs for all, or at least for many, countries into a global IOT will, however, take time, despite the significant take-up and development of those tables at the national level. To address this current data gap, a complementary approach, and the focus of these guidelines, is the development of a GVC satellite account, comprising GVC-specific SUTs and GVC-specific institutional sector accounts, which are based on an enterprise-centred approach, using integrated and more detailed business statistics and information on business lines and business functions, that focus on a specific product or group of products produced by MNEs within the GVC among a group of key partner countries.

D. The global value chain satellite accounting framework

28. These guidelines propose a GVC satellite account approach for better measuring and analysing the globalization phenomenon that builds on the theoretical foundation of the GVC framework described previously. These guidelines present a starting point and guiding material for future work in official statistics to account for GVCs. While the steps for the compilation of the described data sets are laid out, a GVC satellite account has not yet been compiled by a national statistical office (NSO). The Guidelines will therefore benefit from experiences learned by countries in the implementation of the GVC satellite account approach.

29. The GVC satellite account approach focuses on:

- GVC satellite accounts, which comprise GVC-specific SUTs and GVC-specific institutional sector accounts, where the concepts and boundaries are consistent with the core SNA, but additional detail, classifications and presentational changes are used to better identify and articulate GVCs;
- National and multi-country GVC-specific SUTs that focus on a specific product or group of products produced within a GVC (among a group of key partner countries in the case of a multi-country GVC-specific SUT), based on the input-output relations of goods and value-adding services for the GVC, as well as participating firms by type (i.e., lead firms and suppliers) and ownership (domestic- or foreign-owned), and associated business functions;
- A key contribution of these guidelines is the construction of national and multi-country GVC-specific SUTs that are based on an enterprise-centred approach, using integrated and more detailed business statistics and information on business lines and business functions;
- A flexible approach that can be implemented depending on a country's needs and interests, that is, a country chooses the most economically important and/or policy-relevant GVC(s) and their main trading partners. In other words, GVC satellite accounts may focus on a single country or, preferably, expand to multi-country accounts with major GVC partners. Moreover, GVC satellite accounts may comprise only one or several GVC-specific SUTs of interest, but preferably it will also include the GVC-specific institutional accounts;
- Another key contribution of these guidelines are national and multi-country GVC-specific institutional sector accounts, which provide an economic overview of the distribution of value-added and related income across the different countries through transactions in goods, services, income, assets, and liabilities in its network of affiliate and non-affiliate firms and the degrees of control among enterprises in a GVC through foreign direct investment or other forms of control through market dominance;
- Harmonization of classifications, reconciliation of data asymmetries, data linking and data exchange;
- The analytical and policy uses of the GVC framework.

E. Structure of these guidelines

30. The concepts described previously are laid out in the Guidelines in the following parts:

- **Part II: GVC Satellite Accounts** – includes descriptions of how to define the industrial and geographical boundaries of a GVC, classifications, required data and data sources, coordinated data collection of MNEs through profiling conducted by large cases units (LCUs), GVC-specific national and multi-country SUTs, and GVC-specific national and multi-country institutional sector accounts;
- **Part III: Integrated Business Statistics** – lays out definitions for business lines and business functions, the importance of business registers and global registers and resolving data inconsistencies in basic economic statistics (e.g., bilateral trade asymmetries);
- **Part IV: GVC Analysis and Policy Framework** – demonstrates in-depth how GVC accounting and resulting data can address specific policy questions;

- **Part V: Annexes** – covers the relationship between the GVC satellite accounts and the E-SUTs, the data framework of multi-country SUIOTs, empirical challenges in compiling GVC accounts (such as estimating for missing data) and conceptual accounting topics (such as inward/outward processing and factoryless goods production).

The following is a brief description of each part.

1. Global value chain satellite accounts

31. As described earlier, one way to better illustrate and therefore understand the role that GVCs play within the economy is to rearrange and expand the information found in standard macroeconomic accounting frameworks. In the context of national accounting, that is referred to as satellite accounting.

32. The foundation of the GVC satellite accounts is SNA, an internationally recognized framework used to measure economic and financial activity within a country or region and their cross-border economic relationships. That framework is used by countries throughout the world to compile macroeconomic statistics on production, incomes, investment, consumption, saving and financial transactions, as well as stocks of non-financial and financial assets, liabilities and net worth. The data are organized into a sequence of accounts that articulate the change in wealth from one period to another by tracing the activities of economic agents (i.e., industries, households, governments, corporations). SNA provides a set of concepts, definitions, classifications and accounting rules for compiling and integrating data to give a comprehensive picture of the economy and how it works. Some key measures that emerge from that framework include GDP, household disposable income, investment, capital stock, productivity, the international balance of payments, government debt and national net worth.

33. One of the strengths of SNA lies in its flexibility. While the system lays out the concepts, component accounts and accounting rigour required to produce a set of integrated and internally consistent set of accounts it also affords the compiler the flexibility to vary and, in a sense, "extend", that is, expand or reformulate the framework to address a specific/emerging need. At the limit, this extending is referred to as satellite accounting. There are essentially two types of satellite accounts that can be produced.

34. The first type of satellite account involves a rearrangement of the classifications or data (e.g., more detail or alternative aggregations) and the possible addition of complementary information to the existing core accounts. Those satellite accounts do not change the underlying concepts of the core SNA but rather provide an expanded perspective on a specific industry and related categories of products or activities. The second type of satellite account seeks to change the underlying concepts of the core SNA. That would involve, for example, changing the concept of production (e.g., including volunteer activities or household work as production), consumption or capital formation. The GVC satellite accounts are based on the first type of satellite account, wherein the concepts and boundaries are consistent with the core SNA, but additional detail, classifications and presentational changes are used to better identify and articulate GVCs.

35. Because such satellite accounts would be an extension of the existing SNA and BOP, they can provide an integrated, consistent, and comprehensive accounting framework that ties new globalization measures, such as trade in value-added from goods and services, and links them to the existing macroeconomic accounts and business statistics. With the further experimentation and testing of national GVC accounts

for specific GVC industries with the partner countries in the GVCs, it is expected that analytical value of the extended global accounts will significantly improve. The strength of compiling GVC satellite accounts for the SUTs and institutional sector accounts with a national perspective consistent with partner countries in the network of GVC-specific firms will be that countries are able to establish their benchmarks for trade in value-added derived from global accounts.

36. One of the most important features of satellite accounts is that they are designed in such a way that they are consistent across economic territories, through time and with the greater SNA. It is envisioned that GVC satellite accounts can be produced by a single country or that countries can collaborate to create a multi-country GVC satellite account. Multi-country GVC satellite accounts will contain a richer set of information, but the cost of the additional detail must be considered against the complexity of joint international compilation and timeliness. The concept of geographic boundary is further elaborated in part II.

37. GVC satellite accounts comprise national or multi-country GVC-specific SUTs and national or multi-country GVC-specific institutional sector accounts. As described in part II of the Guidelines, the GVC-specific SUT accounts would be compiled from national SUTs with a common breakdown of industries and products among the partner countries involved. In addition, to reflect the governance structure of the GVC, the accounts would include a further breakdown on whether the lead, affiliated and non-affiliated enterprises in the GVC network are foreign- or nationally controlled and/or a foreign- or national associate. In a similar way, the list of products explicitly identified in the SUTs reflects the GVC-related products that includes the final product of the GVC and the intermediate goods and services that are used to produce the final product. Finally, because of the multi-country nature of the SUTs, the trade of those products between the GVC-partner countries would also be explicitly shown.

38. Countries themselves can choose to focus on specific GVCs and partner countries based on their relative importance in terms of value-added to the national economy, international investment and trade relations, and/or to address specific policy questions. Such accounts would be based on existing firm-specific microdata; publicly available microdata; existing input-output coefficients; and existing, or newly collected, information on governance and business functions. Of course, the GVC-specific SUTs are also developed within, and can be linked to, SNA accounts, including E-SUTs. Further, linking them to the sequence of the distribution and use of income, capital, and financial accounts would complete the GVC satellite account (see paras. 39–43).

39. Such GVC satellite accounts would have the advantage of providing a supplementary framework for developing new measures without overburdening or reducing the accuracy or consistency of the core accounts. While there is a strong connection between an extended multi-country SUT and a GVC-specific SUT (in fact, in many ways a GVC-specific SUT can be seen as a natural extension of an extended SUT integrated into a global IOT in that it focuses a lens on a specific set of products produced in a GVC), a GVC-specific SUT does not require the development of a full global IOT with the additional granularity, as it focuses only a specific set of products and activities for a specific GVC. Therefore, an extended SUT is not a prerequisite for compiling a GVC-specific SUT.

40. With the increasing understanding of the input-output relationships between core and supporting business functions of GVCs for specific industries, GVC-specific SUTs can be delineated in standardized presentations of products and industry classifications. Progressively, with further profiling of GVCs for specific industries, the available product and industry classifications for automotive, apparel and textile and

electronics industries can be extended to other industries such as the agrifood, chemical and pharmaceutical industries.

41. Furthermore, part II of the Guidelines outlines the general structure of GVC-specific institutional sector accounts, so as to be able to delineate MNEs, as well as distinguish income, investment and financing flows and related asset and liability positions occurring within MNEs. This structure can be used to separately identify the income and financing of industry-specific GVCs, and their impact of specific GVCs on host economies. Supplementing the description of the economic cross-border production activities of the lead enterprise and supplying enterprises, the coordination and governance of a specific GVC can be described using the institutional sector accounts of SNA (i.e., production, generation of income, etc.).

42. In a GVC-specific SUT framework, the production of goods and services correspond to business functions that directly contribute to the specific GVC. It is important to note that this highly detailed product dimension is largely absent in the institutional framework, as it intends to describe the relationships between institutional units, rather than within and between firm technological and logistical relationships. Rather, the institutional framework focuses on the income, investment and financing streams between the firms making up the GVC and establishes how individual parts, as well as the entire GVC, would impact host economies and the home economy of the lead firm.

43. The organizational principle behind capturing transactions between the enterprises in GVCs is to delineate their behaviour according to business governance, for example, in taking account of the different degrees of control exercised by the lead firm in the GVC through taking direct or indirect ownership positions in the supplying firms in the chain through foreign direct investment or exercising other forms of control through market dominance or exclusive production arrangements for purposes of production, tax and financing considerations.

44. The institutional sector accounts for GVCs will provide an economic overview of how the optimization of the distribution of value-added and related income across the different countries through transactions in goods, services, income, assets and liabilities in its network of affiliate and non-affiliate firms depends on, or is influenced by, the economic and regulatory environment of the countries in which the GVCs operate. The GVC-specific institutional sector satellites (contrary to the extended institutional sector accounts), therefore, depend on the identification of GVC-participating firms, available through the elaboration of a GVC-specific SUT and the underlying business statistics.

45. The GVC-specific institutional accounts proposed include the following tables (as further presented in part II):

- **Extended current account:** transformation of value-added to income
- **Extended accumulation account:** foreign-controlled non-financial corporations (affiliates)
- **Extended balance sheet:** foreign-controlled non-financial corporations (affiliates)

and potentially the following:

- From-whom-to-whom matrix for foreign direct investment
- From-whom-to-whom matrix on *other investment, derivatives, portfolio investment*
- Non-financial assets and net worth matrix
- From-whom-to-whom matrix for balance sheet totals

2. Integrated business statistics

46. The GVC satellite accounting framework is complemented by the framework of integrated business statistics, which together should result in the development of firm-level statistics in the GVC network, as presented in part III of the Guidelines. Global enterprise profiles and related global and national business registers should identify the domestic and cross-border mechanisms of control and ownership established by the lead firms in their firm networks. Those profiles should clarify the structure, transactions and positions to compile the multi-partner country SUT and institutional sector accounts for specific industries of GVCs. The integrated business statistics will facilitate an assessment of the impact on the firm-level statistics and indicators on key variables, such as employment, income, productivity and international trade within the GVCs as compared with firms not participating in the GVCs within a specific GVC industry.[12]

[12] GVC effects on employment and income, while possible, are an area of future work and are not further elaborated upon in the Guidelines.

47. Through the profiling of the GVC-related networks, the statistical infrastructure will be established to better target the integrated data collection of the firms within GVC networks based on the understanding of the interdependencies between cross-border transactions in goods, supporting services and income and in positions of assets and liabilities between partner countries. It is critical, in that regard, that countries develop national statistical business registers that go beyond their national boundaries to include links to foreign parents and affiliates. Moreover, efforts being made at the international level to construct a global groups register (see part III, section 7) would further facilitate such global profiling. Furthermore, those national statistical business and global enterprise registers will allow for tailored collaboration between partner countries in analysing bilateral asymmetries, developing global enterprise registers and establishing early warning systems for large statistical impact events on economic statistics, like large corporate investments and inversions.

48. Part III also introduces the concept of the business line. A global enterprise can organize its core production activities (i.e., production of goods and services to be sold in the market) in several different business lines. Such an enterprise could be a lead firm for various GVCs in different specific industries. Therefore, business, trade and investment data for a GVC satellite account would need to be collected from the statistical units of the business line of a global enterprise to allow for the correct data specification of the industry-specific GVCs controlled by the lead firm.

3. Harmonization, data reconciliation, microdata linking, and data exchange

49. Part III of the Guidelines notes that compiling GVC satellite accounts will incorporate a wide range of techniques for harmonizing and better integrating existing data (based on new IT systems, data exchange, microdata linking, central business registers, and administrative and other big data), as well as, potentially, the collection of new data in the form of specialized business surveys or profiling of MNEs. Such efforts should probably begin with work to harmonize existing sets of national and balance of payments accounts and the balance sheet, supply and use, and other accounts that support them. The first step for most countries is the adoption of concepts and definition from the 2008 SNA and BPM6 in areas that are quantitatively significant[13] and where deviations from international standards can result in significant bilateral asymmetries in national accounts. Next in importance is empirical work, including the reconciliation of such data as bilateral and global trade balances, export and import prices, and assets and liabilities. As is further explored in part III and annex I, such reconciliations

[13] For instance, the implementation of the BPM6 services component "manufacturing services on input owned by others".

can significantly improve the accuracy of bilateral and international data, at a significantly lower cost than expansions of existing data-collection systems, with no increase in respondent burden.

50. A key element in successful reconciliations is through the use of data exchanges, which is further elaborated on in part III. Data exchanges and reconciliation can help identify double-counting of transactions, gaps in coverage, misclassification of industry and product classifications for key firms, as well as persistent misunderstandings and misreporting by respondents. Those data exchanges are most effective at the microdata level, but bilateral reconciliation of tailored subaggregates can help identify the types of problems previously cited, many of which can then be resolved without the exchange of microdata.

51. Part III of the Guidelines advocates for the use of microdata linking as an appropriate statistical tool for measuring the production arrangements of the global firm in industry specific GVC. Microdata linking is the combining of microdata on entities such as enterprises, jobs and persons. It can assist in answering questions on the domestic and cross-border interconnectedness of the firm network and impacts on jobs, income and growth. An important application of coordinated microdata linking in GVC measurement is the determination of a complete and accurate picture of the activities of MNEs within the national borders. In addition, statistical offices need to find solutions for sharing granular data, as long as confidentiality and trust of respondents can be guaranteed, because policymakers are asking for granular data. There is also great value in sharing data even at the aggregated level. Part II also discusses initiatives at the international level to provide guidance on the exchange and sharing of economic data across countries.

4. Dissemination and confidentiality

52. It is worth noting that compilation of a GVC satellite account will likely prove analytically useful to an NSO even if it is not published or disseminated to the public because of confidentiality concerns, as the data from a GVC satellite accounting framework can serve to cross-validate or benchmark the relationships between industries as published in SUTs. If an NSO chooses to disseminate a GVC satellite account, it must consider the preservation of statistical confidentiality. Confidentiality is a fundamental principle of official statistics. The United Nations Fundamental Principles of Official Statistics stipulate that individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons or not, are to be strictly confidential and used exclusively for statistical purposes. Statistical confidentiality is necessary in order to gain and keep the trust of both respondents to statistical surveys and users of the statistical information.

53. It is therefore important that appropriate disclosure checking procedures are in place as part of any dissemination process. Countries may apply different criteria to decide whether specific data may be disclosed or not. That is likely to be driven by the legislation in place underpinning the collection of data from businesses. Usually, the number of enterprises observed in an industry influences that decision and also whether disclosure can be determined by deduction. One solution would be to choose a higher aggregation level with a sufficient number of enterprises in an industry to overcome any disclosure problems. In some cases, permissions may be sought from a business to publish information that helps to reduce the number of disclosive cells.

54. The issue of confidentiality may render some disseminated national data sets incomplete owing to the suppression of data. The gaps will vary across countries, for

example, the different legislations and treatment of data collected from businesses. For example, many countries distinguish hundreds or even thousands of products in their SUTs but do not publish tables at those levels because they may include a lot of confidential information. However, it should be noted that countries do often allow people outside the NSO to have access to more detailed data, albeit confidential and under signed agreements, for research purposes.

5. Analytical and policy framework

55. Following the new theoretical insight in what drives economic growth, productivity and international trade, a new GVC analytical and policy framework has emerged in which imports matter as much as, if not more than, exports. Part IV of the Guidelines presents that new policy paradigm, which takes a holistic view on economic development and international trade and in which the flows of goods, services, people, ideas, and capital are interdependent and must be assessed jointly.

56. Trade policies are increasingly informed by data on value-added contributions to better target trade policy in addition to bilateral gross trade flows. Specifically, bilateral trade balances measured in gross terms hide significant import content in the production data of goods and services, including their foreign and domestic value-added. Protectionist pressures based on bilateral gross trade balances could result in misguided trade policies, such as: a) higher import taxes that lower the competitiveness of domestic lead firms that rely heavily on imported inputs and, for various reasons, cannot switch to domestic suppliers; b) higher import tariffs that tax domestic value-added portions that are embodied in those imports from third countries; and c) higher import taxes that would likely result in higher consumer prices if lead firms pass through the additional costs they incur to the final consumers. Therefore, effective trade liberalization goes beyond the tariff rate on final goods.

57. The new GVC policy framework for economic development and trade goes beyond simple tariff cutting and involves legal commitments on laws and regulations. Recently, preferential trade agreements have proliferated and have proved to be a more congenial setting for the economic integration of groups of like-minded countries. Economic integration often involves opening and levelling the playing fields in terms of investment, intellectual property and competition policy and seems to be an effective way to expand involvement in GVCs. New areas are covered in those agreements that facilitate the operations of complex production structures that span multiple countries.

58. The competitiveness of upstream sectors, especially services, shapes a country's success in GVCs. Upstream sectors contain both a) foreign value-added, and b) domestic value-added that are supplied to exporting sectors. Typically, countries entering manufacturing GVCs start as buyers of foreign technology and know-how, which enables them to increase their domestic value-added that is exported. In order to become manufacturing sellers, countries need to increase the share and quality of domestic services value-added.

59. Most countries have increased their dependence on foreign inputs, as measured by the foreign value-added as a share of their gross exports, that is, they increasingly rely on imported inputs that are processed and subsequently exported. But the competitiveness of the domestic segment of the value chain is as important as that of the international segment.

60. Furthermore, in a world dominated by complex and fragmented production processes, economic development can occur through economic upgrading and densification. Economic upgrading is largely about gaining competitiveness in higher

value-added products, functions, and sectors via skills, capital, and process upgrading. Densification involves engaging more local actors (i.e., firms and workers) in the GVC network. In some cases, that could mean that performing lower value-added activities (or functions and tasks) on a larger scale can generate large value addition for the country. Raising domestic labour productivity and skills contributes to the overall goal to increase a country's value-added because of GVC participation.

61. That new GVC analytical and policy framework depends critically on economic statistics classified into business functions, rather than aggregated industrial sectors along the value chain. For instance, with a focus on upstream value-added services sectors in a value chain for economic development, the analytical and policy perspective shifts to the country's domestic value-added that is exported. The traditional industrial sectoral data can cover aspects of intersectoral upgrading and, to a lesser extent product upgrading (due to the high aggregation of sectors in the data). However, providing evidence of functional upgrading requires an explicit recognition in the economic statistics of the integration of domestic production structure along the business functions of the GVCs, that is, for understanding of the interrelationships of goods and value-added services of the business functions of the GVCs. In an aggregated classification of national SUT, the aggregated industrial sectoral data mask which types of value-added activities a country truly specializes in and what value-added shares of the GVC are associated with them. Such value-added activities range from research and development (R&D), design, input sourcing, processing, marketing, distribution and customer support.

62. The detailing in the classification of business functions of the cross-border GVC structures will offer new statistical insights in support of the policy framework for GVCs. It will allow for the policy focus to shift to the business functions that a country is able to carry out, those it wishes to carry out in the future in its consideration of policy measures to achieve functional upgrading. Moreover, it will allow for the attention to shift to tasks emphasizing the role of workers and skills. For GVC entrants, the focus on tasks means to lower barriers to knowledge, including to foreign skilled personnel and individual services, and also includes establishing strong intellectual property rights to attract technology-intensive foreign investors. At the same time, prioritizing business functions requires countries to match talents and services with the necessary infrastructure (i.e., physical, digital, and institutional) and cutting-edge technologies. GVC participation allows countries to absorb valuable foreign technology and know-how via imports and foreign direct investment. Increased connectivity – global and within a country – opens opportunities for economic upgrading and ensures that the development potential of technologies reaches a large fraction of the world population.

6. Relationship between the GVC satellite accounting framework and the extended supply-use tables, the data framework, empirical challenges and conceptual accounting topics

63. Part V of the Guidelines addresses the relationship between the GVC satellite accounting framework and the E-SUTs, the data framework of the empirical challenges of multi-country SUIOTs and the conceptual accounting topics associated with GVC satellite accounting. Specifically, the empirical challenges discussed include estimating for missing countries in the GVC satellite account framework; overcoming national data inconsistencies between national accounts and trade statistics; reconciling bilateral trade asymmetries; harmonizing classifications; and international coop-

eration in data sources and methodologies, among others. The conceptual accounting topics include those not resolved under the research agenda of the UNECE "Guide to measuring global production", such as classification of factoryless goods producers and transactions in intellectual property products (IPP) through a further development of the decision tree.[14]

[14] UNECE, Guide to Measuring Global Production.

7. Further reading and glossary

64. Online materials are also provided as a compendium to these guidelines, available on the Statistics Division's website.[15] The compendium consists of 14 chapters authored by the members of the Expert Group on International Trade and Economic Globalization Statistics in preparation for these guidelines, which expand on certain topics in more detail. The Guidelines include a glossary of terms used throughout the Guidelines, based on existing international standards and manuals (i.e., the 2008 SNA, the sixth edition of the Balance of Payments Manual (BPM6), the Manual on International Merchandise Trade Statistics 2010 (IMTS 2010), etc.), whenever possible.

[15] See https://unstats.un.org/wiki/.

Part II
GVC satellite accounts

A. Introduction

1. As described in part I, GVC consists of the full range of activities that firms and workers do to bring a product (i.e., good or service) from its conception to its end use and beyond.[16] That range includes activities such as R&D, production, transportation and distribution, marketing and sales, and after-sales services to the final consumer. A GVC operates among multiple affiliated and non-affiliated firms and across national borders.

2. A number of efforts have been made in recent years to develop a better understanding of GVCs. Perhaps the best known and most visible of those are those related to the development of global or regional IOTs, for example OECD-WTO TiVA,[17] FIGARO,[18] World Input-Output Database,[19] APEC-TiVA,[20] and the North American TiVA initiative.[21] However, as already noted, because of the sheer volume of data involved, they typically provide only a relatively aggregated view of GVCs, and, moreover, are only, generally, able to provide a view of GVCs that reflect the generation of value-added in a value chain on the basis of the activity classification of the firms involved in the chain. The relatively aggregated nature of those tables also means that the underlying assumptions used to generate results have a larger impact. Chief among those is the implicit homogeneity assumption that all firms classified to a particular sector have the same production function.

3. How to address the implicit homogeneity assumption among firms and enable a "look through" the global firms in GVCs and see their contributions in the fragmented production process across multiple countries is the topic of these guidelines. Large firms, for example, capitalize on economies of scale while affiliated firms may also have different production processes and indeed different cross-border trade relationships than non-affiliated firms. In response, significant efforts are being made to improve the quality of current TiVA estimates by better capturing the underlying heterogeneity within activities. Indeed, the current OECD-WTO TiVA database includes important breakdowns for Chinese and Mexican data, with breakdowns between processing and non-processing firms in the case of China and breakdowns between global-manufacturers (i.e., exporting and typically foreign owned) and non-global-manufacturers for Mexico.

4. In addition, at the national level many countries are now beginning to develop E-SUTs[22] that look to capture improved granularity using a variety of approaches – for example by focusing on exporting firms, size, and ownership. The latter dimension is especially important given the governing role of MNEs in managing GVCs. The current focus of countries on those core dimensions of granularity is not, of course, by accident, reflecting as they do core defining characteristics of firms that are readily available in national statistical information systems such as in business registers and trade registers. But within the framework of E-SUTs, other classifications of

[16] Gary Gereffi and Karina Fernandez-Stark, *Global Value Chain Analysis: A Primer, Second Edition*, The Duke Center on Globalization, Governance & Competitiveness, July 2016.

[17] See www.oecd.org/sti/ind/measuring-trade-in-value-added.htm.

[18] See https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/information-data#figaro.

[19] See www.wiod.org/home.

[20] See www.apectivagvc.org/.

[21] See www.usitc.gov/publications/332/working_papers/ecwp-2017-12-a-12-12-17-as-pdf_0.pdf.

[22] For example, Mexico has published its E-SUT in November 2018, as part of the Mexican National Accounts System. Also see box A.1 in Part V.

firms are also possible, as well illustrated in the case of China and Costa Rica, which have developed E-SUTs by differentiating between firms operating in free trade zones and other firms.

5. E-SUTs, however, are also designed to extend the current accounting framework that is typically captured in global IOTs and related TiVA estimates so that they are able to provide insights on the trade-production and investment nexus, through extensions that move conventional supply-use tables beyond their current focus on production and so include information on income. In so doing they provide a link between the production and institutional sector accounts and the basis for fully integrated international economic accounts.

6. Those national tables have tremendous benefit in and of themselves but linked together to create "extended" global IOTs they become particularly powerful accounting tools. However, it will be some time before most countries are able to develop E-SUTs and even longer to develop Extended global IOTs.

7. These guidelines propose a GVC satellite accounts approach that builds on the E-SUTs principle of disaggregation of production structures by zooming in on national interests for particular traded products related to specific sectors such as in agriculture, industry and services. Those products and sectors can be grouped by GVC industries for which standardized product classifications can be adopted for international comparison and intercountry collaboration purposes between major trading partners in specific GVC industries such as in horticulture, automotive, apparel and textile, electronics and other industries.

8. Taking a simpler and more targeted approach also provides scope to consider a number of additional firm characteristics that are relevant for GVC analysis, in particular:

- Type of GVC
- GVC-relevant geographical boundary
- GVC governance
- GVC-relevant industry breakdown
- GVC-relevant product breakdown
- GVC-relevant additional information (e.g., employment, capital, etc.)

9. The satellite account approach adopted in these guidelines offers a national perspective for a limited set of major trading partners in a multi-country presentation of the accounts. The focus of this chapter is to elaborate on the framework of the satellite account within SNA that explicitly identifies firms related to specific economic activities, products and transactions that are specific to a single GVC industry using internationally standardized product classifications.

10. Those accounts are based on an enterprise-centred approach to compiling and analysing integrated business statistics that are organized around business functions. These data build on a set of information that is generally available (for example, in LCUs, where profiling is carried out for large MNEs) and needs to be brought together within the context of GVC business functions and governance structures.

11. The accounts can be compiled using a so-called top-down approach. That approach entails rearranging national SUTs and institutional sector accounts according to the principal domestic and cross-border production arrangements of the enterprise group networks operating in both the compiling country and its major trading partners. That should take into account both the core and supporting functions. The initial estimates should be performed using additional data sources for the following:

- Proportional breakdown for GVC-specific business functions
- GVC-related intermediate and final products
- Institutional (sub) sectors reflecting the global enterprise group structure of lead, affiliate and non-affiliate enterprises

12. This part of the Guidelines describes the satellite framework for GVCs by presenting all the necessary elements to setting up a GVC satellite account. This part also provides practical guidance for the compilation of a GVC satellite account and also what indicators can be derived from it. Refer to part V of these guidelines for additional elaborations on the relationship between a) the GVC satellite account framework and the E-SUTs; b) the data framework of multi-country SUIOTs; c) empirical challenges and conceptual accounting topics; and d) special accounting topics linked to GVCs, respectively, in part V, annexes A, B, C and D.

B. Types of global value chains

13. GVCs are generally associated with a specific industry and related final product(s). Examples of GVC industries that have been studied in the literature include the following: automotive; electronics; apparel and textiles; horticulture, including coffee and tea; fruits and vegetables; spices; flowers; plants; and so on. Each industry-specific GVC has its own characteristics in terms of GVC governance, activities and products involved and geography. It is therefore important to specify at the outset the type of GVC being considered, that is, for which industry the GVC satellite account is compiled.

14. From a national perspective, the selection of which GVC(s) to analyse depends on the importance of the international investment and trade relationships with the partner countries in the GVC in the compiling country. A country may be interested, for example, in understanding its upstream and downstream position in a specific GVC. It may also want to enhance its participation and upgrading in a specific GVC or indeed in better measuring the impact of a particular GVC on the generation of income, employment and productivity of its business functions.

15. Flexibility must be applied when selecting the GVC-specific industry. Statistically, the economic dominance of a specific industry GVC in the total economy will be a major determining factor for the selection. Key indicators are the geographical distribution of value-added, trade, investment and employment of the core and supporting functions in the domestic economy and partner country markets. Apart from production-related considerations, the selection could also take into account the dominance of GVC-related enterprises in the financial sector through their exposures to major external risks in capital markets.

16. Alternatively, the selection of the GVC may rely on identifying trends in the data for example using international trade statistics to identify a country's most heavily traded intermediate products. This information should indicate the main GVCs in which the country participates. Levels and shifts in traded intermediate goods may include not only manufacturing products but also intermediate agricultural products from developing countries such as dried and graded coffee beans and tea, cut flowers and so on. Additionally, a shift in the type of traded intermediate products may also indicate an expansion into a new GVC network for a country. Ultimately, the selection may depend on policy interests, particularly those related to the role of workers and skills. GVCs may also indicate both the skills a country needs (and/or desires) and the physical and institutional infrastructure requirements for entering into certain GVCs. The institutional infrastructure may incentivize the lowering of barriers to knowl-

edge, including relaxing regulations on foreign skilled personnel and services, and establishing strong intellectual property rights to attract and maintain foreign direct investment relationships.

C. Geographical boundaries of global value chains

17. The activities of a GVC are carried out across national boundaries on a global scale. Ideally, a GVC satellite account would capture detailed information from each economic territory involved in the GVC. However, in practice, that may be neither feasible nor practical: the amount of information with the appropriate level of detail may not be available for all the partners from each economic territory associated with the particular GVC.

18. A practical approach for the compilation of a GVC satellite account relies instead on the identification of the main relevant players in the GVC. That approach implies establishing, in the initial design of the GVC satellite accounts, a threshold of activity. For example, if 10 countries are involved in a specific-industry GVC, it may not be possible or practical to coordinate the statistical activity required to develop a multi-country GVC satellite account across all 10 countries. Rather, a threshold of activity can be established to include only those countries that contribute the most to the GVC, such as the countries that account for at least 50 per cent of the inputs into the GVC. While the trade flows within the selected countries would be explicitly identified, the trade flows between them and other countries might be collapsed as trade with the rest of the world.

19. The compilation of multi-country GVC satellite accounts requires a collaborative effort among statistical offices of the countries involved in the GVC. A multi-country GVC satellite account will contain a richer set of information: the cost of this additional detail most likely being traded off against the benefits of joint international compilation and timeliness. If countries choose to collaborate in developing a multi-partner country GVC satellite accounts, there are a number of important considerations. First, a GVC satellite account is a collaborative effort among statistical compilers across countries, which is a fundamental change in the way NSOs traditionally develop statistical products. Historically, NSOs compiled official statistics independent (albeit with an awareness) of the work performed by NSOs in other countries. When constructing a multi-country GVC, NSOs may run up against organizational, governance and legislative constraints. There are a number of best practices and necessary conditions that should be followed when establishing agreements and appropriate governance structures to undertake international data compilation projects. At a very high level, these necessary conditions include:

- Clearly identified net benefit
- Willingness to harmonize concepts and data requirements
- Willingness to coordinate statistical programs
- Willingness for each partner to adapt
- Willingness to consult
- Willingness to implement quality control measures
- Willingness to incur costs

20. Box 2.1 presents an example from a project in North America to compile a regional trade in value-added database (NAFTA TiVA), which required similar collaboration among national statistical agencies as would be needed in a multi-country GVC study .

Box 2.1
Memorandum of Cooperation for the North American TiVA (NA-TiVA) Project

The North American Trade-in-Value-added (NA-TiVA) project is a trilateral, multi-year initiative that aims to produce a regional TiVA database that maps the value chains connecting Canada, the United States and Mexico.

The table below presents the structure of the memorandum of cooperation signed among the participating agencies of Canada (Statistics Canada), Mexico (National Institute of Statistics and Geography, INEGI) and the United States (United States Trade Representative, United States International Trade Commission, Census Bureau and the Bureau of Economic Analysis). The memorandum of cooperation is the cornerstone of the NA-TiVA initiative.

This agreement describes the objectives, deliverables, and timeline of the work programme and highlights the importance of the data sharing and transparency of cross-border statistical collaboration. It elaborates on the need for a common website, a methodological document ("white paper") that captures the concepts and methods used for the multi-country accounts and the deployment of staff of each agency participating in the NA-TiVA initiative, as well as the methodologies followed by other worldwide initiatives to ensure international comparability. Additionally, it details the work streams like the drafting of the white paper, the reduction in asymmetries in trade in goods and services and the compilation of the national and regional SUTs.

Field	Characteristics
General Information	Title of document
	Name of the agencies / institutions which participate in the agreement
	Signature date
	Signatures of agencies / institutions (specifying the staff) which participate in the agreement
	Languages used in the the agreement
Introduction	Context of the agreement
	Main Objective
	Definitions and concepts developed in the document
Scope	Activities to achieve the objectives
	Implementation and deadline of the actions agreed in the document
Action Plan	Phases: - Specific Objectives - Deadlines - Deliverables
Financial and legal aspects	Financing
	Status
	Duration and Amendment

21. While developing a single country GVC satellite account may have operational advantages, it does have a number of important analytical drawbacks. In the case of a single country GVC satellite account, users are limited to information about the business functions and value-added of the GVC within the domestic economy. In contrast, a multi-country GVC SUT framework, even with a limited number of countries being major trading partners in a GVC-specific industry, benchmarks can be established as proxies for the foreign and domestic value-added in imports and exports related to a GVC specific industry as the production structures for the export and import flows are made explicit in the GVC SUT framework.

D. Governance of global value chains

22. GVCs are characterized by a set of interrelated activities, or business functions, performed by workers in firms across countries and governed by a lead firm, that brings a product from its conception to its final use and beyond. The governance struc-

ture of a GVC consists of the set of relationships that are in place between the firms involved in the GVC. Appendix B presents the mapping of those different relationships between participating firms in GVCs.

23. Different types of firms, which are distinguished between lead firms and suppliers, operate in a GVC.[23] Lead firms in GVCs initiate and coordinate the activities of the value-added chain. That first-mover status gives them "power in the chain" because they tender contracts, place orders and select suppliers. However, lead firms also hold the ultimate financial risk, as they are contractually (or otherwise) obligated to compensate suppliers and service providers for their work. That does not imply, however, that suppliers and affiliates do not also bear some risk, as they may also hold financial risk if they do not meet the terms of the supply contract. In practice, the extent of captivity or control across different supply chains can vary considerably.

[23] The terms "lead firm" and "supplier" used here are as described in the *UNECE Guide to Measuring Global Production*. Note that lead firms may also take the form of an enterprise group. See the glossary for more information.

24. Lead firms often provide the specifications for the production of parts and components that are inputs into the final product. Multiple levels of suppliers may be needed by the lead firm for producing its specific goods or services. The lead firm could work directly with the first-tier supplier, which generally provides design and innovation capabilities. The second-tier supplier is an entity that supplies directly to the first-tier supplier without supplying directly to the lead firm. Raw materials are generally supplied by the end-tier supplier. The lead firms may also impose a host of other transaction-specific requirements on suppliers, including financing, delivery to a particular location and utilization of specific ICT systems and approved vendors. Lead firms are sometimes referred as original equipment manufacturers.[24] The lead firm has the ultimate decision-making authority regarding the operation of the supply chain. It can be a domestically owned or a foreign-owned company. Often it is the globally consolidated parent enterprise in an ownership chain. For national accounting purposes, as well as for measuring production and trade in GVCs, the lead firm is assigned to a national territory or country. The lead firm should be located where the ultimate decision-making authority is resident. The best proxy for that concept[25] is probably the location where the board of directors and chief operating officer conduct their affairs.

[24] See Timothy Sturgeon and others (2016), Frederick and Gereffi (2011).

[25] Leaving aside the issues related to corporate inversions and so on.

25. Lead firms therefore organize and coordinate their production activities and business functions among various suppliers across the world, and they may have different ownership and control relationships with different suppliers, which themselves may have other suppliers with different ownership and control relationships. The concept of business governance as applied to GVCs is in essence looking at the specific relationships between lead firms and their suppliers, of which the latter can be distinguished in affiliated firms and non-affiliated firms. Those concepts need to be bridged into the existing conceptual framework of both the international[26] and national accounts. Annex B provides the relevant concepts and definitions in BPM6 and the 2008 SNA that are used to translate business governance of GVCs into an accounting framework.

[26] BOP and IPP statistics.

26. In the context of the GVC satellite framework, lead firms correspond to the concept of ultimate investor (or ultimate controlling parent), that is the enterprise that has the ultimate control over the enterprises that are in a direct investment relationship. In the BPM6 and the 2008 SNA, lead firms involved in the production of goods or non-financial services are classified in the Non-financial Sector.

27. Moreover, the GVC satellite account approach follows the principles of SNA regarding residency as well. Therefore, the activities of the lead firm are recorded in the country of its residence.

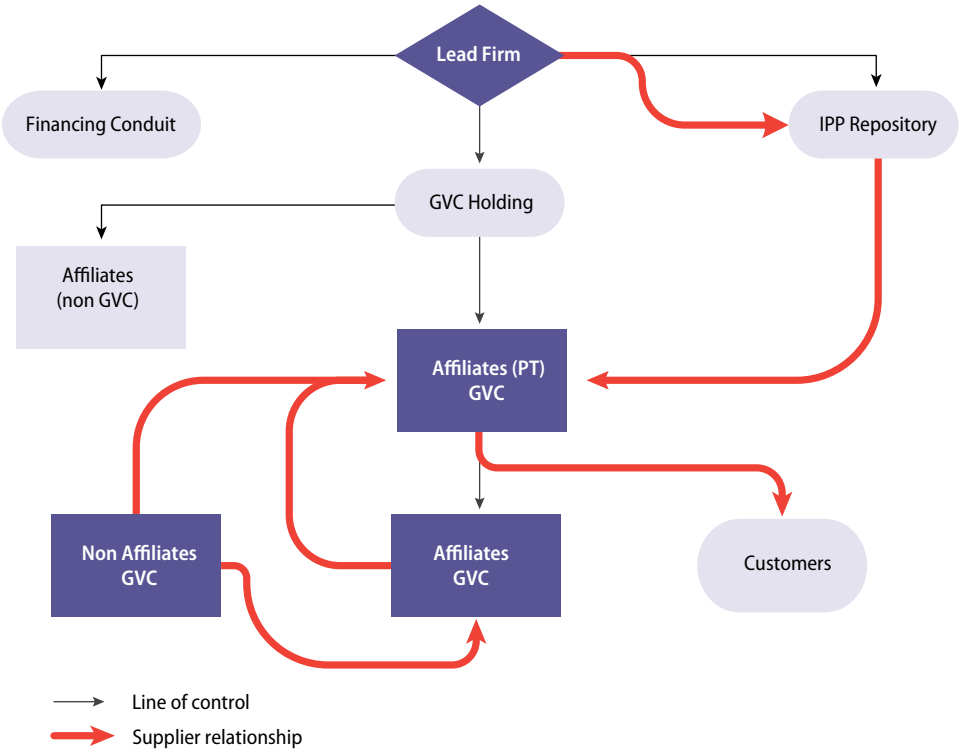
28. In practice, for large enterprise groups, the concept of "lead firm", or otherwise referred to as "global group head", of a specific GVC may need to be further clarified, as it may be that the ultimate investor is an enterprise group spanning several GVCs. Depending on the decision-making model within that corporate group, the strategic

planning as regards the business lines that define a given GVC may be done at the corporate headquarters or may be done at the lower level in the corporate structure, such as that of a product division (see part III for further details). Any specialized firms that are controlled by the lead firm and provide financial services to the enterprise group are also in scope for the industry-specific GVC accounts.

29. Supplier firms provide products, such as raw materials, intermediate products or other partially assembled components to the supply chain. A distinction is made between affiliated firms and non-affiliated firms depending on their relationship with the lead firm. Affiliated firms correspond to enterprises that are in a foreign direct investment relationship with the lead firm; that is, they are under the control or influence of the direct investor or the ultimate controlling parent. Non-affiliated supplier firms are those firms that provide intermediate products to the supply chain in line with the specification of the lead firm but are not related to the lead firm; that is, they are neither under control nor influence of the lead firm.

30. Figure 2.1 provides an example of an ownership and supplier structure that a lead firm may adopt with its suppliers. The GVC extends to the lead firm and several affiliated supplier firms that each, in turn, may have several affiliate enterprises that contribute to the value chain, as well as unaffiliated firms providing dedicated inputs to the GVC. In order to simplify the example, each of the boxes represents multiple firms contributing to the GVC. The specific functions in the supply chain are allocated between the contributing firms. In this example there are affiliate firms (denoted as "Affiliate supplier (PT)") engaged in producing the final product. These affiliates themselves own and control further affiliates ("Affiliates") and they may channel profits from their affiliates to the lead firm (Pass through investment, "PT"). Furthermore, non-affiliated firms provide inputs into the GVC. The lead firm is also assumed to be the ultimate controlling parent.

Figure 2.1
Schematic of a GVC governance structure



31. The product in the example in figure 2.1 has a high R&D content. The R&D function itself takes place at the lead firm. IPP assets deriving from the R&D function have been deposited in an IPP repository or licensing enterprise that licenses the use of IPP assets to the affiliated firms in the GVC. The licensing firm therefore receives licence fees from the subsidiaries, which it may accumulate as retained earnings or payout as dividends to the lead firm. Typically, the country in which the licensing corporation has been incorporated offers a lower tax burden than either the country of incorporation of the subsidiaries or the country of residence of the lead firm.

32. The lead firm has in addition channelled its investment into the affiliated firms through a fully owned intermediate holding corporation in another low-tax domicile. That holding corporation (GVC holding) has a direct or indirect controlling interest in the affiliates participating in the GVC and in legal terms separates lead firm from the affiliates.

33. The GVC supply relationships are illustrated in figure 2.1 by the red arrows. The lead firm provides R&D through the licensing firm to its top-level affiliates. Non-affiliates provide inputs through affiliates, while affiliates provide inputs to the affiliate that assembles and markets the product to customers. Corporate control/ownership relationships are indicated by the black lines.

34. Financial relationships will probably exist between any of these enterprises. It is important to clearly distinguish different financial functions that exist within the GVC and within the MNE structure. Each of those financial functions will have implications for the shape of the balance sheet of the entities concerned. To distinguish between the production or business line considerations of a GVC and the concepts required for analysing the financing and tax considerations of the GVC, such specialized financial entities are taken into account.

35. In this simplified example, several complications occur that may affect an NSOs' ability to represent the capital and financial transactions and balance sheets for a specific GVC if the lead firm controls several GVCs through its MNE structure. In that case, detailed profiling of the lead firm by each business line that makes up a GVC will be required.

36. In the example, two mechanisms are introduced by which the MNE may determine its taxes and financial considerations for the firm. Those functions may be fulfilled by regular affiliate corporations or by so-called special-purpose entities.

37. The first, most generic, function is that of a holding corporation. Typically, such holdings would not introduce a separate management layer, but instead would be passive holdings fully managed by the parent company. Such holdings would likely be located in low-tax economic territories, such that dividends and reinvested earnings of subsidiaries would accrue there.

38. The second function is that of a licensing firm, where the IPP assets have been lodged. The example assumes that this function involves direct licensing to the affiliates (PT). Licence revenues are taxed in the economic territory where the licence firm is registered and subsequently provided to the lead firm.

39. GVCs are characterized by the fact that the business functions are carried out in different parts of the world. Countries participate in the GVC by leveraging their competitive advantage: usually developing countries offer low labour costs and raw materials, while wealthier nations with more advanced education systems typically control R&D, design and marketing.

40. The residence of an economic entity (or an institutional unit) is attributed to the economic territory with which it has the strongest connection, in other words its cen-

tre of predominant economic interest. Each institutional unit is a resident of one and only one economic territory. In the case of a multi-territory enterprise, it is preferable that separate institutional units be identified for each economy.

41. Because the main feature of the GVC is to record the interrelated activity by economic territory, the concept of residency of the firms engaged in the GVC should be included in the satellite account. That inclusion adds a significant amount of complexity to the GVC satellite account, as the compiler needs to identify the economic territory of all the non-resident firms. However, in practice, it may suffice to clearly distinguish the residency of GVC-related firms in those territories for which there is a high "interconnectedness" in the GVC.

E. Classifications of global value chains

42. For the purpose of compiling GVC-specific satellite accounts, various classifications are applied to extend the traditional SUT and institutional sector accounts. Those include the classifications related to business functions, GVC participating firms, products and institutional sectors. Each will be presented in turn.

1. Classification of business functions

43. GVCs are characterized by a business line that represents a sequence of business production processes or business functions that bring a product from its conception to its final consumers. In order to map the governance of the firms participating in the GVC in terms of their business functions, it is important to understand the international production arrangements that are set up to generate and optimize the value for the lead firm by distributing income across the various economic territories where it operates. The business functions undertaken in a particular country in the GVC allows for the identification of, for example, opportunities for functional upgrading, which can be realized by gaining competitiveness in higher value-added functions through skill, capital and process upgrading.

44. Figure 2.2 presents the typical "smile curve" of GVCs, illustrating how business functions are generally located along the generation of value-added in a GVC. This smile curve reflects the higher share of value-added generated by upstream and downstream business functions as compared with the core production functions of GVCs .

45. The classification presented here is based on the latest surveys on the international sourcing of business functions conducted by Eurostat,[27] which are very similar to surveys conducted by other countries.[28] Work is currently under development at the international level to further refine this classification, based on country experiences of conducting surveys on business functions.

46. Business functions are the activities controlled by the lead firm; they can be divided into core functions and support functions and are undertaken by the lead, affiliate and non-affiliate firms in the GVC. Core business functions are activities of an enterprise in the GVC that yields income: the production of final goods or services intended for the market or for third parties. Usually the core business functions make up the primary activity of the enterprise, but they may also include other (secondary) activities if the enterprise considers them as part of its core functions.

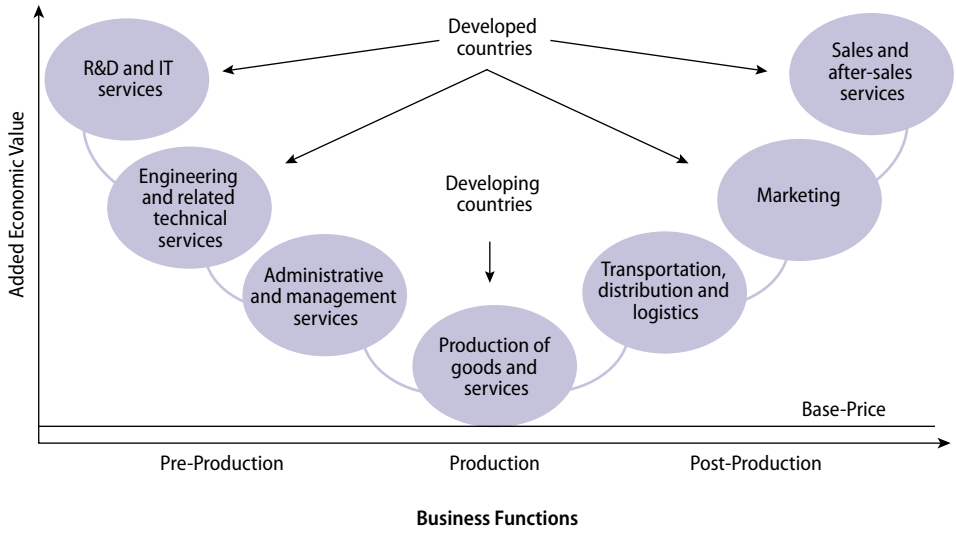
47. Support business functions are ancillary supporting activities carried out by the enterprise in order to permit or to facilitate the core business functions of the GVC, i.e., its production activity. The outputs (results) of support business functions are not themselves intended directly for the market or for third parties. Support business functions can be further subdivided into:[29]

[27] See Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Business_functions and http://ec.europa.eu/eurostat/cache/metadata/en/iss_esms.htm.

[28] For more information, see box 3.1 in part III.

[29] See Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Business_functions and http://ec.europa.eu/eurostat/cache/metadata/en/iss_esms.htm. The authors note that Eurostat was in the process of revising its proposed business function classification list for use in business function surveys at the time of this writing.

Figure 2.2
The smile curve of business functions of global value chains



Source: Adapted from Global Value Chain Analysis: A Primer 2nd Edition (Gereffi and Fernandez-Stark, 2016)

- Transportation, distribution and logistics services: transportation activities, warehousing and order processing
- Marketing, sales and after-sales services: market research, advertising, direct marketing services (telemarketing), exhibitions, fairs and other marketing or sales services; also included are call-centre services and after-sales services such as help desks and other customer-support services
- Information and communication technology (ICT) services: information technology (IT) services and telecommunication (IT services including hardware and software consultancy, customized software data processing and database services, maintenance and repair, web hosting, as well as other computer-related and information services, but excluding packaged software and hardware)
- Administrative and management services: legal services, accounting, bookkeeping and auditing, business management and consultancy, human resources management (e.g., training and education, staff recruitment, provision of temporary personnel and payroll management, as well as health and medical services), corporate financial and insurance services; also included are procurement functions
- Engineering and related technical services: engineering and related technical consultancy, technical testing, analysis and certification; also included are design services
- R&D services: research and experimental development services

48. In order to construct satellite accounts for GVCs, business functions need to be mapped to the reference classification of products and economic activities. While the mapping of the support business functions may not change when looking at different industry-specific GVCs (see Appendix A for the mapping of support business functions to CPC v2.1), the mapping of the core business function depends on the GVC under consideration. For example, in the automotive GVC, the core business function is the manufacture of motor vehicles. In the GVC for textiles, the core function is the production of apparel. Table 2.1 presents an example of mapping business functions for the automotive GVC to ISIC.

2. Classification of global value chain participating firms

49. The classification of participating firms according to their role within the GVCs is used to determine the firms in scope of the GVC satellite account for a specific GVC industry, namely:

- Lead firm
- Affiliated supplier
  - Controlled [subsidiary (controlled)]
  - Non-controlled [associates (influenced)]
- Non-affiliated supplier

50. The lead firm is the firm that "controls" the chain – and is generally located where the board of directors conducts their business. While there are two types of affiliated suppliers (controlled and non-controlled), for practical purposes, an affiliated supplier will be considered any firm that is controlled (as per foreign direct investment control measures) by the lead firm being the ultimate controlling parent. Likewise, a non-

Table 2.1
Mapping of business functions of the automotive GVC to ISIC Rev. 4

Core business function* *may include secondary activities if the enterprise considers these as part of its core functions	ISIC Rev.4 code
Production of automobiles	e.g., ISIC 291- Manufacture of motor vehicles for an automotive GVC
Supporting business function	**ISIC Rev.4 code**
Transportation, distribution and logistics services: transportation activities, warehousing and order processing.	ISIC H - Transportation and storage ISIC 49 - Land transport and transport via pipelines ISIC 50 - Water transport ISIC 51 - Air transport ISIC 52 - Warehousing and support activities for transportation ISIC 53 - Postal and courier activities
Marketing, sales and after-sales services: market research, advertising, direct marketing services (telemarketing), exhibitions, fairs and other marketing or sales services; also included are call-centre services and after-sales services such as help desks and other customer support services.	ISIC 73 - Advertising and market research
ICT services: information technology (IT) services and telecommunication (IT services including hardware and software consultancy, customized software data processing and database services, maintenance and repair, web hosting, as well as other computer-related and information services, but excluding packaged software and hardware).	ISIC 62 - Computer programming, consultancy and related activities ISIC 63 - Information service activities
Administrative and management services: legal services, accounting, bookkeeping and auditing, business management and consultancy, human resources management (e.g., training and education, staff recruitment, provision of temporary personnel, payroll management as well as health and medical services), corporate financial and insurance services; also included are procurement functions.	ISIC 70 - Activities of head offices; management consultancy activities ISIC 69 - Legal and accounting activities
Engineering and related technical services: engineering and related technical consultancy, technical testing, analysis and certification; also included are design services.	ISIC 71 - Architectural and engineering activities; technical testing and analysis
R&D services: research and experimental development services.	ISIC 72 - Scientific research and development

affiliated supplier will be considered any firm that supplies goods or services to the GVC over which the lead firm has influence but does not hold a controlling interest in the supplying firm.

51. Table 2.2 summarizes the different categories of firms in the value chain in terms of BOP/IIP and foreign direct investment and national accounts (see also fig. 2.1 for further details). A further subsectorization of the institutional sectors of the national accounts is indicated in table 2.2, which would explicitly identify the specific firms in the GVC.

52. Based on the classification of participating firms, a "statistical business frame" of firms by GVC industry along with their role and their economic territory can be determined. For any specific GVC industry in an economic territory, the firms in scope would represent the sum of the activities of the lead firms, affiliated supplying firms and non-affiliated supplying firms operating in the economic territory. That GVC frame will be the basis on which firm characteristics and activities will be gathered.[30] As such, the concept of a GVC frame establishes the link between the macroaggregates and the micro-firm level information. Building the GVC satellite account from the bottom (micro) up has many benefits in terms of both quality and analytical usefulness.

53. If access to firm-level microdata is limited, the GVC frame can then be constructed using GVC/industry-level ratios or shares. The GVC/industry-level ratios

[30] While this may seem a significant task, it is expected that a specific GVC industry will be represented by a small number of large firms. In addition, the expectation is that only those firms directly supplying inputs to the GVC are identified.

Table 2.2
GVC Categories of firms

GVC concept	BOP/IIP and foreign direct investment	National accounts
Lead Firm	Ultimate controlling parent Classified in S11 when it concerns corporate groups	Ultimate controlling parent Classified in S11 (head office) when it concerns corporate groups S.11UP
Affiliated supplier Affiliated firms are defined on the basis of control that the lead firm has directly or indirectly over the affiliated firm. This control derives from direct or indirect ownership and management control and is similar to the concept used in foreign direct investment.	Direct investment Enterprise Subsidiary (controls more than 50 per cent of share votes)	Foreign-controlled non-financial corporation S.11FC
Non-affiliated supplier Non-affiliated firms are defined as being closely (if not uniquely) devoted to the production of goods and services needed in the GVC. They are not owned nor controlled directly or indirectly by the lead firm. In order to identify non-affiliated firms a criterion is needed to define the close relationship to the production in a GVC, such as the share of output provided to a single GVC.	Direct Investment Enterprise Associate (influences more than 10 but less than 50 per cent of share votes)	Foreign associate non-financial corporation S.11FA
	Other enterprises No influence less than 10 per cent of share vote. Unrelated firms are enterprises that fall outside any foreign direct investment relationship, either as investor or as investment enterprise.	Nationally-controlled non-financial corporation S.11NA
Dedicated financial institution	Foreign-controlled captive financial institution These are direct investment enterprises that are foreign controlled, e.g., subsidiaries.	Foreign-controlled captive financial institution S.127FC

Box 2.2
Classification of participating firms for an Automotive GVC in North America

If a statistical business register and supporting microdata sets are available, the method for compiling the data for a GVC within a given economic territory of a multi-country GVC framework involves going back to the firm-level data and reclassifying the firm's activities using the GVC classifications.

To illustrate this approach, assume that it is determined that there are five GVCs operating in Country A (one for each of Ford, General Motors, Honda, Hyundai and Toyota) and there is a single enterprise operating in Country A associated with each GVC. For each of these enterprises, it is possible to update its traditional classification (industry and sector) with GVC-specific classifications, such as business function, governance and residency. In doing so, their output, value-added, exports, imports and other macroeconomic accounting variables also get classified to these new GVC categories. In cases where access to microdata is limited, this step involves extracting this information from each industry through the use of models, ratios and assumptions.

GVC (Classification)	GVC (Honda) participating enterprise 1	GVC (Ford) participating enterprise 2	GVC (General Motors) participating enterprise 3	GVC (Hyundai) participating enterprise 4	GVC (Toyota) participating enterprise 5
Governance	Lead	Affiliated supplier – controlled	Affiliated supplier – not controlled	Non-affiliated supplier	Lead
Business function	Management	Research and development	Assembly	Production of automotive goods	Management
Industry	Head office	R&D	Motor vehicle manufacturing	Motor vehicle parts manufacturing	Head office
Product	Management services	R&D services	Automobiles	Component parts	Management services
Trade Characteristic	Exporter	Exporter	Exporter	Non-exporter	Exporter
Residency	Country A	Country A	Country A	Country B	Country B

indicate the share of an industry's inputs supplied by upstream and downstream GVC suppliers or the share of an industry's output that relates to the GVC (as a subsequent input into another production process or as a final consumption good). Those ratios can be established through various means. They can be based on prior research and industry knowledge or publicly available information related to dominant firms. Upper- and lower-bound assumptions might be established. The quality of these GVC assumptions or models will determine the quality of the final estimates.

54. In the identification of the firms participating in a GVC, the profiling of MNEs and global enterprise groups is of particular importance. Moreover, LCUs are increasingly being established in NSOs that not only profile the GVC networks operating in the national territory, but also to coordinate the data collection and compilation along similar lines as recommended in the Guidelines. Box 2.3 presents more information on LCUs.

Box 2.3
Large cases units for GVC enterprise groups

An LCU is established nationally to ensure the consistency of the economic data in relation to a small number of the largest MNEs or MNE groups. The main purpose of such a unit is to improve the quality, consistency and coherency of the data, but there can also be other beneficial impacts, such as better use of resources and reducing the statistical reporting burden on MNE groups. That is a critical step towards assuring the overall quality of the macroeconomic aggregates and business statistics produced by a country and ultimately a region.

LCUs already exist in a number of NSOs and many more are being created in countries across the European Union and in Canada. While the positioning of the LCU in an organizational structure differs across NSOs, often LCUs are located in either the Business Statistics Directorate, Business Register Unit, or in the National Accounts Directorate. They represent an answer by national statistical institutes (NSIs) to the many challenges posed by economic globalization and the cross-border fragmentation of production and services activities associated with bringing many products from conception to market of final product and beyond (e.g., after-sale services, disposal and recycling). As such, they are the ideal sources for building an understanding of GVCs that are operating in an economy, including their cross-relationships with partner countries in the value chain.

The key feature of LCUs is that the unit is engaged in an ongoing consistency assessment across all statistical data, from either survey or administrative sources, and within and between the statistical domains, that relate to a particular MNE or MNE Group in different GVC industries. Each client is treated on a case-by-case basis.

The operations of LCUs can vary from one NSI to another mainly due to institutional arrangements e.g., the balance of payments is compiled in the national central bank or the statistical system is decentralized by province or where different institutions are responsible for particular statistical domains or products. Consequently, in a country with a highly centralized statistical system, the role of the LCU can extend to data collection and compilation of accounts and business statistics for lead, affiliate and non-affiliate enterprises in a GVC, in addition to assuring the consistency of the data.

Typically, an LCU will be reviewing practically all the economic and employment data that relate to these selected firms and, in some cases, collecting and compiling the data as well. The LCU also reviews key administrative sources for these selected GVC-related enterprises such as:

- Exports and imports of goods
- Corporate profits and taxation
- Employee/employment insurance data
- Assets and liabilities

Where the data is collected by the LCU, the opportunity to consolidate and rationalize the data-collection strategy across various statistical domains (e.g., STS, structural business statistics, foreign direct investment, outward foreign affiliates statistics) presents itself. For example, single monthly, quarterly and annual LCU/MNE enquiries can be issued, which reduces duplication and response burden.

Another aspect of LCU operations is the need for more developed client relationships that entail ongoing contact and regular face-to-face meetings, complemented by ad hoc and informal contact. For example, an LCU could aim to meet every client company at least once every two years and in some cases more frequently. Ongoing contact ensures that the LCU is fully informed regarding corporate events, such as restructurings, large transactions mergers and so on.

Box 2.3 (*continued*)
Large cases units for GVC enterprise groups

It is also important to have the right selection of MNE groups to be managed by the LCU. Selection criteria could include not only the size of the MNE group, but also complex ownership structures, opaque organizational structures, number of countries across which it operates, transmission of inconsistent data, rearrangements and relocations, involvement in global production arrangements, ownership of IPP and so on.

When it comes to understanding the operations of the principal national players in GVCs, the LCU is well-positioned to deliver all the product and activity data together with providing an understanding of the structural and cross-border relationships. The profiling of the entities by the LCU, together with the source data, provides a comprehensive national picture of the contribution made nationally by a particular MNE that is a member of a GVC.

The LCU data set can also provide information on business functions relationships between national affiliates in a GVC. Furthermore, the LCU microdata linking for the selected companies across merchandise and services trade data, product production, business register, structural and short-term business statistics provides detailed insight in contract manufacturing operations. In addition, the flow of intermediate and final products in trade in goods and services and production processes can also be identified and used for the compilation of GVC-related macroeconomic accounts and business statistics.

A feature of those GVCs is that they engage in many activities, such as merchanting, contract manufacturing and the related factoryless goods manufacturing. Those activities are difficult to identify and measure for many compilers, and it is only when all the various statistical and administrative data related to a particular entity or MNE group are subject to consistency checking that questions emerge that ultimately lead to further examination and identification of the source of the inconsistencies. In that way the quality of a significant portion of the overall macroeconomic accounts and business statistics can be assured.

And finally, in order to get a a full picture of the activities of an MNE group, an LCU may need to engage in date sharing with LCUs in other NSOs, taking into considerations the necessary legal and administrative issues surrounding confidential data. See part III of these guidelines for further discussion of international data-sharing initiatives.

3. Classification of global value chain products by global value chain industry

55. For any industry-specific GVC, in addition to identifying and mapping the participating enterprises in the global enterprise groups and the associated non-affiliated enterprises and their economic activities to ISIC, it is important to identify the relevant intermediate and final products. All those constituent elements are then mapped to the standard classification of products, namely the Harmonized System (HS) for internationally traded products and the Central Product Classification, CPC Ver. 2.1 for the classification in the SUT framework. The product mappings are based on standardized list of product codes and descriptions for industry-specific GVCs. Therefore, the product mapping for the GVC for automotive has different HS and CPC product lists than the product mapping for the GVC for textiles or electronics.

56. Appendix C illustrates the product mapping for a GVC for "passenger vehicles"; Appendix D illustrates the product mapping for a textile and apparel GVC; Appendix E illustrates the product mapping for an electronics GVCs; and Appendix F illustrates the product mapping for a medical devices GVC. The product mapping identifies all the goods-related products (from conception to end-use support) that represent the core

production activity of the final product. The services related to the business support functions required to bring a final product to market (such as transportation services, research and design, and marketing services) are mapped and presented in annex A.

57. In general, the scope of the GVC must be determined. The scope of the GVC refers to the mapping of participating firms in the supply chain of the GVC. Does the chain include only direct suppliers or suppliers of specialized intermediate goods in the core production activity of the GVC? For example, assume a GVC for automobiles is being developed. It is clear that an automotive parts manufacturer that provides parts to an assembler would be part of the GVC. But what about the steel manufacturer that supplies steel to the components manufacturer? Should they be included in the GVC? The decision about the GVC reach will vary from satellite account to satellite account and will depend on analytical usefulness and availability of data. Once a decision on the scope of the GVC is taken, preferably in consultation with the compilers in partner countries, the scope of the enterprises included in the multi-partner country GVC satellite should be transparently communicated to the users of the accounts.

4. Classification of global value chain institutional sectors

58. The institutional sector classification of the 2008 SNA (and the BOP/IPP) distinguishes the following sectors:

- Non-financial corporations
- Financial corporations
- General Government
- Households
- Non-profit institutions serving households

59. The extension to the institutional sector framework is largely made to accommodate concepts from foreign direct investment. The first extension is the distinction between foreign-controlled and nationally-controlled corporations, which is applied to both non-financial corporations and financial corporations. The foreign-controlled corporations are by definition part of a foreign direct investment relationship and, in that context, need to be seen as subsidiaries.

60. As regards nationally-controlled non-financial corporations, further distinctions are applied. The first subcategory in the breakdown covers all non-financial corporations that are not foreign controlled, but are foreign influenced, that is, associate companies in the foreign direct investment relationship. The second subcategory is encompassing direct investors that are themselves not direct investment enterprises. These corporations are labelled as ultimate controlling parent (UCP). The third subcategory reflects nationally-controlled corporations that are not in any foreign direct investment relationship, the residual subsector of non-financial corporations, and is labelled other nationally-controlled non-financial corporations.

61. As regards the financial corporate sector, the distinction between foreign control and national control is less relevant for the development of the extended framework, as we would only want to identify those financial corporations that fulfil a specialized financial function only in the context of the GVC. That would exclude all categories of financial corporations except the category captive financial institutions. This category encompasses such entities such as passive holdings and conduits.

62. The additional sector detail would support the lead firm and affiliates distinction and has the benefit of providing a clear and direct correspondence with foreign direct investment concepts.

63. Unaffiliated firms are not controlled by an enterprise related to the lead firm. Their link to the affiliated firms and/or the ultimate controlling parent would be

through their practically exclusive supplier relationship with a given value chain and their provision of goods and services to the exact specification of the lead firm. As the level of the GVC-specific institutional classification, such a distinction is hard to implement, and would be subject to frequent revisions, as trading and manufacturing relationships within GVCs would change. Notably, those types of relationships are difficult to implement in the general business register. The non-affiliated firms would be classified either as associates, when affiliates may have a minority stake in the unaffiliated entities of more than 10 per cent but less than 50 per cent or would be part of the other nationally-controlled non-financial corporation sector.

64. In the context of the development of a GVC, specific capital and financial account satellite, those two sectors would contain only the identified non-affiliated firms, hence it is not considered necessary to provide an additional sector concept for non-affiliates there.

Table 2.3
GVC-specific institutional sector classification

Code	Description
S11	Non-financial corporations
S11(FC)	Foreign-controlled non-financial corporations ("foreign subsidiaries")
S11(NC)	Nationally-controlled non-financial corporations
S11(NC.FI)	Foreign-influenced non-financial corporations ("foreign associates")
S11(NC.UI)	Ultimate controlling parent/ultimate investor
S11(NC.ONF)	Other non-financial corporations
S12	Financial corporations
S12(FC)	Foreign-controlled financial corporations
S12(NC)	Nationally-controlled financial corporations
S127(FC)	Foreign-controlled captive financial institutions
S127(NC)	Nationally-controlled captive financial corporations
S13	General government
S14	Households
S15	Non-profit institutions serving households

5. Classification of global value chain functional breakdown

65. The GVC functional classification encompasses and enhances the standard BOP/IIP functional classification. Specifically, in order to support the relationships between affiliated and non-affiliated firms as required for more direct support of GVC analysis, a separate category distinct from foreign direct investment needs to be introduced. This category is labelled "other intercompany financing" and encompasses the same instrument mix as foreign direct investment, although it is expected that the predominant categories are found in loans (F4) and accounts payable and receivable (F8). It would also include minority interest of less than 10 per cent of shareholder voting rights. The GVC functional classification is fully consistent with the detailed direct investment relations provided in the standard BOP/IIP of the compiling and partner countries included in the GVC satellite.

Table 2.4
GVC-specific functional classification

Item	Description
Direct investment	Foreign direct investment is a category of investment associated with a resident in one economy having control or a significant degree of influence on the management of another enterprise in another economy. As well as the equity that gives rise to control or influence, direct investment includes financial investment between indirectly controlled enterprises, including so-called fellow enterprises, may include regards debt and may involve reverse investment. A direct investment enterprise is assumed to be controlled when 50 per cent of its equity is held by its parent (subsidiary) and is assumed to be under influence (associate) when the investor holds between 10 per cent and 50 per cent of the equity.
Pass-through funds	"Pass-through funds" or "funds in transit" are funds that pass through an enterprise resident in an economy to an affiliate in another economy, so that the funds do not stay in the economy of that enterprise. Those funds are often associated with direct investment. Such flows have little impact on the economy they pass through. Special purpose entities, holding companies, and financial institutions that serve other non-financial affiliates are particularly associated with funds in transit, but other enterprises may also have pass-through funds in direct investment flows.
Other direct investment	
Other intercompany financing	
Non-intercompany financing	Encompasses other investment, portfolio investment, reserves and derivatives.
Other investment (less OIF)	BPM6: 6.61 Other investment "less OIF" is a residual category that includes positions and transactions other than those included in direct investment, other intercompany financing, portfolio investment, financial derivatives and employee stock options, and reserve assets. To the extent that the following classes of financial assets and liabilities are not included under direct investment, other intercompany financing or reserve assets, other investment includes: a) other equity; b) currency and deposits; c) loans (including use of IMF credit and loans from the IMF); d) non-life insurance technical reserves, life insurance and annuities entitlements, pension entitlements, and provisions for calls under standardized guarantees; e) trade credit and advances; f) other accounts receivable/payable; and g) Special drawing right allocations (special drawing right holdings are included in reserve assets).
Portfolio investment (less OIF)	BPM6: 6.54 Portfolio investment is defined as cross-border transactions and positions involving debt or equity securities, other than those included in direct investment, other intercompany financing or reserve assets.
Derivatives	BPM6: 6.58 The definition of the functional category financial derivatives and employee stock options (other than reserves) largely coincides with the corresponding financial instrument class. The difference in coverage between the functional category and the financial instrument is that financial derivatives associated with reserve asset management are excluded from the functional category and are included in reserve assets. That category is identified separately from the other categories because it relates to risk transfer, rather than supply of funds or other resources.
Reserves	BPM6: 6.64 Reserve assets are those external assets that are readily available to and controlled by monetary authorities for meeting balance-of-payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes (such as maintaining confidence in the currency and the economy and serving as a basis for foreign borrowing).

F. Global value chain-specific supply-use tables

66. Once the mapping of relevant products and business functions is developed, the information can be integrated into national and multi-country SUTs, following the same principles as those that underpin the development of ESUTS and their integration into multi-country SUTs and IOs (for more detail, see annexes A and B of part V). In doing so, they provide an ability to zoom in on the industry focus of the GVC satellite accounts.

1. Global value chain-specific national supply-use tables

67. The integration of information starts from the compilation of national SUTs with a common breakdown of industries and products. The breakdown at industry level explicitly identifies the relevant ISIC divisions/groups for the GVC (see the mapping of business functions in the previous section). Similarly, the breakdown at the product level explicitly identifies the GVC-relevant products. In the case, for example, of the automotive GVC, the industry breakdown will explicitly identify the following activities:

- ISIC 291 – manufacture of motor vehicles
- ISIC 49-53 – referring to distribution and logistics
- ISIC 62-63 – referring to information and communication technology (ICT) services
- ISIC 69-70 – referring to administrative and management functions
- ISIC 71 – referring to engineering and related technical services
- ISIC 72 – referring to R&D
- ISIC 73 – referring to marketing, sales and after-sales services
- ISIC XXX – referring to ISIC classes for all the intermediate products in the scope of the GVC

68. As is further described in part III, a global enterprise can organize its core production activities (production of goods and services to be sold in the market) in a number of different business lines. Such an enterprise could be a lead firm for various GVCs in different specific industries. Therefore, business, trade and investment data for a GVC satellite account would need to be collected from the business line of a global enterprise to allow for the correct data specification of the industry-specific GVCs controlled by the lead firm. The enterprise or enterprise group would be able to delineate the statistical units in each of its business lines and further by each business function.

69. As stated earlier, the activities of the lead firm are recorded in the country of its residence. In addition, in order to reflect the governance structure in the SUTs, there should be a further breakdown for each of the ISIC categories that corresponds with the business functions of a GVC undertaken in the economic territory to reflect whether the firm is foreign controlled or nationally controlled and if the firm is part of the GVC or not. Therefore, for each of the GVC-relevant ISIC categories the following breakdown is applied:

ISIC			
Foreign controlled		Nationally controlled	
GVC-related	Non GVC-related	GVC-related	Non GVC-related

70. In a similar way, the list of standardized products explicitly identified in the SUTs reflects the GVC-related products that include the final product of the GVC and the intermediate goods and services that are used to produce the final product. Table 2.5

Table 2.5
GVC specific SUTs by business functions and standardized products

Supply Table at basic prices

			Industries											Imports				
			ISIC 1	…	ISIC 291 Manu-facture of motor vehicles	ISIC 49-53 Distribu-tion and logistics	ISIC 73 Marketing, sales and after-sales services	ISIC 62-63 ICT services	ISIC 69-70 Administra-tion and manage-ment functions	ISIC 71 Engi-neering and related techni-cal	ISIC 72 Research and devel-opment	…	Output	Total	from Country B	from Country C	from RoW	Total supply at basic prices
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
PRODUCTS	…	(1)																
	…	(2)																
	CPC 837 Market research, etc.	(3)																
	…	(4)																
	CPC 4911 Motor vehicles	(5)																
	…	(6)																
	…	(7)																
	…	(8)																
	Total	(9)																
Adjust-ments		(10)																
	Direct purchases abroad by residents	(11)																
	Total	(12)																

Industries			
ISIC 49-53 Distribution and logistics			
Foreign-controlled		Domestic-controlled	
GVC-related	Non GVC-related	GVC-related	Non GVC-related

Table 2.5
GVC specific SUTs by business functions and standardized products (*continued*)

Use Table at basic prices

			Industries										FINAL USE							
			ISIC 1	…	ISIC 291 Manufacture of motor vehicles	ISIC 49-53 Distribution and logistics	ISIC 73 Marketing, sales and after-sales services	ISIC 62-63 ICT services	ISIC 69-70 Administration and management functions	ISIC 71 Engineering and related technical	ISIC 72 Research and development	…	Output	Final consumption expenditure	Gross capital formation	Exports				Total	Total use
																Total	to country B	to country C	to RoW		
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
PRODUCTS	…	(1)																			
	…	(2)																			
	CPC 837 Market research, etc.	(3)																			
	…	(4)																			
	CPC 4911 Motor vehicles	(5)																			
	…	(6)																			
	…	(7)																			
	…	(8)																			
	Total	(9)																			
Adjustments		(10)																			
	Direct purchases abroad by residents	(11)																			
	Total	(12)																			

Table 2.5
GVC specific SUTs by business functions and standardized products (*continued*)

			Industries										FINAL USE							
			ISIC 1	…	ISIC 291 Manufacture of motor vehicles	ISIC 49-53 Distribution and logistics	ISIC 73 Marketing, sales and after-sales services	ISIC 62-63 ICT services	ISIC 69-70 Administration and management functions	ISIC 71 Engineering and related technical	ISIC 72 Research and development	…	Output	Final consumption expenditure	Gross capital formation	Exports				Total	Total use
																Total	to country B	to country C	to RoW		
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
GVA	Compensation of employees	(13)																			
	Other taxes less subsidies on production	(14)																			
	Consumption of fixed capital	(15)																			
	Net operating surplus/ net mixed income	(16)																			
	Gross operating surplus/ gross mixed income	(17)																			
	GVA	(18)																			
	Total input at basic prices	(19)																			

Table 2.5
GVC-specific SUTs by business functions and standardized products (*continued*)

		Industries										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Gross capital formation by asset type	(1)											
Capital stock by asset type	(2)											
Labour by relevant breakdown	(3)											
TEC indicators	(4)											
number of enterprises	(5)											
size enterprise by size class	(6)											

illustrates the outcome of that integration, where the business functions are explicitly identified in the corresponding ISIC breakdowns. Only for those industries, a further breakdown by foreign- and nationally controlled and by GVC-related and non-GVC-related enterprises, as shown above, is applied across all business functions.

2. Multi-country global value chain-specific supply-use tables

71. In the multi-country SUTs, the trade of products between the GVC-partner countries must be explicitly shown and reconciled. In the case, for example, that there are three partner countries in a GVC, the integration of GVC information starts with the compilation in each country of a SUT with a breakdown of industries and products as presented in table 2.5. Once the national SUTs are compiled in each of the GVC partner countries, they are integrated into a multi-partner country SUTs, as presented in table 2.6. As stated earlier, the activities of the lead firm are recorded in the country of its residence.

72. Table 2.6 presents the format of the of multi-country SUTs in the case of three partner countries. The table shows the detailed bilateral trade between the three countries and the trade with other countries appear as trade to and from the rest of the world. By combining the national SUTs into a common multi-country GVC framework, the interrelationships in the production arrangements of the production cycle from conception to final products and in international trade of goods and services from the offshoring of core and supporting functions become apparent. Also, the control structure between participation firms for the coordination of the production processes is made explicit. In addition, the framework shows how imported products from one of the countries are used in the other countries (as intermediate inputs, final consumption or re-exports) from which the benchmarks of foreign and domestic value-added in international trade can be determined.

73. There are a number of empirical challenges in the compilation of multi-country SUTs, such as the reconciliation of trade asymmetries, the estimation of the direct purchase abroad by resident units, the estimation of import flow matrices and distribution margins, merchanting, factoryless good producers and so on. Those issues are described in more detail in annexes C and D of part V. Box 2.4 presents a simplified list of steps for compiling a GVC-specific SUT.

G. Global value chain-specific institutional sector accounts

74. The GVC satellite accounts also link the GVC-specific characteristics of the SUTs to institutional sector accounts consistent with the sequence of national accounts (e.g., production, generation of income, etc.) with an additional breakdown of the institutional sectors that make the governance structure of the GVC explicit:

- Institutional subsectoring to delineate the GVC business governance
- BOP/IIP functional classification to describe the direct investment relationship and other GVC specific financing functions in the structure of financial assets and liabilities

75. Those extensions and the format of the accounts are described below.

Box 2.4

Simplified list of steps for compiling a global value chain-specific supply-use table

1. Choose a GVC of interest, based on economic size/importance and/or policy needs.
2. Define the geographic boundary of the GVC. Ideally, a GVC satellite account would capture detailed information from each economic territory involved in the GVC. However, in practice, a more practical approach for the compilation of a GVC satellite account relies instead on the identification of the main relevant partner countries in the GVC and availability of data. This approach also implies establishing a threshold of inter-country trade flows, such as the combined inter-country trade between selected countries making up at least 50 per cent of the intermediate inputs into the GVC. While the trade flows within the selected countries would be explicitly identified, the trade flows between them and other countries might be collapsed as trade with the rest of the world.
3. Identify the firms involved in the production of the final product of the GVC and producers and suppliers of intermediate goods and services that are used to produce the final product, based on production data from business surveys, national SUT data, customs registers and trade data.
4. Decide on the scope of the GVC, preferably in consultation with the compilers in partner countries. Does the chain include only direct suppliers or suppliers of specialized intermediate goods in the core production activity of the GVC? The decision about the GVC reach will vary from satellite account to satellite account and will depend on analytical usefulness and availability of data.
5. Identify the firms that are in scope. Classify the participating firms according to their role within the GVC, namely:
   - Lead firm
   - Affiliated supplier
     - Controlled [Subsidiary (controlled)]
     - Non-controlled [Associates (influenced)]
   - Non-affiliated supplier
6. Identify the GVC-relevant industries and products (goods and services) and business functions. The list of standardized products explicitly identified reflects the GVC-related products that include the final product of the GVC and the intermediate goods and services that are used to produce the final product.
7. Map the GVC-specific industries and its business functions to relevant ISIC divisions/groups and map the GVC-specific products (related to the activities of the business functions) to relevant CPC codes. (see examples in handbook)
8. Compile a national (single-country) GVC-specific SUT, with a breakdown by GVC industry and related products. Apply a further ISIC breakdown related to the business functions by foreign- and nationally-controlled firms and by GVC-related and non-GVC-related enterprises across all business functions
9. Once the national SUTs are compiled in each of the GVC partner countries, integrate them into a multi-partner country SUTs. In the multi-country SUTs with detailed import matrices, the trade of those products between the GVC-partner countries must be explicitly shown and reconciled.

Table 2.6
Global value chain-specific multi-country supply-use tables (three-country case)

		Country A				Country B				Country C				Country A			Country B			Country C			Country A		Country B		Country C		Export to RoW + discrep-ancies	Total use (basic prices)	Total output (basic prices)
		Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2			
Country A	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country B	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country C	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country A	Industry 1																													
	Industry 2																													
	Industry 3																													
Country B	Industry 1																													
	Industry 2																													
	Industry 3																													

Table 2.6
Global value chain-specific multi-country supply-use tables (three-country case) (*continued*)

		Country A				Country B				Country C				Country A			Country B			Country C			Country A		Country B		Country C		Export to RoW + discrep-ancies	Total use (basic prices)	Total output (basic prices)
		Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2			
Country C	Industry 1																													
	Industry 2																													
	Industry 3																													
Import from all countries (CIF)																														
Total supply (basic prices)																														
*Net taxes on products payable to foreign governments																														
Import from rest of world (CIF)																														
Net taxes on prodcuts																														
Trade and transport margins																														
Total supply (purchasers' prices)																														
Grross value added (basic prices)	Compensation of employees																													
	Operating surplus																													
	Other gross value added																													
Total input (basic prices)																														

Source: *Handbook on Supply, Use and Input-Output Tables with Extensions and Applications*, United Nations 2018.

1. Global value chain-specific national institutional sector accounts

76. The elaboration of the GVC-specific SUTs in extended institutional sector accounts introduces additional detail about the types of institutional units and the financial assets and liabilities that are only related to a specific GVC industry.

77. The GVC industry-specific institutional sector accounts are presented with an additional functional subdivision of investment in direct investment and portfolio and other investments in the financial account for a case of an affiliated corporation that also has a pass-through function in channelling income from its subsidiaries to the lead firm.

78. In table 2.7, the transition of value-added into income is presented, in showing the sequence of the income and use of income accounts for this specific affiliate, as well as the related counterpart entries to the affiliate. The presentation is therefore not complete, it merely illustrates how the affiliate would be incorporated in the extended framework. A similar example could be constructed for each of the corporations that make up the GVC. The presentation follows the standard national accounts sequence of accounts.

79. In the generation of income account, gross value-added (109) is broken down in its primary cost components, compensation of employees (30), taxes less subsidies (5) on production and gross operating surplus (74). The primary income account details how the gross operating surplus of the corporation is distributed and how it may be augmented by income streams that derive from investments in other corporations.

80. In this example, the first step is to allow for the consumption of fixed capital (32), such that we allow for the economic use of gross fixed capital, which reduces the gross operating surplus to a net operating surplus of 34. Subsequently, property income flows are presented that are directly linked to specific financial assets and liabilities on the balance sheet. In the example, we can therefore apply a functional classification to the income flows, distinguishing between foreign direct investment related property income, other intercompany (e.g., with non-related enterprises) and other property income.

81. The major component of those income flows is the income received in the form of dividends from its subsidiary. That is shown as an entry on the resources (credit) side under the heading distributed income of corporations (67). As the subsidiary is incorporated in another country, the counterpart entry to this is the entry in the external sector account under uses (debit). The corporation immediately transfers that amount to its immediate parent (GVC holding) in the form of dividends. This corresponds to the income derived from so-called pass-through investment. The affiliate, however, also has generated a gross margin on its own operations. Those funds are reinvested in the company. In the national accounts and balance of payments reinvested earnings from foreign investment receive a specific treatment, in that such earnings are treated as if they were dividends that are reinvested; e.g., corporate net savings are set to zero, and the reinvested earnings are calculated as a residual. The reinvested earnings are thus calculated as 10 and recorded as a use of income (debit). A negligible part of this is due to minority holdings, which is excluded from the imputation. The counterpart is an entry in the external account on the resources side (credit).

82. The Affiliate (PT) has some minor property income from its relations with other, non-related non-financial corporations, from trade credit and minority shareholding in unrelated firms, which are recorded under other intercompany financing.

Table 2.7
Global value chain-specific institutional sector account: current account – transformation of value-added to income

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
Gross Value Added									109							
Compensation of Employees	30															
Taxes and Subsidies on production and imports	5															
Gross Operating Surplus	74															
Gross Operating Surplus									74							
Consumption of Fixed Capital	32															
Property Income, FDI																
Interest	8															8
Distributed Income of Corporations	67							67	67							67
Reinvested Earnings on FDI	10															10
Property Income, Other Inter-company Financing																
Interest					1				1							
Distributed Income of Corporations					2				2							
Other Property Income																

Table 2.7
Global value chain-specific institutional sector account: current account – transformation of value-added to income (*continued*)

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Finan-cial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Finan-cial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
Other Property Income																
Interest	15													11	0	4
Distributed Income of Corporations																
Other Property Income																
Balance of Primary Incomes, Net	12															
Balance of Primary Incomes, Net									12							
Current taxes on income and wealth	12														12	
Social Contributions																
Other Current transfers																
Disposable Income (Net)	0															
Disposable Income (Net)									0							
Final Consumption																
Savings	0															

83. Affiliate (PT) has engaged in bank borrowing, on which it pays interest (15), which is recorded under other property income, to domestic financial institutions (11) and abroad (4). This leads to the net balance of primary incomes to 12.

84. The balance of primary incomes is transferred into the secondary income distribution account. For Affiliate (PT) the only relevant entry here is the amount of income and wealth taxes paid (12), leading to a disposable income equal to 0. Net savings, the balance item of the use of income accounts is also equal to 0, as there are no entries foreseen for corporations in that account. Net savings is equal to 0 due to the imputation for reinvested earnings described previously.

85. Table 2.8 presents the accumulation accounts, the combined capital and financial account, for Affiliate (PT).

86. The structure of the capital account is relatively simple. It shows in the aggregate gross fixed capital formation (46) less consumption of fixed capital (32). With savings at 0, that leads to a net borrowing of 14. Those net investments are combined with the total financial investment recorded in the financial account (21), through reinvested earnings (10), lending from related non-resident firms (6) accounts receivable from related firms (2) as well as some financing under the other accounts.

87. Notable is the pass-through investment recorded under direct foreign investment in equity from the GVC holding through Affiliate (PT) into Affiliate (15). There is an investment under other intercompany financing, related to taking a minority interest in a non-affiliated corporation (3), and a decrease in intercompany loans (-6). Under other investment, Affiliate (PT) has a net investment of 9, split across currency and deposits, debt securities, loans and other accounts payable, and a net financing of (-2).

88. Table 2.9 presents the Balance Sheet for Affiliate (PT). Affiliate (PT) is a nearly wholly owned subsidiary of GVC Holding (foreign direct investment, equity liability 1020). A salient feature of the example is that a large part of the equity liability of Affiliate (PT) reflects a pass-through investment by Affiliate (PT) in a subsidiary (785); this intra-MNE investment is also recorded under foreign direct investment .

89. Affiliate (PT) also has a sizeable debt (380) with regards to another corporation in the group, namely a conduit established to attract debt security financing on behalf of the group. Part of its financing is handled through accounts payable (40).

90. Under other investment, portfolio, Affiliate (PT) finances itself through bank borrowing (268), equity (30, participations less than 10 per cent) and other accounts payable (18). The asset side of the balance sheet is characterized by the large amount of non-financial assets (gross value 850), as well as the foreign direct investment in the fully owned Affiliate (foreign direct investment equity 785). It has a minority interest in a non-affiliated firm (15), which it has also provided with a loan (15). Under other investment, there are deposits at banks (20), an investment in short-term debt securities (36) and accounts receivable (25).

2. Global value chain-specific multi-country institutional sector accounts

91. The step to multi-country institutional sector accounts involves not only the inclusion of foreign direct investment in the context of the national accounts but enlarges the scope to encompass a) geographical coverage of the accounts, showing country and multi-country aggregates, and b) full bilateral mapping between the countries and institutional sectors distinguished for all instrument and functional types.

Table 2.8
Global value chain-specific institutional sector accounts – accumulation account of foreign-controlled non-financial corporations (i.e., affiliates)

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
									0							
Non-Financial Assets																
GFCF	46															
CFC	-32															
Inventories																
Non-produced Assets									74							
Capital Transfers	0															
Net Lending(+)/Net Borrowing(-)	-14								0							
Net Lending(+)/Net Borrowing(-)	8								-14							
Foreign Direct Investment																
Debt Securities																
Loans								6	6							
Insurance Technical Reserves																
Equity	15							15	15							
Equity (Reinvested Earnings)								10	10							
Other Accounts								2	2							

Table 2.8
Global value chain-specific institutional sector accounts – accumulation account of foreign-controlled non-financial corporations (i.e., affiliates) (*continued*)

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Finan-cial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Finan-cial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
Other Intercompany financing																
Equity (Minority)	3												2			
Loans	-6												-6			
Other Accounts																
Other Investment, Portfolio Invest-ment and Reserves																
Reserves																
Currency and Deposits	-5															
Debt Securities	7															
Loans	5							-2	-2							
Insurance Technical Reserves																
Equity							0		0							
Derivatives																
Other Accounts	2				4				4							
Net Worth																
Total	21	0	0	0	4	0	0	31	21	0	0	0	-3	4	0	

Table 2.9
Global value chain-specific institutional sector accounts – balance sheets of foreign-controlled non-financial corporations (i.e., affiliates)

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
Non-Financial Assets																
Produced Assets	850															
Non-produced Assets	0															
Foreign Direct Investment																
Debt Securities																
Loans								380	380							
Insurance Technical Reserves																
Equity	785							1,020	1,020							785
Other Accounts								70	70							
Other Intercompany financing																
Equity (Minority)	15												15			
Loans	15												15			
Other Accounts																

Table 2.9
Global value chain-specific institutional sector accounts – balance sheets of foreign controlled non-financial corporations (i.e., affiliates) (*continued*)

	Assets								Liabilities							
	Foreign Controlled		National Controlled						Foreign Controlled		National Controlled					
	S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH		S-FCC	S-FIN-CAPT	S-UIC	S-FIC	S-OTHC	S-FIN	S-OTH	
	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector	Foreign Controlled Non-financial Corporations Foreign Subsidiaries	Foreign Controlled Captive Financial Institutions	Ultimate Investor	Foreign Influenced Non-Financial Corporations (Foreign Associates)	Other Non-Financial Corp	Financial Corporations excl foreign controlled captive corporations	Other Sectors	External Sector
Other Investment, Portfolio Investment and Reserves																
Reserves																
Currency and Deposits	20													20		
Debt Securities	36															36
Loans	40					126		102	268							
Insurance Technical Reserves																
Equity							30		30							
Derivatives																
Other Accounts	25				18				18				25			
Net Worth									0							
Total	1,786	0	0	0	18	228	30		1,786	0	0	0	55	20	0	821

92. That would provide a highly detailed framework, essentially a from-whom-to-whom" representation[31] incorporating the full detail by institutional sector and geography.

93. In the following tables, we present a suggestion for the balance sheets of multi-country institutional sector accounts, the same approach can obviously also be used to present the transaction accounts and other flows.

94. Here we choose to present the multi-country accounts in four tables, representing the following categories:

- Foreign direct investment (Table 2.10)
- Other investment, portfolio investment and reserves (Table 2.11)
- Non-financial assets and net worth (Table 2.12)
- Total assets (Table 2.13)

95. Each table is conceived as a two-tier from-whom-to-whom table. It contains the geographical detail as the top-level classification. The examples presented limit themselves to three economies only, obviously a fully specified set of multi-country accounts would provide for an exhaustive geographical classification. The second classification introduced an institutional sector breakdown of three sectors, a foreign direct investment enterprise sector, a non-foreign direct investment foreign direct investment corporate sector, and other sectors. The other sectors encompass the financial corporations, government, household and non-profit institutions serving households sectors, such that the tables do not get overly complicated. The assets are represented in the rows, and the liabilities are represented in the columns. Each entry represents simultaneously an asset and a liability.

96. Table 2.10 presents the foreign direct investment from-whom-to-whom matrix. It only recognizes cross border positions (e.g., the off-diagonal submatrices in the matrix), and within these sub-matrices, only involving assets and liabilities of the

[31] See Shrestha, Mink, Fassler (2012) on an elaboration of the from-whom-to-whom concepts.

Table 2.10
From-whom-to-whom matrix for foreign direct investment

			Liabilities												
			Economy 1				Economy 2				Economy 3				
		FDI	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	Total Assets
Assets	Economy 1	DI Enterprises													
		Other Corp					80								80
		Other Sectors													
		Net Worth													
	Economy 2	DI Enterprises									40				40
		Other Corp													
		Other Sectors													
		Net Worth													
	Economy 3	DI Enterprises													
		Other Corp													
		Other Sectors													
		Net Worth													
Total Liabilities			-	-	-	-	80	-	-	-	40	-	-	-	

separately identified foreign direct investment sector vis-à-vis its investors. Table 2.11 completes the financial balance sheet presentation by reporting on other investment, portfolio investment, official reserves and derivatives as a single functional category, showing the linkages between foreign direct investment enterprises and other sectors outside the scope of the foreign direct investment relationships. This matrix inter alia shows the degree to which direct investment enterprises are linked with other sectors in domestic and international financial and credit markets.

Table 2.11
From-whom-to-whom matrix on other investment, derivatives, portfolio investment and official reserves

			Liabilities												
			Economy 1				Economy 2				Economy 3				
		OI/PI/RES	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	Total Assets
Assets	Economy 1	DI Enterprises													
		Other Corp													
		Other Sectors		70											70
		Net Worth													
	Economy 2	DI Enterprises													
		Other Corp													
		Other Sectors					25								25
		Net Worth													
	Economy 3	DI Enterprises													
		Other Corp													
		Other Sectors													
		Net Worth													
Total Liabilities			-	70	-		25	-	-		-	-	-		

97. The example contained in table 2.12 is that of a direct investment chain, spanning three economies, where a non-financial corporation in economy 1 has obtained an 80 per cent shareholding in a non-financial corporation in economy 2, which thereby constitutes foreign direct investment. This enterprise subsequently takes a 100 per cent stake in a non-financial corporation in economy 3.

98. The example resembles one presented in BD4, explaining the span of control,[32] and enhanced to cover also the non-foreign direct investment components of each of the involved institutional units in Table 2.12.

[32] OECD Benchmark Definition of Foreign Direct Investment (BMD4), fourth ed., chap. 3, fig. 3.1, pp 53.

99. The example identifies the internal consistency for the sectors and counterpart sectors involved across the different tables. This can be seen in the balance sheet total table (see table 2.13), where rows and corresponding columns have the same totals. About the domestic counterpart sectors, those are made to balance using a balancing entry in net worth.

100. As the example is partial (e.g., focusing only on describing a single foreign direct investment chain, and its immediate counterparts), consistency is enforced by accommodating balances for counterpart sectors in net worth.

Table 2.12
From-whom-to-whom matrix for non-financial assets and net worth matrix

			Liabilities												
			Economy 1				Economy 2				Economy 3				
		NFA/NW	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	Total Assets
Assets	Economy 1	DI Enterprises													
		Other Corp				-									
		Other Sectors													
		Net Worth		10	70										80
	Economy 2	DI Enterprises								100					100
		Other Corp													
		Other Sectors													
		Net Worth					-5		25						20
	Economy 3	DI Enterprises												50	50
		Other Corp													
		Other Sectors													
		Net Worth									10				10
	Total Liabilities		-	10	70		-5	-	25	-	10	-	-	-	

Table 2.13
From-whom-to-whom matrix for balance sheet totals

			Liabilities												
			Economy 1				Economy 2				Economy 3				
		Total	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	S-FDI	S-ONF	S-OTH	NF	Total Assets
Assets	Economy 1	DI Enterprises	-	-	-	-	-	-	-	-	-	-	-	-	-
		Other Corp	-	-	-	-	80	-	-	-	-	-	-	-	80
		Other Sectors	-	70	-	-	-	-	-	-	-	-	-	-	70
		Net Worth	-	10	70		-	-	-		-	-	-		
	Economy 2	DI Enterprises	-	-	-	-	-	-	-	100	40	-	-	-	140
		Other Corp	-	-	-	-	-	-	-	-	-	-	-	-	-
		Other Sectors	-	-	-	-	25	-	-	-	-	-	-	-	25
		Net Worth	-	-	-		-5	-	25			-	-		
	Economy 3	DI Enterprises	-	-	-	-	-	-	-	-	-	-	-	50	50
		Other Corp	-	-	-	-	-	-	-	-	-	-	-	-	-
		Other Sectors	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Worth	-	-	-		-	-	-		10	-	-		
	Total Liabilities		-	80	70		100	-	25		50	-	-		

H. Linking global value chain-specific supply-use tables with global value chain-specific institutional sector accounts

101. To ensure the consistency of data in the GVC SUTs and in the GVC sector accounts, it is useful to build a linking table between the SUTs and the institutional sectors, as shown in table 2.14. This table allows the governance of the GVC industries to be explicitly identified in the SUTs by linking them to the institutional sector breakdown of the GVC sector accounts.

102. As an enterprise always belongs to an institutional unit, it is possible to link the production activities of industries and institutional sectors. Output of an institutional unit is equal to the sum of the outputs of the individual enterprises of which the institutional unit is composed. To clarify relationships and contents of industries and sectors, the GVC accounting system calls for the cross-classification of output, intermediate consumption (broken down by domestic and import component) and value-added by both industry and sector. Table 2.15 illustrates this cross-classification in a multi-country presentation. Critical GVC-related indicators can be obtained from tables 2.14 and 2.15. These single and multi-country cross-tables can be further extended for labour and capital good information (see Section 9 for further detail).

I. Linking with KLEMS accounts

103. Discussion to this point has focused on the need to provide relevant economic accounting statistics on the country origins of economic value across the GVC. This section outlines a related global industry-level production account that can be used to assess some of the underlying economic reasons for the cross-country origins of economic value that manifest in the GVC.

104. A global production account can be constructed by combining multi-country SUIOTs (as described in annex B) and capital (K), labour (L), energy (E), materials (M) services (S) (KLEMS) accounts using conceptually appropriate industry-level purchasing power parities (PPPs), which are further discussed below. KLEMS seeks to identify the prices and quantities of the components of production and the sources of economic growth by measuring and accounting for the contributions of capital (K), labour (L), energy (E), materials (M), services inputs (S), and total factor productivity to overall economic growth. Integrating multi-country SUIOTs and KLEMS estimates via PPPs yields measures of industry-level price competitiveness across countries, industry-level total factor productivity comparisons, and a decomposition of world economic growth to the country-industry level. An industry-level production account for each country is an important first step towards a globally integrated industry-level production account.

105. The basis of KLEMS accounting at the country level is an industry-level production account, which permits a bottom-up analysis of the sources of economic growth within a country. The foundation of KLEMS accounting is a set of country-level supply-use tables that include the value of outputs and intermediate inputs used by industry.[33] The input side of the KLEMS account includes nominal and real estimates of intermediate and capital and labour inputs used by industry, whereas the output side includes nominal and real industry output and value-added.

106. In nominal terms, the extension from the country-level tables to the world account involves two basic modifications. The first is identifying which transactions represent flows across borders, or in other words, the country of origin of the imports

[33] Construction of the supply-use accounts in nominal terms is covered by the *Handbook on Supply, Use and Input-Output Tables with Extensions and Applications* (United Nations, 2017) and the Eurostat *Manual of Supply, Use, and Input-Output Tables* (Eurostat, 2008).

Table 2.14
Cross-classification of global value chain-specific supply-use tables and global value chain institutional sector accounts

Sectors	Industries										Total
	ISIC 1	…	ISIC 291		…	ISIC 49-53				…	
			Core business function			Distribution and logistics					
			Foreign-controlled	Domestic-controlled		Foreign-controlled		Domestic-controlled			
						GVC-related	Non GVC-related	GVC-related	Non GVC-related		
Foreign Controlled Corporations											
Foreign Controlled Non-financial Corporations Foreign Subsidiaries											
Total output											
Intermediate consumption											
GVA at basic prices											
⋮											
Foreign Controlled Captive Financial Institutions											
Total output											
Intermediate consumption											
GVA at basic prices											
⋮											
Nationally Controlled Corporations											
Ultimate Controlling Parent/Ultimate Investor											
⋮											
Foreign Influenced Non-Financial Corporatoins (Foreign Associates)											
⋮											

Table 2.14
Cross-classification of global value chain-specific supply-use tables and global value chain institutional sector accounts (*continued*)

Sectors	Industries										Total
	ISIC 1	…	ISIC 291		…	ISIC 49-53				…	
			Core business function			Distribution and logistics					
			Foreign-controlled	Domestic-controlled		Foreign-controlled		Domestic-controlled			
						GVC-related	Non GVC-related	GVC-related	Non GVC-related		
Other Non-Financial Corporations											
⋮											
Other Corporations											
Financial Coprorations excl. foreign Controlled Captive Corporations											
⋮											
Other Sector											
⋮											
Total Economy											
⋮											

Table 2.15
Cross table of global value chain-specifc multi-country supply-use table and institutional sector accounts

Sectors	Industries																		Total
	ISIC 1	…	ISIC 291 Core business function		…	ISIC 49-53 Distribution and logistics												…	
			Foreign-controlled	Domestic-controlled		Foreign-controlled						Domestic-controlled							
						GVC-related			Non GVC-related			GVC-related			Non GVC-related				
Sectors						Country A	Country B	Country C	Country A	Country B	Country C	Country A	Country B	Country C	Country A	Country B	Country C		
Foreign Controlled Corporations																			
Foreign Controlled Non-financial Corporations Foreign Subsidiaries																			
Total output																			
Intermediate consumption																			
GVA at basic prices																			
⋮																			
Foreign Controlled Captive Financial Institutions																			
Total output																			
Intermediate consumption																			
GVA at basic prices																			
⋮																			

Table 2.15
Cross table of global value chain-specifc multi-country supply-use table and institutional sector accounts (*continued*)

Sectors	Industries																	Total
	ISIC 1	…	ISIC 291 Core business function		…	ISIC 49-53 Distribution and logistics											…	
			Foreign-controlled	Domestic-controlled		Foreign-controlled						Domestic-controlled						
						GVC-related			Non GVC-related			GVC-related			Non GVC-related			
Sectors						Country A	Country B	Country C	Country A	Country B	Country C	Country A	Country B	Country C	Country A	Country B	Country C	
Nationally Controlled Corporations																		
Ultimate Controlling Parent/Ultimate Investor																		
⋮																		
Foreign Influenced Non-Financial Corporatoins (Foreign Associates)																		
⋮																		
Other Non-Financial Corporations																		
⋮																		
Other Corporations																		
Financial Coprorations excl. foreign Controlled Captive Corporations																		
⋮																		
Other Sector																		
⋮																		
Total Economy																		
⋮																		

used in an industry and the destination country for exported products of an industry. The second modification is to impose consistency in the measures of cross-border flows across countries, such that the value of exports of a producing country corresponds to the value of imports in the purchasing country.

107. Moreover, KLEMS accounts are typically assembled for individual countries using local currency units, thus can be used for analysing the sources of growth within a country, or cross-country comparisons of growth, but not cross-country-level comparisons. Therefore, a world industry-level production account requires prices adjusted for PPPs to deflate inputs and outputs at the industry level so that the outputs and inputs into production are in consistent units.[34] For example, the production of cars in Japan in yen and cars in Germany in Euros cannot simply be added together to create the total production of cars in the two countries. Thus, it is important to adjust the price measures, both for industry outputs and inputs, using PPPs to allow for relative price differences across countries at the product- and detailed-input levels. Combining a time series of multi-country SUIOTs and country-level KLEMS accounts with the price deflators for each cell of the tables, including the primary inputs, produces a global industry-level production account.

108. While there is considerable work on expenditure side PPPs (e.g., the World Bank International Comparison Program produces PPPs for most countries[35]), and exchanges rates are readily available, they are not conceptually appropriate for industry-level comparisons. Expenditure-side PPPs capture the relative price differences for final demand, but there is not a one-to-one correspondence between those prices and industry-level output prices. For example, automobile parts can be produced, in part, by the fabricated metals industry, the electrical equipment industry, the miscellaneous manufacturing industry, the plastics industry or others, so a single expenditure-side PPP for auto parts bundles the prices (and the retail margin) of the auto parts produced by different industries. Furthermore, products that are sold only as intermediate input (i.e., not to final demand) do not have a corresponding PPP in final demand-based data.

109. Recent research (Nomura, Miyagawa, and Samuels, 2018)[36] shows how to link available data for the United States and Japan to conceptually relevant PPPs for industry outputs and intermediate inputs and (Jorgenson, Nomura, and Samuels, 2018)[37] discusses the relevant PPPs for capital and labour inputs for the two countries. For labour PPPs, details on rates of labour compensation, cross-classified by each type of worker in the KLEMS production account form the basis of the PPP. For capital PPPs, relative prices of investment goods are converted to relative services prices using the user cost of capital annualization factor. A similar approach, perhaps with additional data collection, would be required to construct conceptually appropriate PPPs for other countries. A more detailed discussion of those issues is given in (Samuels and Strassner, 2019).[38]

110. Industry-level price level indexes (PLIs), calculated as the PPP in the base year divided by the exchange rate,[39] fall naturally out of the framework of the world production account. Price-level indices show how industry prices in one country compare with competitors' prices in a manner that is consistent with national accounting concepts. Measures of price competitiveness are important for policymakers to assess international competitiveness and the impacts of economic policy in a global setting that includes integration with GVCs. Price competitiveness of outputs and inputs are also a key economic determinant when lead firms determine the locations of business functions and production processes along the GVC.

111. Industry productivity-level indices are another important application of the world production account. The gap in the level of productivity at the industry level between two countries is measured as the gap in industry output less the gap in industry inputs

34 The Eurostat-OECD Methodological Manual on Purchasing Power Parities (PPPs) provides information on the basic construction of PPPs.

35 See World Bank International Comparison Program at www.worldbank.org/en/programs/icp.

36 K. Nomura, K. Miyagawa and J. Samuels (2018): "Benchmark 2011 Integrated Estimates of the Japan-U.S. Price Level Index for Industry Outputs", Bureau of Economic Analysis, 2018. Available from www.bea.gov/system/files/papers/WP2018-15.pdf.

37 Dale W. Jorgenson, K. Nomura and J. Samuels (2018): "Progress on Measuring the Industry Origins of the Japan-U.S. Productivity Gap", presented in Fifth World KLEMS Conference at Harvard University, June 4–5. Available from https://scholar.harvard.edu/files/jorgenson/files/pl01b_jorgenson_nomura_samuels_2018.pdf?m=1527941772.

38 J. Samuels and E. Strassner (2019): "Towards a Global Integrated Industry-level Production Account: A Proposal", International Productivity Monitor, Vol. 36, p. 7-33. Available from https://EconPapers.repec.org/RePEc:sls:ipmsls:v:36:y:2019:1.

39 This can then be extrapolated backwards and forwards in time using time series observations of the industry output prices in local currency units from the KLEMS data sets and the exchange rate to form a time series of price-level indices by industry for the countries under comparison.

weighted by cross-country value shares. Those measures are important for assessing gaps in efficiency across countries and comparative advantage in certain sectors in the context of the GVC. Such comparisons become apparent only within the framework of industry-level comparisons; information on growth rates is not sufficient.

112. Box 2.5 presents recent applications of the KLEMS accounts.

Box 2.5
Applications of the KLEMS accounts

The most important application of KLEMS in practice and in the economics literature is analysis of the sources of economic growth from the bottom up. Therefore, it is instructive to review some of the more recent studies that use this method. (Jorgenson, Ho and Samuels, 2016) construct an industry-level production account and use the account to analyse the sources of economic growth in the United States over the post-war period in the U.S. They divide the economy into producers of Information Technology (IT), users of IT, and non-IT industries. The paper shows the importance of IT production in United States

GDP growth over the period. One important finding is that a disproportionate share of aggregate productivity growth originated in IT-producing industries. That is, the IT-producing sector accounted for about 5 per cent of nominal aggregate value-added, but a substantially larger share of aggregate productivity growth. Productivity analysis based on aggregate data would miss this important distinction between IT and other types of production and perhaps erroneously conclude that productivity growth was balanced across sectors of the economy.

KLEMS work has now been adopted into official national accounting statistics by Australia, Sweden, Finland, Denmark, Italy, the United Kingdom, the Netherlands, Ireland and Mexico. In the United States, the Bureau of Economic Analysis and the Bureau of Labor Statistics produce an integrated industry-level KLEMS production account that is consistent with the official GDP accounts, including internally consistent accounting data on industry output and KLEMS inputs.

The EUKLEMS and World KLEMS consortiums provide proof of concept on implementing country-level production accounts for countries across the world. Those data sets are produced by a consortium of academic researchers and statistical offices and now cover about 40 countries using consistent KLEMS methodology. Research studies using those data sets confirm the importance of these data for basic macroeconomic analysis. For example, the findings based on the EUKLEMS database in (Timmer, O'Mahony and van Ark (2007)) show that a large portion of the productivity gap between Europe and the United States is driven by a gap in productivity of the service industries, leading to an argument for a "single market" for services in Europe.

The Conference Board's Total Economy Database provides aggregate production account information for about 123 countries but does not include industry-level sources of growth.

J. Indicators that can be derived from global value chain satellite accounts

113. There is a wide range of indicators that can be derived from a GVC satellite account, as outlined below:

- Value-added indicators (TiVA) for a specific GVC that can benchmark other indicators; for example, domestic value-added in exports and imports and foreign value-added in domestic exports
- Relative proportions of business functions (classified by ISIC and CPC) involved in the production of the GVC and which are related to exports
- Role of core and support functions in the GVC
- Compensation of employees involved in the GVC by business function
- The GVC-related intermediate and final products (goods and services) supplied (by the domestic economy in the single country GVC satellite account case and by each country in the GVC for the multi-country satellite account case)
- Comparisons between those firms in the GVC with those not related to the GVC-with their productivity and economic activity
- Level and sources of intermediate consumption of goods and services used in the GVC
- Exports of the GVC-related products (by business function)
- Amount to which the GVC-relevant goods and services are supplied by nationally controlled or foreign-controlled firms
- In the multi-country GVC satellite account case, the GVC-related products (i.e., goods and services) imported from each country
- In the multi-country GVC satellite account case (where the rest of the world can be reasonably estimated with proxies), the proportion of each country's supply of goods and services to the entire (global) GVC
- In the multi-country GVC satellite account case, identification of where each type of firm in the GVC is located: (i.e., lead firm and affiliated supplier (either controlled *[subsidiary (controlled)],* non-controlled *[associates (influenced)], or* non-affiliated supplier)
- In the multi-country GVC satellite account case, country in which the R&D/IPP resides in the GVC
- Other net taxes on production related to the GVC
- Consumption of fixed capital related to the GVC
- Operating surplus, net, related to the GVC
- Value-added at basic prices related to the GVC (within the domestic economy for the single-country GVC satellite account and for the multi-country case, foreign and domestic value-added in imports and exports related to a GVC-specific industry)

114. In addition to real sector indicators that can be obtained from the GVC-specific SUTs (e.g., see also country cases in Part IV of the Guidelines), the analytical value of the GVC specific institutional sector accounts complement those indicators with the domestic and cross-border transactions and positions of the sequence of accounts. By not covering the product and activity detail of the institutional units in the production accounts, the institutional sector accounts of GVCs could be produced more frequently, ideally following the quarterly frequency of the balance of payments and international investment positions. This higher frequency and the early availability allow for a more recurrent analysis of the domestic and cross-border interactions between the foreign- and domestically owned entities making up the industry-specific GVCs. Those interactions will explain the income generated from GVC production activities and its distribution from its production, tax and financing arrangements. Moreover, it will

describe the investment and financing arrangements through the transactions and positions of the entities that make up the GVC in foreign direct investment and other investment in the financial accounts and balance sheets in support of its operations.

115. The GVC sectoral frameworks could be used to capture the behaviour of GVC-related entities in business cycle analysis, strengthen standard macroeconomic analysis and projections and support fiscal and monetary policy. This additional analytical value of the GVC-specific sector accounts is obtained through the isolation of transactions by multilateral enterprise groups in GVCs that matter for a domestic economy. In a multi-country setting, they can be treated consistently. Through the whom-to-whom accounts, the interconnectedness between the GVC-related entities and other entities in partner countries provide an additional detail for macro-prudential analysis by providing detail of the cross-border linkages, risks and exposures from the financing of GVC operations.

Appendix A
Global value chain product codes for support business functions

GVC-relevant products from support functions	CPC Ver.2.1 code and description
Transportation, distribution and logistics services: transportation activities, warehousing and order processing	CPC - 671 Cargo-handling services CPC 67110 This subclass includes: • cargo-handling services for containerized freight • services of container freight terminal facilities for all modes of transport, including stevedoring services (i.e., loading, unloading and discharging of vessels' containerized freight, at ports) CPC 67190 This subclass includes: • cargo-handling services for non-containerized freight • services of freight terminal facilities, for all modes of transport, including stevedoring services (i.e., loading, unloading and discharging of vessels' non-containerized freight, at ports) • cargo-handling services incidental to freight transport not elsewhere classified • baggage-handling services at airports and at bus, rail or highway vehicle terminals CPC 672 - Storage and warehousing services CPC 67210 This subclass includes: • storage and warehousing services for frozen or refrigerated goods, including perishable food products • blast-freezing services, associated with storage and warehousing This subclass does not include: • specialized freezing of food on a fee or contract basis, cf. corresponding subclass in group 881, based on type of good to be frozen CPC 67220 This subclass includes: • bulk storage and warehousing services for liquids and gases, including oil and oil products, wine and the like CPC 67290 This subclass includes: • storage services of grains • other storage or warehousing services CPC 679 - Other supporting transport services CPC 67910 This subclass includes: • ship-broker services • freight brokerage services • freight forwarding services (primarily transport organization or arrangement services on behalf of the shipper or consignee) • aircraft space brokerage services • freight consolidation and break-bulk services CPC 67990 This subclass includes: • type rating services (aircraft-specific permits for flying a particular type of plane) • liquefaction and regasification of natural gas for transportation • radio navigational aid locating services, such as GPS (global positioning system) provision CPC 8534 Specialized cleaning services 85340 This subclass includes • cleaning of computer rooms and the like • specialized cleaning services for reservoirs and tanks, these being parts of either industrial sites or transport equipment • sterilization of objects or premises (operating rooms)

GVC-relevant products from support functions	CPC Ver.2.1 code and description

Transportation, distribution and logistics services: transportation activities, warehousing and order processing	CPC 83117 This subclass includes:
	• provision of a bundled service package that combines information technology-intensive services with labour (manual or professional depending on the solution), machinery and facilities to support, host and manage a business process for a client, including:
	  • financial business processes, such as financial transaction processing, credit card processing, payment services, lending services
	  • human resource business processes, such as benefits administration, payroll processing, personnel administration
	  • supply-chain management business processes, such as inventory management, procurement services, logistics services, production scheduling and order processing
	  • customer relations management business processes, such as help desk, call centre, customer service
	  • vertical market business processes, conducted by specific industries such as electric, chemical, petroleum
	  • other business processes for a client
	• furnace and chimney cleaning services
	• exterior cleaning of buildings of all types
	• cleaning of fireplaces, stoves, furnaces, incinerators, boilers, ventilation ducts and exhaust units
	• cleaning of transportation equipment
	This subclass does not include:
	• maintenance services for central heating installations, cf. 54631
	• building exterior cleaning services when associated with building completion, cf. 54790
	• cleaning services for agricultural premises (hen houses, piggeries, etc.), cf. 86121
	• cleaning of carpets, upholstery, fabric, wall hangings, etc., cf. 97130

Marketing, sales and after-sale services	
Marketing services	CPC 837 - Market research and public opinion polling services This subclass includes: • market analysis, analysis of competition and the behaviour of consumers use of research monographs, statistics, econometric models, surveys, etc. investigation services designed to secure information on public opinions regarding social, economic, political and other issues
Sales services	CPC 611 - Wholesale trade services, except on a fee or contract basis CPC 612 - Wholesale trade services on a fee or contract basis CPC 621 - Non-specialized store retail trade services CPC 622 - Specialized store retail trade services CPC 623 - Mail order or internet retail trade services CPC 624 - Other non-store retail trade services CPC 625 - Retail trade services on a fee or contract basis
Information and communication technology (ICT) services: information technology (IT) services and telecommunication (IT services including hardware and software consultancy, customized software data processing and database services, maintenance and repair, web hosting, as well as other computer-related and information services, but excluding packaged software and hardware);	CPC 841 - Telephony and other telecommunications services CPC 842 - Internet telecommunications services CPC 846 - Broadcasting, programming and programme distribution services CPC 83143 - Software originals CPC 8434 - Software downloads CPC 84392 - Online software CPC 8313 - IT consulting and support services CPC 83141 - IT design and development services for applications CPC 83142 - IT design and development services for networks and sysems CPC 8315 - Hosting and information technology (IT) infrastructure provisioning services CPC 8316 - IT infrastructure and network management services CPC 8713 - Maintenance and repair services of computers and peripheral equipment CPC 92919 - Other education and training services, n.e.c. This subclass includes: • training for car, bus, lorry and motorcycle driving licences • training for flying certificates and ship licences • computer training services • management training services • services provided by music camps, science camps, comp

Administrative and management services	
Legal and accounting services	CPC 82 - Legal and accounting services Includes: • legal services, accounting, auditing and bookkeeping services • tax consultancy and preparation services • insolvency and receivership services
Engineering and related technical services: engineering and related technical consultancy, technical testing, analysis and certification; also included are design services;	CPC 833 - Engineering services This group includes: • application of physical laws and principles in the design, development, and utilization of machines, materials, instruments, structures, processes, and systems. Services of this type involve the provision of designs, plans, and studies related to engineering projects. CPC 834 - Scientific and other technical services This group includes: • geological, geophysical and other prospecting services • surface surveying and map-making services • weather forecasting and meteorological services - technical testing and analysis services
Research and development services	CPC Division: 81 - Research and development services OR CPC 811 - Research and experimental development services in natural sciences and engineering CPC 812 - Research and experimental development services in social sciences and humanities CPC 813 - Interdisciplinary research and experimental development services CPC 83912 - Industrial design services CPC 814 - Research and development originals This subclass includes: • scientific originals, i.e., ideas, plans, blueprints, formulas for inventions, products and processes, which can be protected and licensed as industrial property, trade secrets, patents, etc. Note: The creation of these original works is done on own account, i.e., their production is intended for sale that is undertaken without a contract or known buyer This activity is carried out by ISISC Rev. 4 Division: 72 - Scientific research and development

Appendix B
Relationships between participating firms in global value chains

The concepts described below are useful to understand the types of relationships between enterprises and are taken from the BMP6, the 2008 SNA, and UNECE *Guidelines on Statistical Business Registers,* and are in line with the *OECD Benchmark Definition of Foreign Direct Investment*, fourth edition.

A **direct investment relationship** arises when an investor resident in one economy makes an investment that gives **control** or a **significant degree of influence** on the management of an enterprise that is resident in another economy.

A **direct investor** is an entity or group of related entities that is able to exercise control or a significant degree of influence over another entity that is resident of a different economy. A **direct investment enterprise** is an entity subject to control or a significant degree of influence by a direct investor.

The concept of control and significant degree of influence are defined in an immediate direct investment relationship (i.e., when direct investor directly owns equity that entitles it to **10 percent or more** of the voting power in the direct investment enterprise) as follows:

Control is determined to exist if the direct investor owns more than 50 percent of the voting power in the direct investment enterprise.

A significant degree of influence is determined to exist if the direct investor owns from 10 to 50 percent of the voting power in the direct investment enterprise.

A direct investment enterprise is either a subsidiary or an associate:

a) A **subsidiary** is a direct investment enterprise over which the direct investor is able to exercise control.

b) An **associate** is a direct investment enterprise over which the direct investor is able to exercise a significant degree of influence, but not control.

Control and influence are defined as above and may arise from an immediate direct relationship or in indirect relationship through a chain of ownership.

Affiliates of an enterprise consist of:

a) its direct investor(s), both immediate and indirect;

b) its direct investment enterprises, whether subsidiaries (including branches and other quasi-corporations), associates, and subsidiaries of associates, both immediate and indirect; and

c) **fellow enterprises**, that is, those enterprises that are under the control or influence of the same immediate or indirect investor, but neither fellow enterprise controls nor influences the other fellow enterprise. Often the direct investor and fellow enterprises are all in different economies, but sometimes the direct investor is in the same economy as one of the fellow enterprises (in which case, it is not a direct investor in that fellow enterprise). That situation is more likely to arise in economies

that do not use a local enterprise group as the statistical unit for direct investment purposes.

Therefore, **affiliate enterprises** are in a direct investment relationship with each other. Consequently, non-affiliate enterprises are those enterprises that are not in a direct investment relationship with each other.

An important concept for the analysis of GVCs is the **ultimate investor** (or **ultimate controlling parent**), which is the enterprise that has control through a foreign direct investment position in the direct investment enterprise. As such, the ultimate investor controls the immediate direct investor. It is identified by proceeding up the immediate direct investor's ownership chain through the controlling links (ownership of more than 50 per cent of the voting power) until an enterprise is reached that is not controlled by another enterprise. If there is no enterprise that controls the immediate direct investor, then the direct investor is effectively the ultimate investor in the direct investment enterprise. The country in which the ultimate investor resides is the ultimate investing country in the direct investment enterprise. In terms of foreign affiliates statistics, it is the ultimate controlling institutional unit that is the ultimate investor in a foreign affiliate.

Enterprise group: An enterprise group is a set of enterprises controlled by the group head. The group head is a parent legal unit that is not controlled either directly or indirectly by any other legal unit. An enterprise group comprises of the group head and subsidiaries. The subsidiary enterprises of a subsidiary enterprise are considered to be subsidiaries of the parent enterprise. An enterprise group is an association of enterprises bound together by legal and/or financial links. A group of enterprises can have more than one decision-making centre, especially for policy on production, sales and profits. It may centralize certain aspects of financial management and taxation. It constitutes an economic entity that is empowered to make choices, particularly concerning the units which it comprises. Enterprise groups may be either global or local. A global enterprise group refers to an investor and all the enterprises under that investor, whereas the local (or territory-specific) enterprise group refers to an investor and the legal entities under that investor that are resident in the reporting economy. The global enterprise group is also called an MNE.

MNE group: An enterprise group that crosses national boundaries.

Global group head: An entity that controls a global enterprise. The global group head is defined as the unit (legal or natural person) which controls all legal units of the group and is not controlled by any other legal unit. This statistical unit is referred to in the GVC framework as the **lead firm** of the MNE group. Also, this statistical unit is referred to the global enterprise in terms of business statistics.

Appendix C
Global value chain product codes for automotive global value chain industry

VC stage/ sub-assembly	CPC codes	CPC code descriptions	HS codes (2002)	HS code descriptions	VC sector
Passenger vehicles	49113	Motor cars and other motor vehicles principally designed for the transport of persons (except public-transport type vehicles, vehicles specially designed for travelling on snow, and golf carts and similar vehicles)	870321 870322 870323 870324 870331 870332 870333	870321, 870322, 870323, 870324: Other vehicles, with spark-ignition internal combustion reciprocating piston engine <1000cc, 1000 – 1500cc, 1500 – 3000cc, > 3000cc 87033: Other vehicles, with compression-ignition internal combustion piston engine (diesel or semi-diesel) <1500cc, 1500 – 2500cc, >2500cc	--
Body system	49121	Chassis fitted with engines, for motor vehicles	870600	8706: Chassis fitted with engines, for the motor vehicles of headings 87.01-87.05	Chassis
Drive train	43121 43122 43123	Spark-ignition reciprocating internal combustion piston engines, of a cylinder Spark-ignition reciprocating internal combustion piston engines, of a cylinder capacity exceeding 1000 cc Compression-ignition internal combustion piston engines, of a kind used for the propulsion of vehicles	840733 840734 840820	Reciprocating piston engines used for the propulsion of vehicles of Chapter 87; of a cylinder capacity: > 250 cc ≤ 1,000 cc > 1,000 cc Compression-ignition internal combustion piston engines (diesel or semi-diesel engines); of a kind used for the propulsion of vehicles of chapter 87	Engine
Body system (suspension)	36111 3612 49129	New pneumatic tires, of rubber, of a kind used on motor cars Retreaded pneumatic tires, of rubber Other parts and accessories n.e.c. of motor vehicles (including brakes, gear boxes, axles, road wheels, suspension shock absorbers, radiators, silencers, exhaust pipes, clutches, steering wheels, steering columns, steering boxes, and parts thereof)	401110 401211 870831+ 870839+ 870870 870880 870894	401110: New pneumatic tires, of rubber; of a kind used on motor cars 401211: Retreaded tires; of a kind used on motor cars (including station wagons and racing cars) Brakes and servo-brakes and parts thereof; 870831: Mounted brake linings 870839: Other 870870: Road wheels and parts and accessories thereof 870880: Suspension systems and parts (including shock absorbers) 870894: Steering wheels, columns and boxes	Tires Brakes^ Wheels Suspension systems and parts (incl. shock absorbers) Steering wheel
Body system (panels)	4921 37115 42999	Bodies for motor vehicles safety glass Metal goods n.e.c. (including anchors, grapnels and parts thereof, of iron	870710 700711 700721 830230	870710: Bodies (incl. cabs), for motor vehicles of headings 87.01 to 87.05; for the vehicles of heading 87.03 700711: Toughened (tempered) safety glass, of size and shape suitable for use in vehicles, aircraft, spacecraft or vessels 700721: Laminated safety glass 830230: Other mountings, fittings and similar articles suitable for motor vehicles	Body panels windows/ windshield metal mountings

VC stage/ sub-assembly	CPC codes	CPC code descriptions	HS codes (2002)	HS code descriptions	VC sector
Body system (front & rear end modules)	42999 43914 4651	Metal goods n.e.c. (including anchors, grapnels and parts thereof, of iron…) Filtering or purifying machinery and apparatus, for liquids or gases, except oil filters, petrol filters and air intake filters for internal combustion engines Electric filament or discharge lamps; arc lamps	870810 870891 870892 842139 853910	Parts and accessories of the motor vehicles of headings 87.01-87.05; 870810: Bumpers and parts thereof 870891: Radiators 870892: Silencers and exhaust pipes 842139: Filtering or purifying machinery and apparatus for gases - Intake air filters for internal combustion engines - other 853910: Electric filament or discharge lamps, including sealed beam lamp units and ultra-violet or infra-red lamps; arc lamps; sealed-beam lamp units	Bumpers Radiators Silencers (mufflers)/exhaust Filters Headlights
Body system (interior)	38111 49231	Seats, primarily with metal frames Parts and accessories for the goods of subclass 49210	940120 870821	940120: Seats of a kind used for motor vehicles 870821: Safety seat belts	Seats Seatbelts^
	47312 4842	Radio broadcast receivers not capable of operating without an external Clocks	8527211 8527291 910400	85272: Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles, including apparatus capable of receiving also radio-telephony or radio-telegraphy 910400: Instrument panel clocks and clocks of a similar type for vehicles, aircraft, spacecraft or vessels.	Electronic Instruments: Radios Clocks
Body system (other)	49231	Parts and accessories for the goods of subclass 49210	870829	870829: Parts and accessories of the motor vehicles of headings 87.01-87.05. Other parts and accessories of bodies (including cabs); other	Other
Drive train	43151	Parts of spark-ignition reciprocating, compression ignition or rotary internal	840991 840999	84099: Parts suitable for use solely or principally with the engines of heading 84.07-08.	Engine parts
	49129	Other parts and accessories n.e.c. of motor vehicles (including brakes, gear boxes, axles, road wheels, suspension shock absorbers, radiators, silencers, exhaust pipes, clutches, steering wheels, steering columns, steering boxes, and parts thereof)	870840 870850 870860+ 870893	Parts/accessories of motor vehicles of headings 87.01-05 870840: Gear boxes 870850: Drive-axles with differential, whether or not provided with other transmission components 870860: Non-driving axles and parts thereof 870893: Other parts/accessories; clutches and parts thereof	Gear boxes Drive-axles Clutches
Body system/ drive train	49129	Other parts and accessories n.e.c. of motor vehicles (including brakes, gear boxes, axles, road wheels, suspension shock absorbers, radiators, silencers, exhaust pipes, clutches, steering wheels, steering columns, steering boxes, and parts thereof)	870899	870899: Parts and accessories of the motor vehicles of headings 87.01-87.05. Other parts and accessories; other	Other Airbags^

VC stage/ sub-assembly	CPC codes	CPC code descriptions	HS codes (2002)	HS code descriptions	VC sector
Electrical Equipment	4642	Electric accumulators	8507*(6)	8507: Electric accumulators, including separators therefor, whether or not rectangular (including square)	Batteries and parts (accumulators)
	4691 4697	Electrical ignition or starting equipment of a kind used for internal Parts for the goods of subclasses 46910 and 46920; electrical parts n.e.c. of machinery or apparatus	8511*(7)	8511: Electrical ignition or starting equipment of a kind used for spark-ignition or compression-ignition internal combustion engines (e.g., ignition magnetos, magneto-dynamos, ignition coils, sparking plugs and glow plugs, starter motors); generators (e.g., dynamos, alternators) and cut-outs of a kind used in conjunction with such engines.	Ignition and parts
	4633	Ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships	854430	854430: Ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships	Wire harnesses
	4691	Electrical ignition or starting equipment of a kind used for internal combustion engines; generators and cut-outs of a kind used in conjunction with internal combustion engines; electrical lighting or signaling equipment (except filament or discharge lamps), windscreen wipers, defrosters and demisters, of a kind used for cycles or motor vehicles	851220 851230 851240 851290	8512: Electrical lighting or signaling equipment (excl. articles of heading 85.39), windscreen wipers, defrosters and demisters, used for cycles or motor vehicles. NOTE: all of 8512 except 851210 (pertains to bicycles).	Signaling Lighting/visual, sound, windscreen wipers, parts
	43912	Air-conditioning machines	841520	841520: Air-conditioning machines, of a kind used for persons, in motor vehicles	Air conditioners

Sources: Sturgeon, Daly, Frederick, Bamber and Gereffi (2016).

Notes: (1) also included in electronics definition; (^): designates safety system component; (*) indicates all six-digit codes within four-digit code are included and number in parenthesis is number of six-digit codes; (+) indicates HS02 is the last year code is used.

Appendix D
Global value chain product codes for textile and apparel global value chain industry

Category	CPC codes	Sector and products	HS codes (all)
Fibre subsectors (raw materials)	1921-23 2611-12 2614, 17, 19 2961-64 39212-15	Unfinished/waste	5001-03 510111-19 5102-04 5201-02 5301-05
Yarn subsectors (components/ intermediates)	2613, 15-16 2621-22	Yarn: unprocessed	510121, 29, 30 5105 5203 5506 5507
	2631-34, 2636-38 2643-46	Yarn: natural	5004-06 5106-10 5205-07 5306-08 5509-11
	2642 3551-6 39216	Yarn: man-made filaments	5402-06 5501-05
	27992-3 27995	Yarn specialty and industrial	5605-06 560490 560420
	2635 2641	Thread	5204 5401 5508
Fabric subsectors (components/ intermediates)	2651-57, 59 2661-3, 69 2671-7, 79 2681-5, 87-9 27996-8 32195 3625 3893	Broadwoven fabric	5007 5111-13 5208-12 5309-11 5407-08 5512-16 5801-03 591131-32 701952, 59
	2689 27911 27992 27998	Narrow fabric	560410 5806 580710 5808 5908-10 591120, -40, -90, 701940, -51
	27920	Non-woven fabric	5602-03
	27912 2811 2819	Knit fabric	5804, 60

Category	CPC codes	Sector and products	HS codes (all)
Fabric subsectors (components/intermediates) *(continued)*	27997-8 3625	Coated fabric	5901 5903 59069 591110
	27994, 96-97	Industrial fabric	5809 5902 5907
Textile product subsectors (final products)	2711-14, 19 2721-23, 29 3893 44813	Carpets and rugs	57 5904
		Curtains and drapes	6303
		Linens	6301-02 6304 630710
	2714 32195	Wall coverings and tapestries	5905 5805
	2715-16 2731-32 27991,9	Bags and canvas products	6305-06
		Rope and cord	5607-09
		Non-woven products	5601 5811
	2714,9	Miscellaneous final products	630720 6308 630790
	27911,13	Trim	5810 580790
Apparel product subsectors (final products)	2821 28221-6 28231-4,7 2825	Hosiery and socks	6115
		Sweaters/sweatshirts	6110
		Knit shirts	6105 6106 6109
		Intimate apparel (underwear, pajamas)	6107-08 6207-08
		Intimate apparel (bras)	6212
		Coats	6101-02 6201-02 621020 621030

Category	CPC codes	Sector and products	HS codes (all)
Apparel product subsectors (final products)	28221, 23 28231, 33	Suits and formalwear	61031 61032 61033 61041 61042 61043 62031 62032 62033 62041 62042 62043
		Dresses and skirts	61044 61045 62044 62045
		Trousers	61034 61046 62034 62046
	28226 28234	Baby	6111 6209
	28227 28235	Athletic (swim suits, ski suits, track suits, other woven)	6112 6211
	2825 28228	Miscellaneous	6113-14 621010 621040 621050
	28232, 34	Woven shirts	6205-06
	28229 28238 28261-2,9 3697	Accessories	6116-17 6213-17
		Headgear	65
	28241-2 2832	Leather and fur	420310 420329 420330 420340 4303

Source: Frederick, S. (2019).

Appendix E
Global value chain product codes for electronics global value chain industry

Category	CPC codes	Sector and products	HS codes (all)
Computers/storage devices and office equipment	4511-13, 15-16 4722, 24 44611	Office equipment: typewriters, teleprinters, fax machines, printers, calculating machines, copiers, mail-related, cash registers	8469* (HS92-12) 8470* (HS92-12) 8472* (HS92-12) 844312 (HS92-12) 844351 (HS96-02) 844331 (HS07-12) 844332 (HS07-12) 844339 (HS07-12) 900911 (HS92-02) 900912 (HS92-02) 900921 (HS92-02) 900922 (HS92-02) 900930 (HS92-02) 851720 (HS92) 851721 (HS96-02) 851722 (HS96-02)
	4524 44231, 32	Laptops, desktops, storage devices, monitors, scanners, personal printer/combo machines	8471* (HS92-12) 852841 (HS07-12) 852851 (HS07-12) 852861 (HS07-12)
Consumer electronics	4524 44231-32	**Radio/alarm clocks**: cassette players, car radios, CBs 85272* auto-specific[40]	852711 (HS92) 852712 (HS96-12) 852713 (HS96-12) 852719 (HS92-12) 852721 (HS92-12) 852729 (HS92-12) 852731 (HS92-02) 852732 (HS92-02) 852739 (HS92-02) 852790 (HS92-02)
	47313	**TV/projectors**: monitors, reception equipment	852810 (HS92) 852812 (HS96-02) 852813 (HS96-02) 852820 (HS92) 852821 (HS92-02) 852822 (HS92-02) 852830 (HS92-02) 852849 (HS07-12) 852859 (HS07-12) 852869 (HS07-12) 852871 (HS07-12) 852872 (HS07-12) 852873 (HS07-12)

[40] 85272 (auto-specific) makes up 50 per cent of world exports for HS8527.

Category	CPC codes	Sector and products	HS codes (all)
Consumer electronics	47321-22 47331	**Sound/video**: sound projection and sound/video recording: microphones, loudspeakers, headphones, amplifiers; record players, cassette players, answering machines, VHS, DVD players	851810 (HS92-12) 851821 (HS92-12) 851822 (HS92-12) 851829 (HS92-12) 851830 (HS92-12) 851840 (HS92-12) 851850 (HS92-12) 8519 8520 (HS92/96-02) 8521 (HS92-12)
	3858	**Video games**	950410 (HS92-07) 950450 (HS12)
	4652 48322, 24	**Cameras**[41]	900610 (HS92-12) 900620 (HS92-12) 900630 (HS92-12) 900640 (HS92-12) 900651 (HS92-12) 900652 (HS92-12) 900653 (HS92-12) 900659 (HS92-12) 900661 (HS92-12) 900662 (HS92-02) 900669 (HS92-12)
	47212 47323	**Cameras:** digital, camcorders, TV cameras	852530 (HS92-02) 852540 (HS96-02) 852580 (HS07-12)
Communication	4526 47211 4722	**Phones/routers/base stations:** phones, routers, base stations, other	851710 (HS92) 851711 (HS96-12) 851712 (HS07-12) 851718 (HS07-12) 851719 (HS96-02) 851730 (HS92-02) 851740 (HS92) 851750 (HS96-02) 851761 (HS07-12) 851762 (HS07-12) 851769 (HS07-12) 851780 (HS96-02) 851781 (HS92) 851782 (HS92) 852520 (HS92-02)
	47211	**Transmission**: TV/radio transmission apparatus	852510 (HS92-02) 852550 (HS07-12) 852560 (HS07-12)
Medical	4811, 12, 17	Capital equipment, therapeutics (partial)	901811 901812 901813 901814 901819 901820 9022 902140 902150

[41] Corresponds to ISICRev4: 2670: Manufacture of optical instruments and photographic equipment.

Category	CPC codes	Sector and products	HS codes (all)
Analytical instruments/industrial equipment	48211 48231 48241-45 48253 48261-64 4827	Microscopes, navigation instruments, balances, mechanical testing, calibration, counters, electricity measuring	901210 901410 901420 901480 901600 902410 902480 90271-5 902780 90281-3 90291-2 90301-4 90308 90321-2 903281,9
	4822	Radar/radio navigation equipment	8526
Parts for computers/storage devices and office equipment	4517-18 4527		8473* (HS92/96-12) 900990 (HS92-96) 900991 (HS96-02) 900992 (HS96-02) 900993 (HS96-02) 900999 (HS96-02) 844399 (HS07-12)
Parts for multiple[42] (HS codes 8525-8528)	47403	Technically covers consumer electronics, communication and analytical/industrial; goes into ISIC4: 2630, 2640, 2651	8529* (HS92-12) 852910 (HS92-12) 852990 (HS92-12)
Parts for communication equipment	4343 47401	Part is for office equipment, but likely smaller share Parts for phones/routers/base stations	851790 (HS92-02) 851770 (HS07-12)
Parts for consumer electronics	48353	Parts for cameras	900691 (HS92-12) 900699 (HS92-12)
	47402	Parts for sound/video	851890 (HS92-12) 8522* (HS92-12) 852210 (HS92-12) 852290 (HS92-12)
Passive	4711-12 47171-72	Resistors, capacitors, varistors	8532 8533
Printed circuits	4713	Circuit boards (PCs)	8534
Active	4714	Tubes/valves: thermionic, cold cathode or photo-cathode	8540
	4715 47173	Discretes/semiconductors: transistors, diodes, PV cells	8541
Integrated circuits[43]	4716 47173	Semiconductor media electronic integrated circuits (ICs) Microassemblies Parts	8542 854210 (HS02) 85422* (HS02) 85423* (HS07-12)854260 (HS02) 854270 (HS02) 854290 (HS02-12)
Discs/media (added 9/8/16)	4751-52	Recorded media, 8524 goes entirely into 8523 in HS07.	8523 8524 (HS02)[44]

Sources: S. Frederick (2019); S. Frederick and G. Gereffi (2013). Note (*): indicates all codes longer than the code listed are included.

[42] Includes parts for industrial equipment as well because it covers parts for HS codes 8525-8528 (Note: 1/8/16).

[43] For HS02 854210, also 852352 in HS07; for HS02 85422 and 85427, also 85423 in HS07; for HS02 854270 also 854390, 854890 in HS07.

[44] 8523: Prepared unrecorded media for sound recording or similar recording of other phenomena, other than products of chapter 37. 8524: Records, tapes and other recorded media for sound or other similarly recorded phenomena, including matrices and masters for the production of records; excluding products of chapter 37.

Appendix F
Global value chain product codes for medical devices global value chain industry

Stage	Category	Product examples	CPC2	ISIC4	HS07
Medical	Drug delivery disposables	Needles, syringes, Catheters, tubing, IV sets	48150	3250	90183
	Medical and surgical instruments	Dental instruments, forceps, medical scissors, dialysis devices, defibrillators	48130 48150	3250	90184 90185 90189
	Therapeutic devices	Artificial body parts, hearing aids, pacemakers, crutches, implants, prosthetics	48171 48172	3250 2660	9021
	Capital equipment	MRI, ultrasound, X-rays, patient monitoring systems, sterilizers	48110 48121 48122 48140	2660 3250	90181 90182 9022 841920
	Other appliances	Respiration, mechano-therapy, psychological testing, breathing	48160	3250	9019 9020
	Furniture	Dental chairs, hospital beds, wheelchairs	48180	3250 3092	9402 8713
	Medical supplies/ consumables*	Bandages Suture materials Ostomy bags Gloves	35270 35290 36990 36260	2100 2100/3250 2220 2219	3005 300610 300691 401511
	Medical manufacturing services	Medical and dental instrument and supply companies	88907 88747	3250 2660	--
Services	Wholesale trade services	Medical and orthopaedic goods	61174 61274	--	--
	Retail trade services	Non-specialized and specialized stores, mail order/Internet, non-store and contract basis for medical/orthopaedic goods	62174 62274 62374 62474 62574	--	--
	Buyers and users	Human health service providers (hospitals, specialized, other)	9311 9312 9319	8610 8620 8690	--
	R&D services	Medical sciences and pharmacy	81130	7210	--
	After-sales services	Installation, maintenance and repair of medical machines and instruments	87350 87154	3320 3313	--
	Retail trade services	Non-specialized and specialized stores, mail order/Internet, non-store and contract basis for medical/orthopaedic goods	62174 62274 62374 62474 62574	--	--

Stage	Category	Product examples	CPC2	ISIC4	HS07
Services	Buyers and users	Human health service providers (hospitals, specialized, other)	9311 9312 9319	8610 8620 8690	--
	R&D services	Medical sciences and pharmacy	81130	7210	--
	After-sales services	Installation, maintenance and repair of medical machines and instruments	87350 87154	3320 3313	--

Sources: S. Frederick (2019); S. Frederick and G. Gereffi (2013). Note (*): indicates all codes longer than the code listed are included. Frederick, S. (2019). Notes (*): medical supplies are not medical devices but are related and included with devices in some analysis. (--) indicates code is not used for that product/stage.

Part III
Integrated business statistics

A. Global enterprise perspective

1. Global enterprises are complex business organizations with a global reach. They organize and coordinate their core production activities and related business functions among various enterprises across the world and may have different ownership structures (e.g., foreign affiliates) and market relationships (e.g., independent suppliers), and may themselves have other suppliers along the GVC. In general, a global enterprise is the ultimate investor and controls the GVC, implying that a global enterprise is a lead firm within a specific GVC. A global enterprise can organize its core production activities (production of goods and services to be sold in the market) in a number of different business lines. Such an enterprise could be a lead firm for various GVCs in different specific industries. Therefore, activity-type measures for businesses are increasingly becoming critically important to understand global enterprises' business models and their roles within a GVC. Thus, for the GVC satellite account approach, business, trade and investment data need to be collected at the statistical unit of the business line of a global enterprise to allow for the correct data specification of the industry-specific GVCs controlled by the lead firm.

2. Business lines are characterized by a sequence of business processes that brings a product from its conception to its final consumers. Collecting data for each business line separately in order to describe the various business lines is an integral part of profiling the enterprise. For example, Philips N.V. is known for its consumer electronics, but also produces medical devices as a second line of business, and Unilever is known for producing food items, but also non-food products, such as toothpaste, shampoo, soap and detergents.

3. For each business line, the enterprise needs to invest in R&D, set up production processes and services for engineering and testing, and have dedicated marketing, sales and after-sales. The enterprise may further have ICT services, logistic and transportation services, and administrative functions, which it shares across several business lines. Those business functions can be divided into core functions and support functions, of which core business functions are activities of an enterprise oriented to the market yielding income, and support business functions, which are carried out by the enterprise in order to permit or to facilitate the core business functions. A distinction must be made between production units, which undertake support business functions for own use (in one or more industry-specific core functions) and for sale in the market or for third parties.

4. Based on its industrial strategy and financial and tax planning considerations, a global enterprise defines a business model of where to allocate its different activities and transactions (i.e., domestically or internationally and either within or outside the enterprise group). Business models can be classified into three different types: divisional, functional and complex-matrix. In the divisional model, each business line is organized as a specific entity that includes all the related business functions. In the

functional business model, business lines and the related business functions are split among different organizational entities to maximize the benefits that specialized, independent and supporting business functions can provide to business lines. The complex-matrix business model combines the two approaches in a flexible way. That mixed type of business model is most commonly adopted by global enterprises, in both developed and developing countries.

5. The statistical relevance of the specific business model adopted by a global enterprise is twofold. First, it provides guidance to better understand the way enterprises tend to arrange their activity in a country based on the set-up of legal entities. Second, it is key to understanding the different economic variables based on financial or managerial accounts held by the legal entities that are influenced by the specific business model adopted by the enterprise.

6. To operate a business in a country as an affiliate of the global enterprise, a new resident legal entity needs to be established. Such a legal entity can assume different forms, such as a foreign affiliate or a branch. The adoption of a specific form of legal entity depends on the national regulatory environment and is sensitive to financial and tax planning motivations. The statistical implications in terms of availability of data are quite different, because only in the case of a foreign affiliate is the full set of variables included in the financial statements usually available, while in the case of a branch a more limited set of business data is usually available.

7. Additionally, a special-purpose entity may be formed, which may take either the form of a legal unit or a branch. Special-purpose entities are entities that have little or no physical presence and no significant production activities and provide supporting functions in terms of administrative, financing and insurance services. However, special-purpose entities can also be set up to manage production activities and real business services with the purpose of serving the enterprise group globally, such as, for example, in the transport and mining industries. The latter institutional units present challenges, both in terms of effective residence of the activity in the country and availability of business data.

8. In the case of the divisional model, the global enterprise tends to establish a single legal entity for each business line in every country where it operates. This legal entity usually assumes the form of a resident-corporation under the control of the global enterprise and includes all of the business functions associated with the business line. This legal framework is replicated for each different business line, which is created by the global enterprise in the host country. By contrast, in the case of the functional model, legal entities are set up for each business function, which would support the various business lines in the host country in a consolidated manner. Finally, in the case of the complex-matrix business model, a specific legal entity is set up for each of the business lines, as well as the business functions that are considered relevant by the global enterprise.

9. The configuration of legal entities resident in a country that reflect the portion of the business model of the global enterprise carried out in the country can also be more sophisticated. For instance, financial and industrial holding companies can also cluster several legal units devoted to similar activities. The high fragmentation of activities in many legal entities and their instability over time can generate statistical problems in terms of data collection and the accuracy and consistency of statistics. Fragmentation and changes in the legal entities may cause problems in updating information on statistical units in the statistical business register, which can impact the quality of business data for short-term indicators and in targeting data collection for structural business surveys.

10. However, the industrial strategy of the global enterprise tends to be quite stable over time in terms of business lines and business functions carried out in a country with respect to the relatively frequent transformation in the number of legal units resident in a country. A better understanding and tracking of the industrial strategy and the business model of the global enterprises can improve the updating of the statistical business register and improve data collection strategies, and the overall consistency of official figures across different statistical domains.

11. Business data relevant for the classification of business activities in business lines and business functions could be (partially) collected from financial statements or from management accounts (internal reporting). Financial statements are usually available at the legal entity level and are prepared for external reporting purposes, while management accounts are usually organized by business processes. Therefore, management accounts are a better source for high-quality information from the global enterprise for statistical purposes, although classification and measurement schemes tend to be not only country-specific but also enterprise-specific.

12. IT solutions may assist in reconciling and integrating external and internal reporting. Enterprise resources planning software incorporate the key business functions of an organization with full scalability of the business data process from internal reporting to financial statements. International accounting standards, such as the consolidation of corporate financial accounts according to the International Financial Reporting Standards, not only provide a common global language for business affairs but also ensure that company accounts are understandable and internationally comparable. Those accounting standards also provide guidance for data collection from global enterprises, such as the accountability of international transactions in goods, services and intangible assets. In addition, reporting based on the international accounting standards also result in high-quality data on key financial variables broken down by business lines and economic jurisdictions.

13. To fully exploit the informative potential of such internal and external business accounts based on international accounting standards, national statistical authorities must closely engage with the global enterprises, while at the same time strengthening their capability to classify, analyse and integrate those data in standard statistical processes. As a result, those activities require quite labour-intensive efforts to be carried out by skilled statisticians and business analysts, as in the case of LCUs established by some countries to ensure the consistency of official figures produced across different statistical domains.

B. Business lines and related business functions

14. The business statistics framework introduced in these guidelines integrates the business models and business accounting schemes concretely adopted by global enterprises in their day-to-day activities. As such, the enterprise activities can be broken down first by business line and then by the supporting business functions, which together define the business process. Each business function of a business line can be carried out inside or outside the global enterprise and can be located either in the resident country or abroad.

15. The starting point of this approach is the business line, which consists of the production of a specific group of final goods or services to be sold in the external market (intra-group flows of goods and services are usually excluded). According to the principles of international accounting standards, a business line identifies a specific area of business that is relevant for the enterprise's profitability and with respect to which a well-defined business strategy and internal reporting system is usually

available. A business line is often characterized by well-defined information systems on costs and revenues and is related to the industrial strategy of the enterprise. It is also characterized by a dedicated internal information system for the monitoring of the company's economic performance and is related to decision centres that have a certain degree of independence over budget and production-related decisions. More specifically, the manager responsible for the business line usually reports directly to the board (top management) and has a certain degree of autonomy in operational and financial decisions.

16. The proposed classification framework can be used to classify business processes carried out by the global enterprise independently from the organization of its legal entities. That approach is flexible across different business models and is relatively independent of changes in the structure of legal entities of the enterprise. However, enterprises can adopt different criteria in defining their business lines; that is, they can use a production process, a technological or client portfolio, a geographical market segmentation or a combination thereof.

17. The classification by business processes allows for a better understanding of the international flows in goods, services and intangible assets, either intra- or extra-group. Mapping each business process to a breakdown by location, markets served, and ownership linkages will allow for the classification of complex operations, including the concentration of business functions in global or regional hubs.

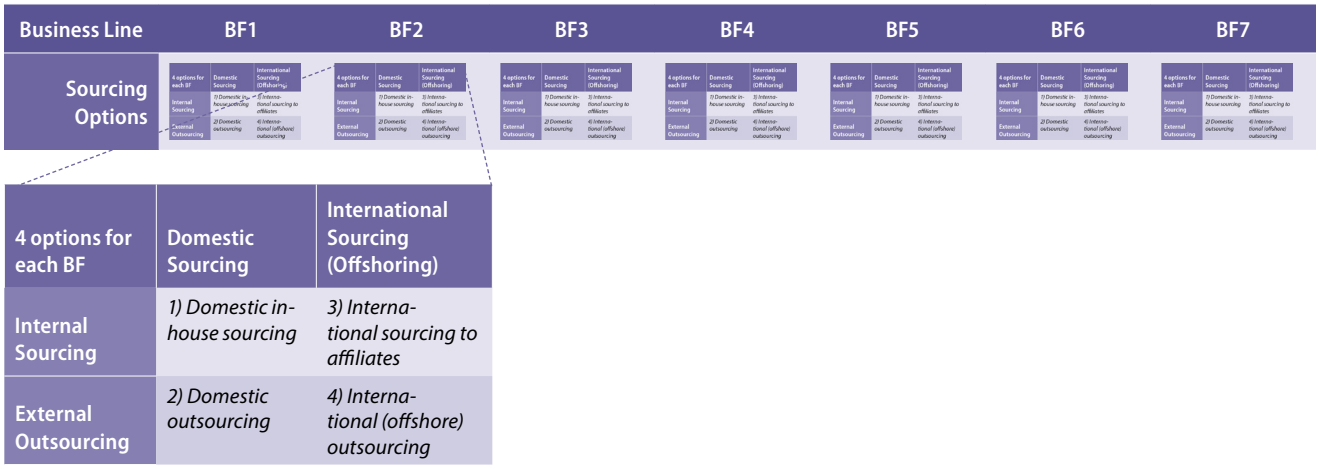
C. Business functions and sourcing arrangements

18. Lower trade and investment barriers, liberalized domestic markets, sharp reductions in transportation and communication cost, have allowed the unbundling and geographical dispersion of value-chain activities. Digitization and technological developments, coupled with new institutional environments, have further allowed domestic enterprises to increasingly organize their business processes globally, breaking up their business processes in distinct business lines and functions, of which goods and services are supplied by a growing number of affiliate and non-affiliate firms, either within or outside the national economy. International sourcing of business functions is a key feature of global enterprises in the industrialized economies as they increasingly optimize their production processes globally.

19. As illustrated in figure 3.1, business functions for each business line can be sourced domestically or internationally and can be sourced within the enterprise through affiliates or outside the enterprise through non-affiliated enterprises. In addition to producing the goods or services from which they earn their revenues, enterprises require a variety of service functions to support their core line of business. Business functions can be viewed as an aggregation of certain supporting tasks carried out by the enterprise. They are equally applicable to goods-producing and services-producing enterprises. The concept of business function is like the concept of occupation but is focused on business activities rather than the activities of individual workers. A specific business function will typically involve a range of job categories and tasks.

20. The concept of business functions can be described by nine generic business functions: R&D, design, production, marketing and sales, distribution, customer service, firm infrastructure, human resources and technology development. For the purposes of statistical surveys, business functions can be associated to the international product classifications such as the CPC. However, because any product of a business function (like manufacturing services, engineering services, etc.) can be the main output of an enterprise for a third party, the producers of the business functions can also be classified through their primary product to an industrial activity code, such as ISIC.

Figure 3.1
Business lines by business functions and sourcing arrangements



4 options for each BF	Domestic Sourcing	International Sourcing (Offshoring)
Internal Sourcing	*1) Domestic in-house sourcing*	*3) International sourcing to affiliates*
External Outsourcing	*2) Domestic outsourcing*	*4) International (offshore) outsourcing*

21. The core business function of the global enterprise represents the revenue-producing activity of the enterprise and will in most cases equal the main economic activity of the enterprise. It includes the production of goods or services intended for the market or a third party. The core function may also include other (secondary) revenue-generating activities if the enterprise considers them to be part of the core business function. Support business functions; that is, ancillary activities, are carried out in order to permit or facilitate production of goods or services but are not themselves sold directly to the market or to a third party. The latter functions do not directly generate revenues, but only costs. However, the cost and quality of support functions can make important contributions to the competitiveness of enterprises.

Box 3.1
Surveys on sourcing of business functions

The first official survey to introduce the concept of business functions in a statistical context was the European Union Survey on International Sourcing, carried out in 2007 (Nielsen, 2008 and https://ec.europa.eu/eurostat/statistics-explained/pdfscache/25826.pdf). The survey was conducted in 13 European countries, using seven business functions and a residual "other" category. The survey was repeated in 2012 with six business functions. In both surveys, business functions were divided into the core business functions of the enterprise and support business functions. These business functions are defined as follows:

Core business function: This function is the primary activity of the enterprise and will in most cases equate with the main activity of the enterprise. It includes production of goods or services intended for the market/third parties carried out by the enterprise and yielding income. The core business function, in most cases, equates with the primary activity of the enterprise. It may also include other (secondary) activities, including the production of intermediate inputs, if the enterprise considers them to comprise part of their core set of functions.

Support business function: Support business functions are ancillary activities carried that facilitate the production of goods or services intended for the market or for sale to third parties. The outputs of the support business functions are not themselves intended directly generate revenues.

Box 3.1
Surveys on sourcing of business functions (*continued*)

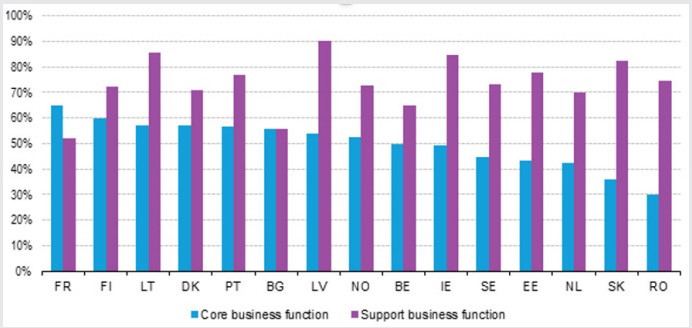
A more elaborate version of the European list of business functions was used by Statistics Canada for the Survey of Innovation and Business Strategy, first carried out in 2009 and repeated in 2012. The list has a total 14 business activities plus a residual category (see appendix A of part III). The list in Canada split the core function into two: production of goods and production of services and identified call centre and help centre activities separately from the European aggregated support function marketing, sales and after-sales services including help desks and call centres. Furthermore, ICT services was divided into the following three groups: software development, data processing and ICT services. Finally, the support function administrative and management functions was divided into four activities: legal services, accounting and bookkeeping, human resources management and financial management.

Because Statistics Canada essentially unpacked the European list of business functions, its sub-categories can be aggregated to the European list. Based on the Canadian experiences, the third European survey on international organization and sourcing of business functions, carried out in 2017–2018 also introduced the splitting of the core function into production of goods and services and furthermore reintroduced the splitting of the support function engineering and R&D-related services into two separate support functions.

Below are some insights in the international sourcing of core and support functions in European countries expressed as shares of enterprises sourcing internationally in the period 2009–2011.

A pilot international sourcing survey called the National Organizations Survey was carried out in the United States, in 2011. The survey used a business function list very similar to the European Survey. It split the European category of "marketing, sales and after-sales services including help desks and call centres" into two, "customer and after-sales service" and "sales and marketing", and specified facilities maintenance as a distinct business function instead of including it in the residual "other business functions" category (see third column of table A). Like the list in Canada, the business function list used in the national statistical organization can be compared to the European list (Clair Brown, Timothy Sturgeon and Connor Cole, 2013). "The 2010 National Organizations Survey: Examining the Relationships Between Job Quality and the Domestic and International Sourcing of Business Functions by United States Organizations." IRLE Working Paper, University of California Berkeley, Berkeley, United States. https://irle.berkeley.edu/wp-content/uploads/2013/12/The-2010-National-Organizations-Survey.pdf).

Finally, the concept of business function has been used by universities to carry out surveys on a smaller scale, for instance the Republic of Korea Institute for Industrial Economics and Trade has carried out a survey on the automobile industry in the Republic of Korea based on the European questionnaire in 2016 (Cho, 2016).



22. Box 3.1 presents a summary of existing surveys on the international organization and sourcing of business functions. Appendix A shows the changes made over time in the Business Functions surveys carried out in Europe and North America.[45]

[45] The authors note that Eurostat was in the process of revising its proposed business function classification list for use in business function surveys at the time of this writing.

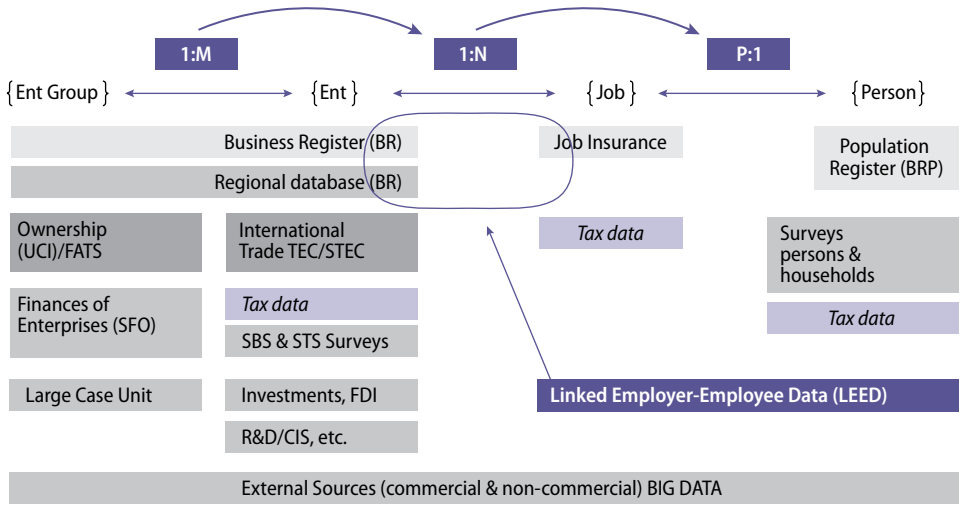
D. Microdata linking

23. Fully understanding the nature of GVCs and global dependencies requires an integrated global view of production and consumption for specific GVC industries. Microdata linking is an appropriate statistical instrument for measuring the production arrangements of the global firm in industry-specific GVCs. Microdata linking is the combining of microdata on entities, such as enterprises, jobs and persons. Figure 3.2 shows an example of a general microdata linking model used at Statistics Netherlands. Microdata linking has become an important cornerstone in the production of new statistics, both for national and international purposes, and is now also widely acknowledged as a strategic activity to reduce respondent burden. Microdata linking can assist in answering questions on the domestic and Cross-border interconnectedness of the firm network and its consequences for jobs, income and growth. At the national level, it can help to analyse job dynamics, income and welfare for its citizens.

24. Microdata linking also supports analysis of both firm and employee characteristics, which allows for improved understanding of the social implication of increased international trade, of outsourcing and offshoring of business functions, and of growing foreign direct investment flows that imply that locally operating firms are increasingly owned, controlled and managed by foreign enterprises. The creation of a linked employer-employee data set, for instance, primarily involves the integration of a wide variety of variables on employees and the labour force with the statistical business register that provide firm-level variables, such as foreign ownership, production, turnover, innovation, investments and trade. The actual organization of linked employer-employee data set databases depends on the national system(s) of the data collection (preferably based on unique identifiers) and the availability of administrative registers.

25. Another example of microdata linking is the compilation of statistics on trade in goods by enterprise characteristics, which link two major statistical domains which have traditionally been compiled separately: that is, structural business statistics and

Figure 3.2
General MDL Model used at Statistics Netherlands



international trade in goods statistics. Specifically, trade by enterprise characteristics provides information on the share of small, medium and large-sized enterprises in total international trade.

26. An important application of coordinated microdata linking or a distributed microdata research approach in GVC measurement is the determination of a complete and accurate picture of the activities of MNEs within the national borders. The first priority is to compile nationally consistent data on large MNEs. Next, there is a great value in sharing data, even at the aggregated level. In addition, statistical offices need to find solutions for sharing granular data, as long as confidentiality and the trust of respondents can be guaranteed, because policymakers are asking for granular data.

27. It is important to ensure that the linked microdata sets are extrapolated to the total population of enterprises in order to be able to generalize the results to the total population level. That extrapolation is often a big challenge, as linked microdata sets can miss many observations because some of them are based on sample surveys. Other reasons for missing data are unit non-response, item non-response, inactive units and undercoverage of an administrative source; for example, owing to ineligibility of certain sub-populations or the use of thresholds. Some variables are completely observed; e.g., ISIC activity code and size-class, as they are available for all statistical units in the national statistical business registers. But for most variables, some values are missing, and often a variable is observed for only a small fraction of the total population.

28. Microdata sets should therefore be accompanied by information on the reasons for missing data, as well as information about the methods used to impute values for them. That metadata is important in general for users of data, but for this information it is essential for microdata linking. For example, structural business statistics are often compiled from surveys based on samples stratified with respect to economic activity and size-class. In that case, most of the missing data is due to the sampling design, while some missing data is due to statistical unit non-response and some due to item non-response.

Box 3.2

Generalization and aggregation of microdata to the total enterprise population

Official structural business statistics on the entire enterprise population are obtained using survey weighting. Weights are calculated for all responding enterprises (statistical units). Those design weights are subsequently adjusted to account for unit non-response. For that purpose, in the case of structural business statistics, number of persons employed and tax-turnover information, in addition to size-class and economic activity, are often used as auxiliary variables. Missing information due to item non-response is usually imputed. The use of weights avoids biases in the estimates due to unequal sampling probabilities according to the sampling design and reduces non-response bias.

Rather than imputing non-responses, the microdata sets on enterprises can be linked to variables from other sources. However, often when linking structural business statistics data and variables with those from other sources, it is no longer evident that the original structural business statistics weights can be used, because the set of statistical units for which all variables are jointly observed from all sources is a subset of the structural business statistics-responding enterprises in the original sample. The missing data pattern is very likely to be different, thus a new weighting or imputation strategy is needed (Boonstra and others, 2004). Sampling designs and other reasons for missing data vary between countries. Consequently, the approaches taken and the variables to be added and retained to the linked microdata sets may to a certain extent be country-specific.

Box 3.3
Joint Nordic-OECD project on linking firm level data with macroeconomic statistics

The Nordic national statistical organizations have been the first to develop a bottom-up, collaborative response to the increased policy questions regarding globalization, building on national data sources at the micro level. Each Nordic national statistical institute (Denmark, Finland, Norway and Sweden) has set up a database that combines, among others, structural business statistics, foreign affiliates statistics and trade statistics, using harmonized variable codes and database structures. By linking those data sources, it is possible to reflect firm heterogeneity by identifying not only enterprises by employment size and trading activity (trader/non-trader) but also by group status (independent/belonging to an enterprise group) or by nationality of ownership (domestically/foreign owned) or any combination of those firm characteristics. Given that administrative sources are widely available and are used in the Nordic countries, that linked microdata generally cover nearly the entire universe of firms and trade transactions. More detailed descriptions of those data sets can be found in Nordic Countries in Global Value Chains (Nordic Council of Ministers and others, 2017). Statistics Denmark was responsible for developing the software program that was run in each country to create the output needed, to ensure the exact same file format and definitions.

To integrate the output derived from the linked Nordic microdata with OECDs TiVA ICIO, a variety of consecutive steps was taken, involving further data preparation (industry conversions, aggregations), and the alignment of business data to national accounts concepts. Finally, a series of challenges specific to breaking down the international trade flows by firm type were addressed. The software program for those calculations has been developed by the OECD, and was subsequently sent, accompanied by the relevant conversion tables and the TiVA ICIO, to the Nordic national statistical institutes to run in combination with their pre-prepared tables based on linked microdata. Only the final results were then sent back to the OECD. This highly coordinated research method not only ensured consistency of the results across countries, but also avoided the need for, on the one hand, the Nordic national statistical institutes to invest time to suppress confidential cells in the data, and on the other hand, the need for OECD to subsequently develop estimations for these missing cells.

The TiVA ICIO follows the practices of SNA, where imports by firms are included as direct imports even if they pass through resident wholesale and retail industries first. In other words, imports of goods by wholesalers and retailers for subsequent sale without any further processing are not recorded as their imports in SNA. The same holds for exports of goods that have not been the subject of any further processing by wholesalers and retailers in the linked microdata used in this study, trade is matched to those enterprises that are immediately responsible for imports and exports, including to wholesale and retail firms. To align with national accounts concepts, the export and import values for the wholesale and retail industry as reported in the linked microdata were constrained to the levels reported in Nordic SUTs (i.e., the ratio of exports (or imports) in total output). The additional trade (on average about half of what was reported) was subsequently distributed to other sectors in a two-stage procedure by first identifying the products involved (using official national Trade by Enterprise Characteristics data) and then proportionately allocating these products to using (importing) or exporting industries and firm types on the basis of information included in the microdata and national SUTs. One of the implications of that adjustment is that in the breakdown of firms by trading status, certain "export only" firms may in fact still import, from a national accounts perspective, via wholesalers.

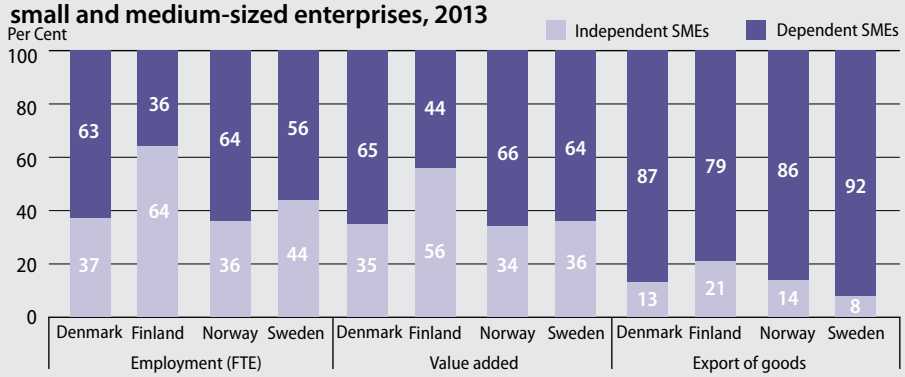
The purpose of the project was to overcome some of the shortcomings of the current TiVA database by introducing firm-based characteristics to better reflect the hetero-

Box 3.3 (*continued*)
Joint Nordic-OECD project on linking firm level data with macroeconomic statistics

geneous nature of GVC integration – including size, for example, small and medium-sized enterprises (dependent and independent); ownership (i.e., foreign and domestically owned enterprises) and trading status (i.e., trading and non-trading companies). The report provides new insights on GVC integration and responds directly to the policy questions raised above and many others.

The analysis focuses both on the economic impact (i.e., the value-added produced) and the employment consequences of GVCs (how much employment in the Nordic countries depends on GVC involvement), and further reveals the importance of domestic value chains, and the role of foreign investment in driving domestic supply chains, both upstream and downstream. The report highlights, throughout, the differences across key industries within the Nordic economy.

Independent and dependent small and medium-sized enterprises, per cent of total employment, gross value-added and exports of goods, of small and medium-sized enterprises, 2013



Source: Nordic Countries in Global Value Chains: Statistics Denmark and OECD (2017)

29. Box 3.2 presents details on generalizing and aggregating microdata to the entire enterprise population.

30. Box 3.3 presents an example of globalization studies building up from microdata undertaken by the Nordic countries.

E. Data sharing and exchange

31. Bilateral sharing of business demographic data and business accounting data, or business microdata, would be a concrete way forward to compiling the data needed for a multi-country GVC-specific SUT. However, it is widely known that direct access and data sharing of microdata at the international level has proven to be limited owing to strict privacy and confidentiality laws governing those data. While there are ongoing initiatives to make progress in addressing data-sharing issues across countries, such as the G20 Data Gap Initiative, which is further discussed in box 3.5, and forthcoming Guidance on National and International Exchange of Economic Data from the Bureau of the Conference of European Statisticians (described in paras. 39-43), it is well understood that this is an area that is still being developed.

32. Therefore, rather than direct sharing of microdata, the so-called "coordinated microdata linking" or "distributed microdata research" approach has been used in most

business statistics-related microdata linking projects to compile international comparable statistics on economic globalization. It requires central coordination of the database construction, the analysis and publication, respecting subsidiarity and national legislation. A typical coordinated microdata linking is carried out in three phases.

33. The first phase involves the construction of the linked microdata set. The project coordinators produce standardized guidelines explaining in detail how the data sets in each participating country are to be structured and provide a common code to ensure that identical tables are made in all countries. Each country records information from all the data sources used in the project into its own national database. Those linked microdata sets are stored locally at the national statistical institutes throughout the project and are not shared with third parties.

34. In the second phase of the project, the data set is tested for consistency. Although each data set being used in the project has already been carefully edited, it is necessary to carry out further checks to ensure, for example, that enterprises are represented by the same statistical units across different data sets and over time, as the reporting units used for specific enterprises can, and often do, differ across the data sources in each project. In fact, in all business statistics projects many differences are found and corrected. Tests used in this phase of the projects are devised by the project coordinators and implemented locally by the national statistical institutes.

35. In the third phase of the project, standardized statistical output is created in each country consisting of descriptive and longitudinal analysis. Sometimes more sophisticated statistical methods are used.

36. Box 3.4 illustrates an example of the issues relating to data consistency that may arise when conducting microdata linking across countries.

37. Innovative solutions need to be developed where data are collected once and used often for different purposes. Bringing together legal experts, IT experts and statisticians may help to advance this work. Pilot exercises could help identify which data should be shared internationally and how it can be done in practice. Meeting with global enterprises in person can help to resolve inconsistencies between data from different sources. Such meetings may also allow for the identification of and the access to

Box 3.4
Microdata linking and data asymmetries

Microdata linking can also be used to improve the quality of existing statistics. In 2013, under the umbrella of the European statistical system's ESSNet project on Measuring GVCs, the NSIs of Denmark, Norway and Finland linked statistics on the activities of affiliates based abroad (outward foreign affiliates statistics) with statistics on foreign-controlled enterprises resident in the compiling economy (inward foreign affiliates statistics). Since inward foreign affiliates statistics are based mostly on administrative (subset of structural business statistics) data while outward foreign affiliates statistics information is collected by a survey, the quality of inward foreign affiliates statistics is generally assumed to be superior. The approach taken was to mirror inward and outward foreign affiliates statistics data sets between the countries, where control was exerted from an enterprise resident in one of the three countries and the foreign affiliate was located in another. In theory, that approach should have resulted in an identical set of affiliates in inward and outward foreign affiliates statistics; however, the exercise showed that there are some discrepancies between the two statistics and gave important leads for the improvement of foreign affiliates statistics data quality.

business accounting data that are not collected nationally but can be retrieved from the internal and external business accounting reports across the business operations of an MNE. The cooperation would also allow for clarification of how the MNE should report its data for national statistics, such as for IPP. While visiting a global enterprise may be costly for a national statistical organization, such meetings may be facilitated in other ways, such as the enterprise visiting the national statistical organization or agreeing to meet at regional corporate offices closer to it .

38. Legal and confidentiality considerations constrain the exchange of microdata between countries. Especially in cases where MNE data are already publicly available, the principle of confidentiality for the exchange of microdata may have to be amended. For example, European legislation accommodates for the possibility of transmission of confidential data, both within the European Statistical System and within the European System of Central Banks.

39. Another way to address the legal obstacles associated with data exchange is to help countries draft legislation that facilitates data exchange. For example, it would be useful to consider an exemption to data confidentiality to allow such firm-level data exchange which are made publicly available by the respondent itself, directly or indirectly, to be considered non-confidential. That could include data published through annual or quarterly reports, if they meet the statistical definitions. Those data could then also be exchanged freely among producers of official statistics.

40. It would also be useful to add a common element on the exchange of individual data between NSOs and possibly with other producers of official statistics. Exchange of individual data, including identifiers, between national producers of official statistics may take place exclusively for "statistical purposes" in the respective area of competence of each producer. Use of data for "statistical purposes" should be defined as the exclusive use of data for the development, quality improvement and production of official statistics, statistical analyses and statistical services. Mentioning quality improvement would be important as a key justification for engaging in data exchange.

41. Several ongoing international initiatives are attempting to make progress in addressing data-sharing issues across countries, such as the G20 Data Gaps Initiative, which is further discussed in box 3.5.

42. To ensure continued meaningful and correct measurement of global production and trade, and to understand their influence on macroeconomic and business statistics, many statistical offices are considering how to exchange data more effectively, especially on the large and complex MNEs. Considering that, the Bureau of the Conference of European Statisticians established the Task Force on Exchange and Sharing of Economic Data (the "Task Force")[46] in February 2017 to facilitate progress in that area. The main output of the Task Force work will be *Guidance on National and International Exchange of Economic Data*, expected to be finalized and endorsed by the Conference of European Statisticians in April 2020.[47] The Task Force is also reviewing concrete examples of useful data exchange; identifying enablers and obstacles and proposing practical options; finding ways to describe MNEs and changes in their structures; and proposing approaches for LCUs in statistical institutes.

43. While there are rules in place for national data sharing and even for international data sharing in the European Statistical System,[48] the Task Force has preliminarily found that there are no frameworks for bilateral or multilateral data exchange between statistical producers beyond the European Union.[49] Thus far, the Task Force has reviewed examples of successful data exchange, finding that, while one-off aggregate-level data exchange seems quite easy to organize if there is a common interest, willingness, and mutual agreement between the parties, regular data exchange of con-

[46] *Terms of Reference of the for the Task Force on Exchange and Sharing of Economic Data*. CE/CES/BUR/2017/FEB/4/Rev.1

[47] ECE/CES/2018/8, para. 80. Available from www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2018/CES_8_E_Exchange_and_sharing_of_economic_data.pdf.

[48] Article 21 of the Regulation (EC) No 223/2009 of the European Parliament and of the Council of 11 March 2009 on European statistics as well as Council Regulation (EC) No 2533/98 of 23 November 1998 concerning the collection of statistical information by the European Central Bank accommodate the possibility of transmission of confidential data both within the ESS and the European System of Central Banks.

[49] ECE/CES/2018/8, para. 27.

Box 3.5
G20 Data Gaps Initiative / financial reporting requirements

In 2009, the G20 Finance Ministers and Central Bank Governors endorsed 20 recommendations to address data gaps revealed by the global financial crisis. The Initiative, aimed at supporting enhanced policy analysis, is led by the Financial Stability Board and the IMF. The Inter-Agency Group on Economic and Financial Statistics plays the global facilitator role to coordinate and monitor the implementation of the DGI recommendations.

The first phase of DGI was successfully concluded in September 2015 and the second phase of the Initiative (DGI-2) was endorsed by the G20 Finance Ministers and Central Bank Governors. The key objective of the DGI-2 is to implement the regular collection and dissemination of comparable, timely, integrated, high-quality and standardized statistics for policy use. DGI-2 encompasses 20 new or revised recommendations, focused on data sets that support: a) monitoring of risk in the financial sector; and b) analysis of vulnerabilities, interconnections and spillovers, not least cross-border.

DGI contain several recommendations that are of direct relevance of the discussions on globalization and the development of the extended sector accounts. It emphasizes the availability of macroeconomic statistics and promotes the implementation of a recommended granularity in the accounts. It also has far-reaching recommendations about the availability of microdata and contains relevant initiatives about the exchange and sharing of data. All those initiatives therefore can be seen as being supportive and of relevance to the statistical work in the field of globalization and the analysis of global value chains.

The implementation of the DGI-2 recommendations is regularly monitored with a view to being concluded by 2021. Of specific interest to the work on globalization is the recommendation on the elaboration of the sectoral accounts, detailing the non-bank financial sector and the development of from-whom-to-whom matrices. The recommendation on the Sector Accounts includes the request to distinguish foreign-controlled enterprises from domestically-controlled enterprises, which is part of the GVC-specific institutional sector accounts elaborated in part II of these guidelines. This recommendation on the sectoral accounts is complemented by a recommendation for international investment position on the external sector – to provide a separate detail on the reporting of non-financial corporations supported by the increased coverage, granularity and timeliness of the Coordinated Direct Investment Survey and Coordinated Portfolio Investment Survey data sets collected by the IMF.

Summary of G20 DGI-2 Initiatives with a bearing on Globalization

No. Initiative

8 Sectoral accounts (priority area)

The G20 economies to compile and disseminate, on a quarterly and annual frequency, sectoral accounts flows and balance sheet data, based on the internationally agreed template, including data for the other (non-bank) financial corporations sector, and develop from-whom to-whom matrices for both transactions and stocks to support balance sheet analysis. The Inter-Agency Group on Economic and Financial Statistics, in collaboration with the Inter-Secretariat Working Group on National Accounts, to encourage and monitor the progress by G20 economies. As part of the proposals, additional detail is sought in the sector accounts as regards the identification of foreign-controlled enterprises in the reporting format. International investment position

10 International investment position

The G20 economies to provide quarterly international investment position data to the IMF, consistent with the Balance of Payments and International Investment Position Manual, sixth edition (BPM6), and including the enhancements such as the currency composition

Box 3.5 (*continued*)

and separate identification of other (non-bank) financial corporations, introduced in that Manual. IMF to monitor reporting and the consistency of international investment position data, and consider separate identification of non-financial corporations, in collaboration with IMF Committee on Balance of Payments Statistics.

12 Coordinated portfolio investment survey

G20 economies to provide, on a semi-annual basis, data for the IMF Coordinated Portfolio Investment Survey, including the sector of holder table and, preferably, also the sector of non-resident issuer table. IMF to monitor the regular reporting and consistency of data, to continue to improve the coverage of significant financial centres, and to investigate the possibility of quarterly reporting. The IMF is working towards the implementation of an increased reporting frequency from semi-annual to quarterly by 2019.

13 Coordinated direct investment survey

G20 economies to participate in and improve their reporting of the IMF Coordinated Direct Investment Survey, both inward and outward direct investment. IMF to monitor the progress.

14 Cross-border exposures of non-bank corporations

The Inter-Agency Group on Economic and Financial Statistics to improve the consistency and dissemination of data on non-bank corporations' cross-border exposures, including those through foreign affiliates and intragroup funding, to better analyse the risks and vulnerabilities arising from such exposures including foreign currency mismatches. The work will draw on existing data collections by the Bank for International Settlements and the IMF, and on the development of the OECD framework for foreign direct investment. The G20 economies to support the work of the Inter-Agency Group on Economic and Financial Statistics.

19 International data cooperation and communication

The Inter-Agency Group on Economic and Financial Statistics to foster improved international data cooperation among international organizations and support timely standardized transmission of data through internationally agreed formats (e.g., Statistical Data and Metadata Exchange), to reduce the burden on reporting economies, and promote outreach to users. The Inter-Agency Group on Economic and Financial Statistics to continue to work with G20 economies to present timely, consistent national data on the PGI website and on the websites of participating international organizations.

20 Promotion of Data Sharing by G20 Economies

The Inter-Agency Group on Economic and Financial Statistics and G20 economies to promote and encourage the exchange of data and metadata among and within G20 economies.

fidential microdata in turn requires legislation or at least a lot of administrative and technical work and trust between the parties.[50]

44. The Task Force has further found that obtaining the required information from MNEs is difficult in some countries owing to the sensitivity of information and that better profiling of MNEs is needed to improve the quality of economic statistics. Once the critical MNEs for data exchange have been identified, the Task Force will determine the data items that would be most useful to share. Needs may vary depending on the data-sharing partners.

45. The Conference of European Statisticians has also expressed support for creating an international network of experts dealing with MNEs' data.[51] Such a network would

[50] ECE/CES/2018/8, para. 52.

[51] Report of the UNECE Task Force on exchange and sharing of economic data from the Twelfth Meeting of the Advisory Expert Group on National Accounts, 27–29 November 2017, Luxembourg. Available from https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12.asp

be useful for exchanging best practices in dealing with MNEs' data. The network could also facilitate identifying the critical MNEs for data exchange, carry out data exchange and analysis, and develop common ways for communicating with and approaching large and complex MNE respondents.

46. The Task Force has prepared a separate note[52] on LCUs as an approach for dealing with multinational enterprise groups, concluding that collecting data from large and complex enterprises will demand an increasingly multidisciplinary approach. Survey managers, statisticians, informatics specialists, subject matter experts, respondent relationship managers and survey design specialists will need to work together to ensure availability and quality of data. More information on the best practices for LCUs in the context of compiling GVC satellite accounts is included in part II.

[52] This note is based on the Chapter on LCUs of the UNECE Guide to Measuring Global Production. ECE/CES/GE.20/2018/18. Available from www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.20/2018/mtg1/18_-_LCU_rev.pdf.

F. Reconciling bilateral asymmetries

47. Bilateral data exchange could also help address bilateral data asymmetries. Often, bilateral reconciliation studies are undertaken to analyse and address bilateral asymmetries in trade statistics, which are a well-documented phenomenon in official statistics. Resolving bilateral trade asymmetries is one of the key steps to compiling multi-country GVC-specific SUTs, as trade flows must be explicitly shown and must be reconciled.

48. Whenever bilateral statistics are reported independently by NSOs in different countries on the same transaction or the same economic activity, inconsistencies can and will occur. Examples of bilateral statistics are international merchandise trade statistics (IMTS), statistics on international trade in services, foreign direct investment statistics and statistics on multinational enterprises and foreign affiliates. Underlying those international transactions and activities are specific contracts between two (or more) economic entities. In principle, the economic transaction is an agreement on a delivery of goods and services against financial compensation (or some equivalence of a financial compensation). The two sides in a bilateral transaction agree on a specific compensation between the buyer and the seller.

49. So why would we ever end up with different numbers in the bilateral statistics of trading partners? The first reason is practical. Statistical agencies in various countries are reporting on – in principle – the same transactions but based on different data sources. The NSOs rely on their own national customs administration, in the case of compilation of IMTS, or conduct their own surveys in case of statistics on international trade in services. Foreign direct investment statistics are based on different administrative records or surveys.

50. In the case of IMTS, the NSO of the exporting country uses the export declarations, while the NSO of the importing country uses the import declarations. Further, the export declaration is completed by the exporting company or its agent, and the import declaration is completed by the importing company or its agent. So, even if NSOs of bilateral partners source from the same kind of administration, the actual records may have been completed differently and will therefore lead to discrepancies in trade statistics. Discrepancies will of course get worse if data for the compilation of trade statistics for one NSO coming from administrative sources and for another NSO from enterprise surveys, as is the case for statistics on international trade in services. Other practical reasons for discrepancies in trade statistics are due to differences in the actual classification of the traded goods on the export declaration versus the import declaration, or due to difference in the time of recording (leaving the exporting country and entering the importing country), especially for transport by sea, or the difficulty of capturing transactions involving goods sent abroad for processing.

51. Besides those practical reasons, bilateral asymmetries appear because of conceptual differences in IMTS, as described below, notably in the: 1) valuation; 2) trade system; and 3) partner country attribution of imports and exports. For 1), merchandise trade imports are recommended to be valued including the charges for freight and insurance, whereas export valuation excludes both of those components. For 2), some countries define their territory for international trade statistics with exclusion of its own commercial and processing free zones. For 3), IMTS 2010 recommends for partner attribution that a) in the case of imports, the country of origin should be recorded; b) in the case of exports, the country of last known destination should be recorded. Country of origin means the country in which the goods have been produced or manufactured, according to the criteria laid down for the purposes of application of the customs tariff. Two basic criteria determine origin: a) the criterion of goods "wholly produced (obtained)" in a given country, where only one country enters into consideration in attributing origin; and b) the criterion of "substantial transformation". Thus, the bilateral comparison of country of origin at imports with country of final destination at exports is not a symmetrical recording of the same trade transactions by the exporting country and the importing country. To be more precise, the current identification of the trading partner (for imports) by country of origin may "skip" countries in which value-added does not reach the level recognized as substantial transformation, while country of final destination would generally be the next country where some transformation takes place.

52. For the purpose of constructing the GVC-specific multi-country SUT, bilateral differences in trade in goods and services need to be reconciled. The following topics should be considered in the reconciliation of trade in goods:[53]

[53] For a more in-depth discussion of bilateral asymmetries, see Compendium Chapter 12.

- **Partner country attribution.** It is advised to use the country of consignment principle to reconcile a difference between country of origin (at the import side) with country of destination (at the partner's export side).
- **Valuation.** It is recommended that both the importing and the exporting country use free on board (FOB) valuation.
- **Trade system.** Both bilateral partners should use the general trade system or agree on which transactions should be excluded.
- **Goods for processing.** If an export transaction happens to be an export from an exporting country after inward processing, the export value could have been declared at factory price. The corresponding import value of the same product by the importing country could have been declared at market price. In such cases, the partners need to agree if the difference (which may be largely for the compensation for intellectual property rights) would need to be allocated as an additional export of services from third country.

53. Reconciliation of bilateral asymmetries in statistics on international trade in services and foreign direct investment will have to be studied on a case-by-case basis. Exchange of microdata would be certainly the best solution in all cases.

G. Building a global enterprise groups register

54. Understanding the structures, governance and business strategy of global enterprise groups is crucially important for the analysis of GVCs. The first step is identifying the firms that are part of such groups, recording their locations of operations, mapping their relationships to other firms in the group and identifying the ultimate controlling institutional unit. Progress towards creation of a multi-country register of MNE groups was undertaken by the European Statistical System in the construction

of the EuroGroups Register (EGR). The United Nations Statistical Commission recognized the need for such a register at the global level and, at its forty-sixth session (Security Council decision 46/107), endorsed the promotion and advancement of the creation of a global enterprise group register "building on and taking into account lessons learned from the ongoing EGR project".[54] A global groups register would significantly help in showing the structures and links among enterprises in different countries and would indicate how control is exercised throughout the global value chain.

55. The aim of the global groups register project is to register as much information as possible on all MNE groups worldwide and to make it live, dynamic and freely accessible to the public. The following statistical units and their characteristics should be included in the global groups register:

- **Legal units:** identity, demographic, control and ownership characteristics
- **Enterprises:** identity and demographic characteristics, activity code (Statistical classification of economic activities in the European Community (NACE)), number of persons employed, turnover, institutional sector
- **Enterprise groups:** identity, demographic characteristics, the structure of the group, the group head, the country of the global decision centre, activity code (NACE), consolidated employment and turnover of the group

56. The global groups register is likely to be located on a global platform with inputs from many sources. It could be hosted on the global platform for data collaboratives under the Statistical Commission,[55] which is a platform for collaboration and use by the global statistical community. The access and use should be controlled, but open, as any sort of systematic collection and updating of data for this register will need the input from many interested parties.

57. The global groups register is likely to grow organically, depending on opportunities and interests of different groups. Those interest groups will partly come from the community of official statistics but could come as well from a multitude of associations (i.e., public, private and civil society). It is envisioned that a collaborative effort among public and private sector partners will take place, including input from large MNEs themselves. Benefits of cooperation for the MNEs would be that they are offered the platform to showcase their efforts on social responsibility towards achieving the Sustainable Development Goals. Many large companies see social responsibility as part of their branding. The benefit for the statistical community is getting insights into the supply chains and the company structure.

58. Some specific information on large MNEs could be collected in the framework of the international work on GVCs, in which very specific information about a certain sector and for a certain region is being gathered. Not all industry sectors for all regions of the world will be systematically covered. Some relationship information could also be collected through direct contact with MNEs in the framework of international profiling.

[54] Security Council decision 46/107. Available from https://unstats.un.org/unsd/trade/events/2016/newyork-egm/documents/core/Decision%2046-107%20-%20Statistical%20Commission%202015.pdf

[55] See https://unstats.un.org/unsd/statcom/48th-session/documents/BG-3d-global-platform-for-data-services-applications-E.pdf.

Appendix A – Examples of business functions list used for sourcing of business functions surveys

2007 International Sourcing Survey (Eurostat)	2012 International Sourcing/Global Value Chains Survey (Eurostat)	2010 National Organizations Survey (United States: Brown and Sturgeon)	2009/2012 Survey of Innovation and Business Strategy (Statistics Canada)	Proposed list Based on 2017/2018 International Sourcing/ Global Value Chains Survey (Eurostat)
(7 functions: 1 core and 6 support)	(6 functions: 1 core and 5 support)	(8 functions: 1 core and 7 support)	(14 functions: 2 core and 12 support)	(9 functions: 2 core and 7 support)
Core business function	Core business function	Primary business function	Provision of goods Production of services	Core business functions • Production of goods (for the market) • Provision of services (for the market)
Distribution and logistics	Distribution and logistics	Transportation, logistics, and distribution	Distribution and logistics	Transport, logistics, and distribution support functions
Marketing, sales and after sales services including help desks and call centres	Marketing, sales services and after sales services, incl. help desks and call centres	Customer and after-sales services Sales and marketing	Call centres and help centres Marketing, sales and after-sales service	Marketing, sales, after-sales service support function
ICT services	ICT services	Information technology systems	Data processing Software development ICT services	IT services and software support functions
Administrative and management functions	Administrative and management functions	Management, administration, and back office functions	Legal services Accounting and bookkeeping Human resource management Financial management	Management, administration, and back-office support functions
R&D Engineering and related technical services	R&D, engineering and related technical services	Research and development of products, services, or technology	Research and Development (R&D) Engineering and related technical services	R&D, engineering and related technical services and R&D support functions • R&D • Engineering and related technical services (except R&D)
Other	Other	Facilities Maintenance Other	Other	Other business functions

Part IV
GVC analytical and policy framework

A. Introduction

1. The proposed GVC satellite accounts and integrated business statistics framework will aid the general public and policymakers in understanding of how their economies are irrevocably connected to, and dependent on GVCs. Socioeconomic policies are enhanced by an understanding of GVCs. Moreover, GVCs have implications for employment, working conditions and labour rights, including the freedom of association and collective bargaining. The GVC analytical and policy framework presented in these guidelines includes the following: trade policy; economic development policy, including competitiveness and potential for upgrading within a GVC; tax policy; financial regulation; macroeconomic analysis and policy and labour markets; and welfare policy.

B. Trade policy

1. Trade in value-added

2. There is an increasing recognition that trade policy based on bilateral gross trade flows should be complemented by measures of value-added contributions from exports and imports. Bilateral trade balances measured in gross terms can be misleading because they do not explicitly show the value-added content in imports from third countries, including domestic value-added. Policymakers increasingly need to consider the potential impact of trade policy measures on the competitiveness of domestic lead firms of global enterprise groups and other MNEs that rely heavily on imported inputs. GVC accounts and related business statistics will facilitate policy analysis on the creation of domestic value-added that is embodied in imports and the effect of pass-through of additional costs in the supply chain on final consumers.

3. Figure 4.1 shows a sample decomposition of gross exports in the automotive sector into: a) the foreign value-added; and b) the domestic value-added. Domestic value-added consists of the direct value-added contribution within the automotive sector, the indirect contribution of upstream sectors supplying to the automotive sector, and of reimported intermediates.

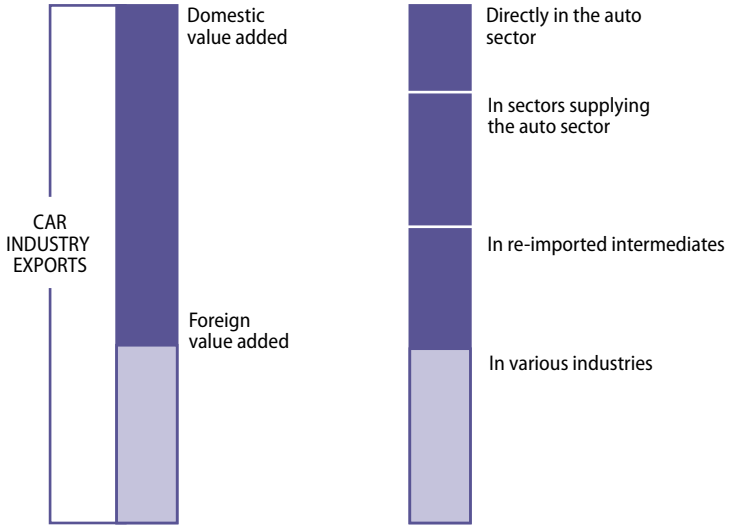
4. More generally, gross exports and gross imports, which is how conventional trade statistics are currently measured and reported, can be broken down according to the top part of figure 4.2. Value-added trade flows focus on the domestic value-added of exports that stays overseas (as indicated by (1) in fig. 4.2) and the foreign value-added that is imported and stays in the importing country (as indicated by (4) in figure 4.2).[56]

5. Value-added measurement, which eliminates double-counting of trade, lowers the total value of exports and imports without affecting overall trade balances with the world. As shown in figure 4.2, the use of such value-added measures rather than gross measures does not change countries' overall trade balances with the world, but does change bilateral balances by eliminating double-counting of trade flows.[57] Namely, in

[56] John B. Benedetto. *Implications and Interpretations of Value-Added Trade Balances*, Journal of International Commerce and Economics. Available from www.usitc.gov/publications/332/journals/implicationsand.pdf.

[57] Note that bilateral relationships are determined on the basis of the final demand destination (i.e., the country where the value-added is finally consumed) of the exporting country's value-added. OECD TiVA Indicators *Guide to Country Notes*. Available from www.oecd.org/sti/ind/measuring-trade-in-value-added.htm#country-notes.

Figure 4.1
Decomposition of gross exports in the automotive sector



Source: Taglioni and Winkler (2016, p. 76), based on Baldwin and Lopez-Gonzalez (2013).

figure 4.2, while items (2) and (3) would cancel out in the trade balance with the world, they do not necessarily cancel out in bilateral trade flows. That phenomenon is due to the fact that a country may import intermediate products from one country and use them to produce products that are exported to a third country. While such transactions would not impact the trade balance at the world level, bilateral value-added balances would shift.

6. Countries that specialize in activities towards the beginning of value chains (e.g., upstream activities, such as mining and agriculture and R&D), and those that specialize in services will typically have higher domestic value-added content in their exports.[58] Therefore, using value-added measures of trade for such countries will result in lower bilateral trade deficits with third countries that are near the end of the value-added chain (i.e., processing and assembling final goods and services) and with neighbouring countries that are the conduit for trade, whereas bilateral balances will generally rise with countries further up the supply chain that provide inputs to countries involved in final assembly and processing.

7. The availability of trade in value-added data—when compared to trade on a gross basis—can help shape trade policy through at least two channels: first, increasing gross trade imbalances have been subject to protectionist pressure, including on tariffs and exchange rate policy. Second, the contribution of upstream industries, in particular services, to gross exports of downstream industries is more easily quantifiable with the availability of trade in value-added data. The competitiveness of upstream sectors—both domestic and foreign—matters as much as that of the gross exporting sector for countries who participate in GVCs.

8. Box 4.1 presents an example of how figures on the domestic value-added of exports in the manufacturing sector in Mexico are relevant for policymakers.

[58] OECD TiVA Indicators *Guide to Country Notes*. Available from www.oecd.org/sti/ind/measuring-trade-in-value-added.htm#country-notes.

Figure 4.2
Gross trade flows and value-added trade flows

Item	Exports	Corresponding TiVA Indicator	Imports	Corresponding TiVA Indicator	Net=Trade Balance
Gross trade with the rest of the world	Domestic value-added that is exported	Domestic value-added content of gross exports			
	(which is the sum of (1) and (2) below:				
	(1) Domestic value-added that stays overseas	Domestic value-added embedded in foreign final demand	(4) Foreign value-added that is imported and stays home	Foreign value-added embedded in domestic final demand	Domestic value-added that stays overseas minus foreign value-added that stays home (1) - (4)
	(2) Domestic value-added that is exported but will return home in imports	Domestic value-added content of gross imports	(2) Domestic value-added that is embedded in imports	Domestic value-added content of gross imports	Exports and imports of item (2) cancel out at the world level
	(3) Foreign value-added that is embedded in exports	Foreign value-added content of gross exports	(3) Foreign value-added that is imported and stays home	Foreign value-added content of gross exports	Exports and iimports of item (3) cancel out at the world level
Value-added trade with the rest of the world	(1) Domestic value-added that stays overseas	Domestic value-added embedded in foreign final demand	(4) Foreign value-added that is imported and stays home	Foreign value-added embedded in domestic final demand	Domestic value-added that stays overseas minus foreign value-added that stays home (1) - (4)

2. Tariffs

9. Despite the large gains from trade resulting from globalization and the unequal distribution of these gains and indeed losses, the lingering effects of global downturns can contribute to increasing protectionist sentiment. It is useful to review the statistical toolkit available to analysts for measuring the impact of tariff policies and examine what new tools may be required to measure the impact of trade on the domestic economy, taking into account the country's integration in GVCs.

10. The textbook analysis of higher tariffs examines the increase in government revenue resulting from the tariff imposition. It also examines the impact of a higher domestic price of imports or increased domestic production from import substitution on domestic profits and earnings. It also examines the inefficiencies that may occur due to the switch to domestic production, and the lost consumer surplus. Trade studies also typically consider the macroeconomic impacts of tariffs; i.e., initially a tariff will reduce aggregate imports, thereby raising net exports and aggregate demand, which, over time, could lead to rises in domestic prices, interest rates, and exchange rates. Ultimately, without monetary accommodation for the resulting increased aggregate demand for the domestic currency, the end result will be higher prices, higher interest rates, and higher exchange rates, with lower exports and increased imports of goods not directly affected by the tariff. Contrary to the expected economic benefits, the second-order effects of the increase in tariffs may result in lower net exports or real GDP.

11. Empirical analyses of the effects of trade restrictions (or of free trade agreements) often focus on the effects of skill-biased technical change. Most empirical research suggests that advances in automation, technology, and productivity account for most of the job losses in manufacturing, rather than greater openness to trade. As recommended in the Guidelines, extended measures of technological change and productivity through the incorporation of KLEMS accounts in the GVC accounting framework could provide a new basis for such jobs and skills-related analysis.

Box 4.1

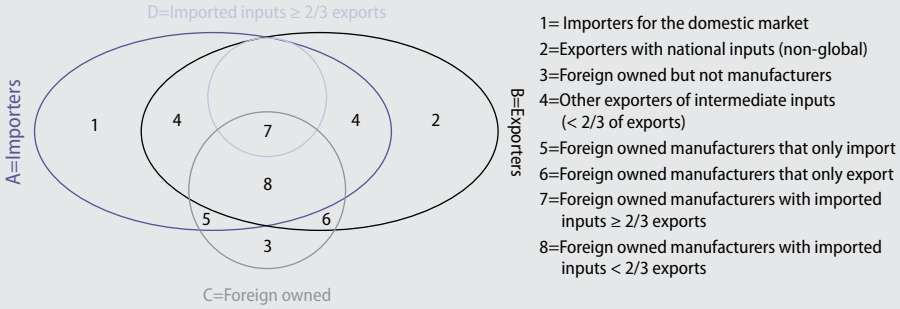
The relevance of domestic value-added of exports in manufacturing for policymaking in Mexico

In order to understand the impact of globalization on the Mexican economy and support public policies that promote the integration of firms in the GVCs, it is essential to monitor the level and dynamics of the value-added contributions of firms in the GVCs for specific industries.

Mexican firms are active participants in different GVC industries, especially in the manufacturing sector (particularly the automotive, aerospace, electrical and electronic equipment, and apparel sectors). The Mexican national accounts system generates and disseminates specific statistics on these GVC-related firms referred to as Global Manufacturers (GM). One of those statistics is the value-added of exports of the global manufacturing.

The purpose of GVC-specific statistics is to provide a spotlight on that category of firms and their integration into GVCs, and their differences with non-GVC related firms classified in the same economic activities. That differentiation matters because GM firms create a very different economic profile as compared with non-GVC related firms, since they are almost exclusively export-oriented and often foreign-owned. Typically, GVC-related firms have higher productivity and pay relatively higher wages. In addition, the higher integration of GM firms in GVCs is not uniquely defined by their export orientation; they are also highly dependent on imports (see items 4, 5, 7, and 8 in the figure below for a definition of the scope of GM firms).

Economic Units considered for the value-added of exports of global manufacturing



Considering their importance of drivers of growth and productivity in the Mexican economy, the value-added of exports of global manufacturing has become a highly policy relevant indicator and summary statistics.

Value-added of exports of global manufacturing can be estimated in two ways:

- As the sum of the domestic intermediate consumption used by the GMs in their production of goods and services in Mexico and the gross value-added of GMs, and:
- As the difference between total exports and total imports of GMs.

Based on the methods used for the calculation of the value-added of exports of global manufacturing , this value-added indicator for GMs should be considered a good first proxy or benchmark of TiVA. Those methods do not take into accounts the foreign value-added in domestic intermediate consumption and exports or Mexican value-added content in the imports from upstream activities in the GVCs. The first-round effects of this value-added content could be accounted for with a multi-country GVC SUT with the main trading partners in specific GVC industries as set out in the Guidelines. A full accounting of these value-added contents would be feasible with a full integration of the Mexican GVC SUT data the global extended TiVA accounting frameworks.

Box 4.1 (*continued*)

The generation of the value-added of exports of global manufacturing indicator in a GVC satellite accounting framework will facilitate the development of industrial policies carried out by the Ministry of Economy in Mexico, including:

- Stimulating vertical integration of Mexican firms in the GVCs.
- Identifying of the potential for closer upstream integration with domestic firms, in particular for small and medium-sized enterprises, and for the creation of innovation clusters that can drive technology spillovers and widespread diffusion of best practice.
- Providing a view of the overall benefits of foreign direct investment on jobs and wages (not only in terms of jobs and wages in the GMs, but also upstream jobs and wages by supplying firms within the Mexican value-chain supplying of the GMs).
- Highlighting benefits to the foreign direct investors in Mexican GM firms.
- Highlighting the potential impact of trade barriers on intermediate imports may have on GM competitiveness, and, in turn, highlighting the domestic value-added content of a country's imports in the exports of Mexican GMs from cross-border trade in goods and services related to the production arrangements of the GVCs.
- Illustrating significant differences in production processes (and productivity) between GM and non-GM firms and thus highlighting the importance of innovation and intellectual property in driving growth, productivity and value-added creation.
- Providing a more discrete view of the nature of GM integration within GVCs and so, in turn, highlighting the potential risks of disruptions on the economy in upstream or downstream activities in the GVCs from regulatory and tax policies.
- Providing insights on the densification and upgrading processes from form networks and introduction of new research and development and technologies.

More information about the value-added of exports of global manufacturing in Mexico can be found at www.inegi.org.mx/temas/pibval/.

12. GVC accounts and related business statistics can further improve the analysis of potential impacts of tariffs on a group of GVC products by highlighting the indirect effect of tariffs on both importers and exporters and the degree to which the value-added of MNEs come from foreign subsidiaries. Moreover, supplementing direct investment data with an extended set of capital accounts, including intellectual property assets, would help policymakers examine the indirect impact of tariffs on domestic investment.

13. Single-country GVC accounts could improve the analysis of the direct and indirect impact of tariffs on cross-border income flows and thus gross national income (GNI). GVC accounts in a multi-country framework would extend the analysis in assessing the upstream and downstream effects of tariffs on domestic incomes and employment. Effects of tariffs on GDP are important, but their political impact comes through the effect of tariffs on people's incomes – compensation, employment, profits, interest, and taxes. Such extensions to the compensation, profits and net interest components could be useful in understanding the domestic value-added included in imports and the impact of a tariff on domestic employment in industries ranging from retail to finance through cross-border production, tax and financing arrangements.

14. Existing price and quantity indices can, like exports and imports, provide a picture of the net impact of country- and industry-specific tariffs on export and import prices, but cannot provide a complete picture of the indirect impact of GVCs on prices and quantities. Likewise, the existing national SUTs are limited in their ability to allow

for accurate predictions and understanding of the total (direct and indirect) impact of tariffs on the prices confronted by consumers, business, and government. Similar information on volume, or quantities, is also missing. Multi-country GVC accounts extended with KLEMS tables could supply a complete picture (direct and indirect) of the GVC effects across countries on prices, quantities, and productivity.

3. Preferential trade agreements[59]

15. A new GVC policy framework has emerged in which imports matter as much as, if not more than, exports and in which the flows of goods, services, people, ideas, and capital are interdependent and must be assessed jointly. Therefore, effective trade liberalization goes beyond the tariff rate on final goods. Because economic integration often involves opening and levelling the playing field in terms of investment, intellectual property and competition policy, participation in preferential trade agreements seems to be an effective way to expand involvement in GVCs. New areas covered in those agreements facilitate the operations of complex production structures that span multiple borders.

[59] This section draws largely on Ruta (2017).

4. Multilateral trade agreements

16. Better data on GVCs can also facilitate multilateral trade and investment agreements that reflect the fact that barriers between third countries upstream or downstream in the chain matter as much as barriers put in place by direct trading partners. In a GVC context, trade agreements will have a larger impact when more dimensions of a GVC are covered, both geographically and sectorally, including services, labour, intellectual property, capital and technology across borders. Multilateral trade agreements can increase the competitive advantage of an entire region participating in GVCs and can amplify the impact of trade liberalization on investment, growth and job creation across entire regions.[60]

[60] OECD. *Trade Policy Implications of Global Value Chains*. Available from www.oecd.org/tad/trade-policy-implications-gvc.pdf.

Box 4.2
Trade policy implications for GVCs in the United States

As summarized in the present part, the use of GVC data and analysis provide a more comprehensive and accurate picture of the impact of a wide range of policies, ranging from regulatory to tax policy. The area where the GVC perspective may be most important is in the analysis of trade policies, particularly tariffs.

Analyses and public discussions of the impact of tariffs tend to focus on the bilateral impact of trade policy on companies and employees in the directly affected industry, ignoring the impact on consumers and other upstream and downstream industries, either domestic or foreign. The following three examples from the United States show the significantly different outcomes that result from going beyond conventional analysis and using comprehensive world input-output tables to analyse the impact of tariffs.

- The United States Department of Commerce analysed the likely impact of iron and steel tariffs on the iron and steel industry, as well as the impact on fabricated metals, autos, and other affected industries, using a world input-output model (the Global Trade Analysis Product (GTAP) Computable General Equilibrium (CGE) model of trade). The analysis indicated that the tariffs would generate 13,000 jobs in iron and steel, but

Box 4.2 (*continued*)

that that would be more than offset with the loss of 56,000 jobs in other industries, for a net loss of 43,000 jobs. The Department also estimated that the tariffs would result in net 0.2 per cent loss in GDP, or $40 billion.

- Since the mid-1990s, the United States merchandise trade deficit with China has risen from $34 billion to $376 billion and the overall United States merchandise trade deficit from $96 billion to $552 billion. Various analyses of the impact of the liberalization of trade from China have estimated large negative effects on the United States economy, including a one-quarter decline in United States manufacturing employment. A study by Feenstra and Sashara, using data from the World Input-Output Data Base, which provide data on the cross-country and cross-industry interdependencies in GVCs, looks at both negative and positive impacts and finds large positive net effects on employment in the United States.

In the study, Feenstra and Sashara found that increased Chinese merchandise trade imports during the period 1995–2011 resulted in the loss of 2.0 million goods and services jobs in the United States. Those losses, however, were more than offset by an expansion of United States merchandise exports that created 3.7 million goods and services jobs, for a net increase in employment of 1.7 million jobs in the United States, with much of the increase in services. They further found that the growth in United States merchandise trade imports from all countries relative to United States merchandise trade exports produced net job losses, but that the growth in total United States imports (goods and services) relative to total United States exports produced net job gains.

- Net gains from a 20 per cent United States cross-border value-added-tax adjustment/tariff become net losses when calculated using a GVC analysis. Bilateral estimates produce an estimated gain of $719 billion, or +3.7 percent of United States GDP. A GVC analysis that includes the direct and indirect effects on trade, as well as the effects on domestic prices, efficiency, and terms of trade, result in a net loss of $214 billion or -1.1 percent of United States GDP

As these estimates show, data are available from national and world input-output based models and data to perform GVC analysis. However, these estimates are all based on private world-input data sets (i.e., WIOD, GTAPP, TiVA). Despite mounting skepticism about official statistics, studies based on private sources do not have the same trust and acceptance as those coming from NSOs. Such trust is critical in educating the public on the impact of alternative trade policies.

17. Box 4.2 presents examples from the United States on trade policy implications for GVCs.

C. Economic development policy, competitiveness and upgrading[61]

[61] This section draws on Taglioni and Winkler (2016).

18. The availability of trade in value-added data also allows analysts to quantify the contribution of upstream sectors to gross exports in a country. Upstream sectors contain both: a) foreign value-added; and b) domestic value-added that are supplied to exporting sectors. Typically, countries entering manufacturing GVCs start as buyers of foreign technology and know-how, which enables them to increase their domestic value-added that is exported. For further upgrading in manufacturing, countries need to increase the share and quality of domestic services value-added and become sellers of final products of the GVC.

19. Most countries have increased their dependence on foreign inputs, measured by the share of foreign value-added as a percentage of their gross exports, as they increasingly rely on imported inputs that are processed and subsequently exported. But the competitiveness of the domestic segment of the value chain is as important as that of the international segment.

20. Box 4.3 presents an example from Morocco on the measurement and analysis of its participation in the automotive GVC, and box 4.4 presents an example on Costa Rica's participation in the medical devices GVC.

Box 4.3

Measurement of Morocco's participation in the automotive GVC

In the late 1990s, Morocco launched an industrialization plan focused on developing new activities in high value-added sectors, such as electronics, aerospace and automotive. Those policies included incentives for foreign direct investment and by 2015 these new sectors were contributing nearly $1 billion to Morocco's exports. Export growth in the automotive industry has been especially strong, which was due to a significant increase in the final assembly of motor vehicles. To analyse what export growth in the automotive industry means in terms of value-added, employment and skill development in Morocco, a GVC approach is used to construct a full picture of imports and exports of automotive parts, combined with foreign direct investment, employment, and domestic value-added statistics. Especially critical in that analysis is to determine the lead firms of the automotive GVC.

For the automotive GVC, lead firms (sometimes referred to as original equipment manufacturers) correspond to automakers, such as Toyota, Volkswagen, General Motors, Renault and Peugeot, and are responsible for overall vehicle design and development and final assembly and typically produce the most important subassemblies, namely car bodies and drive train components (especially engines) in their own factories, which could be located in other countries.

Morocco's role in the automotive GVC

Since 2010, the investment in the Moroccan automotive industry has steadily increased, in which the share of the automotive sector in the cumulative investments rose from about 2 per cent in 2010 to 7 per cent in 2016. The exports of cars and the car parts sector experienced a similar increase between 2010 and 2015. The table below shows that Morocco's exports of passenger vehicles increased over 400 per cent over that period, increasing from $54 million in 2008 to $2.4 billion in 2015. The exports of finished vehicles seem most impressive; and yet, the number of firms and total employees associated with them are relatively low. However, the number of employees in that segment rose astonishingly, by more than 6,000 per cent between 2008 and 2015.

The table further reveals key aspects of Morocco's role in the automotive GVC: being an assembler of finished vehicle and exporter of labor-intensive auto parts, including wire harnessing and manufacturing of seats. Specifically, exports of auto parts (electric wire harnessing, seats and seat belts and body system/drive train and engine parts) doubled, from $1.1 billion to $2.1 billion. In particular, the exports of "electrical wire harnessing", while already strong in 2008, nearly doubled and the exports of seats and seatbelts rose over 200 per cent during the period. And employment in wire harnessing doubled between 2008 and 2015, while employment in the manufacture of seats almost tripled.

The vehicles assembled in Morocco consist mainly of imported parts and components (which are assembled for the finished vehicle), except for a few labour-intensive auto parts, such as wire harnessing and seats, which are produced in Morocco. Typically, car seats are produced close to final assembly because they are bulky and easily scuffed in

Box 4.3 (*continued*)

transport and sometimes require close sequencing in final assembly due to variations in seat features (e.g., power vs manual adjustment) and colour.

Exports for the automotive industry in Morocco

GVC stage	2008 (mln USD)	2008 (# of firms)	2008 (# of employees)	2015 (mln USD)	2015 (# of firms)	2015 (# of employees)
Passenger vehicle	53.7	7	100	2,382.60	10	6,400
Electrical wire harnessing	926.6	37	28,000	1,752.70	80	56,000
Seats and seat belts	91.4	14	2,600	283.3	28	7,300
Body system/Drive train & engine parts	51.5	24	8,400	61.5	28	10,500

Morocco's five main trading partners for the imports of parts and components in the automotive sector account for 78 per cent of total imports in that sector. It would be important for policymakers to know if these imports come from companies belonging to the same enterprise group or not. In other words, it would be important to know if supplier firms of intermediate auto parts are subsidiaries of the lead firms. Such information would need to be provided by the statistical agency in which the lead firm of the global enterprise group is located. It would be important to further differentiate the foreign direct investment, not only by country of origin, but also by type of economic activity, which would give the Moroccan automotive sector more evidence to guide their policies.

A national GVC-specific SUT for the automotive industry would nicely complement the existing business and trade statistics with trade in value-added (TiVA) building on existing information. Collaboration with five main trading and investment partners in Moroccan's automotive industry would allow for the compilation of multi-country GVC SUTs using further differentiated information on production of imports and exports, foreign direct investment and the governance structure of the supplier firms in the GVC. The multi-country GVC SUT would render additional insights on opportunities for the Moroccan automotive industry. Finally, with the planned opening of another large automotive plant in Kenitra in 2019, Morocco will engage in new, highly advanced industrial activities, such as the manufacturing of car engines, which will allow for the development of a research and development sector for the Moroccan automotive sector and would imply broader economic and social participation of Morocco in this GVC.

Box 4.4

Costa Rica in the medical device GVC

At the beginning of the 1980s, Costa Rica made a change in its development model from an approach based on the satisfaction of domestic demand to an emphasis on foreign trade. It sought to take advantage of the benefits and advantages it had in education, health, and political and economic stability. The medical device industry in Costa Rica has been growing significantly since 1987, when the company Baxter International Inc. started operations there. Currently, more than 70 companies in the medical instruments and supplies industry are operating under a free zone regime in Costa Rica.* The criteria used to classify companies as part of this GVC is the type of product they export.

Box 4.4 (*continued*)

The success of Costa Rica in this GVC is closely related to the existence of an extensive and reliable supply chain, free trade agreements, proximity to the United States, a wide range of industrial parks, continuous improvement in educational programmes, registration of new products online, headquarters and regional offices of the United States Food and Drug Administration for Latin America, additional incentives (streamlined migration procedures, online procedures at customs), institutional support and academia that have empowered Costa Rica to attract medical device companies. The following table shows the main products or medical devices exported by Costa Rica. The main destination markets for these placements were Japan, the Netherlands and the United States.

Medical devices product categories by HS codes

Product category	Product examples	HS Codes
Disposables	Needles, syringes, catheters, tubing, IV sets	901831, 901832, 901839
Medical and surgical Instruments	Dental instruments, forceps, medical scissors, dialysis devices, defibrillators	901841, 901842, 901850, 901890
Therapeutic devices	Artificial body parts, hearing aids, pacemakers, crutches, implants, prosthetics	9021
Capital diagnostic and imaging equipment	MRI, ultrasound machine, X-rays, patient monitoring systems, blood pressure monitor	901811, 901812, 901813, 901814, 901819, 901820, 9022

In 2017, Costa Rica's exports of medical devices reached about 25 per cent of total exports ($2,604 million), for a growth of 13 per cent over the previous year, becoming one of the most dynamic subsectors of the Costa Rican economy. In 2015, about 17,000 people in Costa Rica worked in the medical devices industry. By 2018, it is estimated that 22,000 Costa Ricans will work in the medical devices industry, representing an increase of 30 per cent. Most of the exports are disposable medical products, although most companies in Costa Rica are in the production and assembly of medical instruments. From 2015 to 2017, medical instruments have been gaining relative importance with respect to disposable devices.

The interaction of the activity of medical devices with other industries of the economy of Costa Rica is determined through the GVC-specific SUTs under preparation by the Central Bank of Costa Rica. Moreover, the component imported into exports is the trade in value-added (TiVA) measure used by the Central Bank in the analysis of GVC because it shows the relationship between firms and international suppliers.

* Regime that allows companies that operate there to benefit from a series of tax benefits.

21. Exports of domestic value-added can be undermined by inefficient domestic links, including the unreliability or high cost of domestic transport, refrigerated storage of fresh products, and low-quality storage. Regional markets and stocks are critical for agriculture's inclusion in GVCs. Attractiveness to foreign investors is also determined by the ease of access to efficient services and infrastructure, including access to energy (cheap and reliable), financial and trade support, telecommunications, and transport.

22. Services, in particular, have become a major determinant of competitiveness in GVCs. Countries with a higher content of services in the downstream economy are also those producing more complex goods. Recent data on trade in value-added suggest that services represent about 30 per cent of the value-added in manufacturing exports. Figure 4.3 illustrates the services share of domestic value-added embodied in gross exports as a percentage of gross exports in five manufacturing sectors by type of service input. But as not all countries are able to produce high-quality services themselves, it is crucial for them to rely on imported services.

23. For developing countries wishing to participate more in GVCs and to upgrade, one of the obvious measures is to open up their services sectors to foreign and domestic competition and investment. Deregulation of services is expected to yield bigger gains compared with that of goods, as trade costs in services are much higher. A recent World Bank study finds that fewer regulatory restrictions in services are correlated with higher value-added gains from sourcing services in GVCs from abroad. Entry barrier regulations have a stronger negative influence on the value-added gains from sourcing foreign services (foreign links), while conduct/market regulations have a stronger negative effect on the value-added gains from purchasing domestic services from upstream sectors (domestic links). Second, foreign direct investment regulations negatively influence the value-added gains from sourcing services. Differentiating between foreign and domestic services links shows that restrictions related to the movement of foreign personnel (i.e., Mode 4 services under the General Agreement on Trade in Services[62]) reduce the gains from domestic services links.

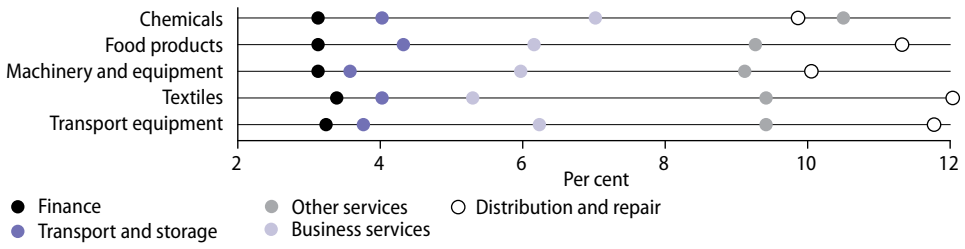
24. In a world dominated by complex and fragmented production processes, economic development can occur through economic upgrading and densification. Economic upgrading is largely about gaining competitiveness in higher value-added products, functions, and sectors via skills, capital, and process upgrading. Densification involves engaging more local actors (firms and workers) in the GVC network. In some cases, that could mean that performing lower value-added activities (or functions and tasks) on a larger scale can generate large value addition for the country. Raising domestic labour productivity and skills contributes to the overall goal to increase a country's value-added as a result of GVC participation.

25. A GVC framework that classifies GVC data by business function can help address several industrial classification issues by answering questions, such as:

- Is a lead firm in manufacturing or services industry?
- And, if most of a lead firm direct value-added in a compiling country is in its services – like R&D and design – does it control and coordinate the production of a final good rather than a final service?

[62] See www.wto.org/english/tratop_e/serv_e/mouvement_persons_e/mouvement_persons_e.htm.

Figure 4.3
Domestic value-added of services embodied in manufacturing gross exports, overall, 2009



Source: Taglioni and Winkler (2016, p. 110). Data: OECD-WTO TiVA. The share of distribution does not include distribution services for final goods.

- Another important question is how to account for GVCs (such as in apparel) where lead firms do not actually own factories,[63] but rely on subcontractors around the globe and generate their value-added mainly through branding (i.e., royalty and licence fees). In industries in which production technology is standardized, for example apparel, footwear, airlines, and now even for computers, consumer electronics and even to some extent automobiles, branding is a key part of lead firm strategy.

[63] The issues discussed in this section relate to factoryless goods producers and contract manufacturing. See part V, annex D for a more comprehensive discussion on these matters.

26. Thus, the classification of GVC data into business functions has several policy implications:[64]

[64] Modified from Taglioni, Winkler, and Engel (2017).

- Rather than focusing only on certain industries and favouring them over others (e.g., manufacturing over agriculture or services industries), the policy focus shifts to the business functions that a country is able to carry out in a GVC-specific industry, those it wishes to carry out in the future, and measures to achieve functional upgrading in a specfic GVC industry.
- The attention given to tasks emphasizes the role of workers and skills. Countries will need to develop the needed talent through technical skills acquisition, and crucially, also soft skills (i.e., managerial skills, strong foreign-language skills, etc.). They also need to ensure that the links between productivity and distribution, and between economic and social impacts of work. For GVC entrants, the focus on tasks implies lowering barriers to knowledge, including to foreign skilled personnel and individual services, and establishing strong intellectual property rights to attract technology-intensive foreign investors.
- At the same time, prioritizing business functions requires countries to match talents and services with the necessary infrastructure (physical, digital, and institutional) and cutting-edge technologies. GVC participation allows countries to absorb valuable foreign technology and know-how via imports and foreign direct investment. Increased connectivity – global and within a country – opens opportunities for economic upgrading and ensures that the development potential of technologies reaches a large fraction of the world population.

27. GVC participation is a necessary but not sufficient condition for development. From the perspective of a country's policymakers, the critical issue nowadays is how to effectively integrate a GVC-led development strategy with the whole economy and therefore how to maximize the benefits from technology transfers, knowledge spillovers, and increased value-added. Policy advice supporting GVC-based growth models requires sound analytics and data and a wide range of indicators and concepts. That helps governments put in place appropriate policies that support GVC integration and boost employment and productivity in agriculture, manufacturing, and services, while also improving worker well-being, social cohesion and environmental sustainability.

28. Because policymaking depends on reliable and comparable GVC measures – both at the macro and micro levels – the availability of more precise data will help inform the quality of analytical work and advisory services to help governments and their partners develop concrete economy-wide and sector-specific solutions.

29. An overall country engagement strategy of GVC participation consists of five components:

- Assessing the position in GVCs
- Using a strategic policy framework: participate, expand and sustain GVCs
- Identifying the key policy objectives
- Identifying the key binding constraints, and

- Designing the necessary policy and regulatory interventions.

The components are intended to emphasize the main goals of a GVC country engagement strategy rather than representing a chronological order that should be followed.

30. The first component of an overall country engagement strategy of GVC participation is to provide a comprehensive, fact-based, and independent preliminary assessment of the country's trade competitiveness (particularly measured in value-added), performance in GVC integration, and economic upgrading. This preliminary view is developed through a desk-based analysis followed by a field-based qualitative assessment and discussion of the identified challenges, opportunities, and policy options with local public and private sector stakeholders. The successful implementation of full GVC diagnostics begins with effective planning and management, and an understanding of how it feeds into the overall country engagement strategy.

31. Planning should focus on the economy as a whole, but also zoom into key industries, strategic segments therein and individual value chains (as narrowly defined as the availability of quantitative and qualitative information allows). A limited number of key industries (three or four) and/or industry-specific GVCs (eight or nine) – existing ones that exemplify critical and/or broader opportunities and challenges, or new ones that are considered important by the local stakeholders, as well as subnational specificities – may also be identified at this stage for deeper analysis and discussion of challenges and opportunities. This provides a first-pass analysis of key industry- and GVC industry-specific issues, which can be the object of more focused and deeper assessments.

32. The second component of a country's GVC engagement strategy is to use a suitable strategic policy framework. How countries engage with GVCs determines how much they benefit from them. And while policy needs to adapt to a rapidly changing world, it remains valid that, for an effective and sustainable strategy of GVC participation, some areas of policy remain key. Identifying the country-specific binding constraints and designing the necessary policy and regulatory interventions will help achieve distinct objectives to:

- Participate in GVCs, including attracting foreign direct investment and facilitating domestic firm entry into GVCs.
- Expand and strengthen existing GVC participation, including promoting economic upgrading and densification, and strengthening domestic firms' absorptive capacity.
- Ensure sustainability and transform GVC participation into inclusive growth by fostering economy-wide productivity spillovers, social upgrading, and welfare improvements.

33. By integrating their domestic firms (suppliers and final producers) into GVCs, developing countries can help their economies industrialize, become services-oriented more quickly and move closer to their development goals. Taglioni and Winkler (2016) developed a strategic policy framework that can be used to assess various aspects of GVC participation and, thus, how to identify key policy needs. The framework suggests "strategic questions" and approaches to addressing such policy needs and offers "policy options". Those are summarized in figure 4.4 and discussed in more detail in the following sections.

34. Identifying a country's position in GVCs from a macro- and micro-level perspective is a prerequisite to formulating its key policy objectives with regard to integration and upgrading in GVCs—which is the third component of a country engagement strategy. This, in turn, helps policymakers identify effective solutions, i.e., suitable

strategies to achieve these objectives and the binding constraints in a country. While the typical sequence would be to first focus on entry and then on economic upgrading in GVCs, it is also important for countries to ensure sustainability and transform GVC participation into inclusive growth along the way.

35. "Entering GVCs" (first focus area in figure 4.4) discusses ways for countries to enter global production networks. Those avenues include ways to attract foreign investors, as well as strategies to enhance the participation of domestic firms in GVCs. GVC entry is the key focus area for concentrated agricultural and commodity sellers which have not yet joined GVCs. Reflecting their comparative advantage, agricultural and commodity sellers tend to enter GVCs in industries of limited complexity, such as agriculture and low-skill manufacturing. Suggestions for entering GVCs encompass measures to ensure that the country can offer world-class connectivity to the global economy and create a business friendly climate for foreign tangible and intangible assets.

36. However, again, GVC participation is a necessary but not sufficient condition for development. Although GVCs open doors, most of the hard work still has to be done at home, with domestic pro-investment, pro-skills, pro-jobs, and pro-growth reforms. Creating demand for high-productivity workers must be matched with a supply of capable workers who have the relevant skills. In other words, when thinking about the first step in facilitating GVC entry, policymakers must have a clear road map of how entry will lead to strengthened and broader participation, and economic and social upgrading. Policymakers must keep a keen eye on the workforce's competencies and how they match up with foreign investment.

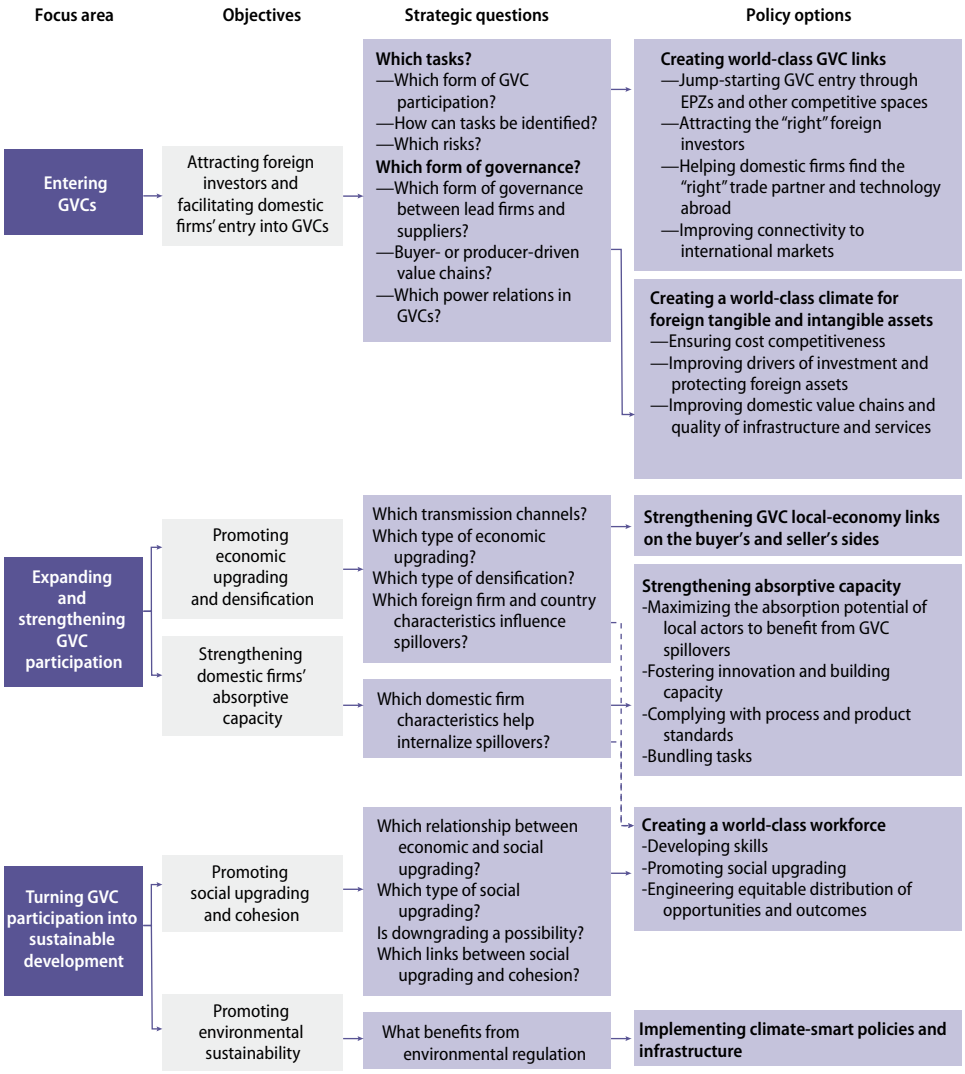
37. Expanding and strengthening participation in GVCs requires countries to leverage their position and enhance domestic production, achieving higher value-added through economic upgrading and densification. The concept of economic upgrading is largely about gaining competitiveness in higher value-added processes, products, tasks and sectors. Densification involves engaging more local actors (firms and workers) in the GVC network. Strengthening GVC-local economy links, absorptive capacity, and skills contributes to the overall goal to increase a country's value-added that results from GVC participation.

38. For countries that have successfully entered GVCs, a "typical" upgrading trajectory is to become a buyer that is either strongly specialized in agriculture or increasingly in manufacturing. The next step is to start specializing in advanced manufacturing tasks and/or professional, modern services, including pre- and post-production high value-added services. Countries that have successfully accomplished that goal are manufacturing buyers with a larger share of services in their domestic value-added. For those countries, the quality of education and availability of skills becomes increasingly relevant.

39. The last upgrading step for many manufacturing buyers is to become a manufacturing seller of the final product of the GVC. Their engagement in GVCs is predominantly specialized in tasks of coordination, and high value-added services, such as R&D and branding. Firms are primarily buyers of inputs and components and sellers to end markets, and/or engaged in modular relationships. Those firms' comparative advantage is based on offering highly specialized products, at the technology frontier, which requires strong innovation capacity.

40. Finally, countries also need to tackle the challenge of turning GVC participation into sustainable development. Three areas of sustainable development are important: macroeconomic sustainability, social sustainability and environmental sustainability. Not only are they important development objectives per se, but they also ensure the sustainability of a GVC-centric approach to development. Labour market-enhancing

Figure 4.4
A strategic policy framework for making GVCs work for development



Source: Taglioni and Winkler (2016, p. 5). EPZs = export processing zones.

outcomes for workers at home and more equitable distribution of opportunities and outcomes create social support for a reform agenda aimed at strengthening a country's GVC participation. Climate-smart policy prescriptions can mitigate the challenges for firms from climatic disruptions, as those firms seek to ensure the long-term predictability, reliability, and time-sensitive delivery of goods necessary to participate in global value chains. Because climatic disruption can impair firms' ability to access inputs and deliver final products, countries' preparedness is an increasingly critical factor in firms' location decisions.

41. The fourth component involves investigation of possible binding constraints and solutions. A country's GVC engagement strategy needs to take into account the role of institutional characteristics and policy indicators, including the business and investment climate and drivers of competitiveness across economic, regulatory, operational, and infrastructural dimensions, when assessing the benefits of GVC integration. That exercise allows for the detection of areas for improvement to achieve the defined policy objective.

42. What are the key institutional and policy characteristics that help countries achieve their chosen policy objectives? The strategic policy framework in figure 4.5

identifies policy options that are relevant for different policy objectives. Identifying the key binding constraints to integration and economic upgrading requires developing a sound theoretical model. However, initial insights can also be gathered by screening a country's performance of selected indicators and comparing it with peer or benchmark countries, and assessing the statistical correlation between measures of GVC integration with these indicators. To guide policymakers in prioritizing policies, figure 4.5 lists performance indicators that can be used to identify the most important challenges that a country must address.

43. Policy and regulatory interventions in a wide range of influencing areas will determine success in GVC participation and upgrading. Those areas are as different as trade and trade policy, domestic services regulations, investment regulations and incentives, compliance with process and product standards, innovation, industry, entrepreneurship, labour markets, education, and infrastructure and connectivity. Synergies should be created between those multiple interventions. Moreover, long-lasting engagement with a variety of national and GVC partner country stakeholders should be fostered for implementing a national and regional strategy to achieve GVC-led development.

44. That includes establishing the model of country engagement and the appropriate institutional setting for identification of strategies in GVCs that offer the promise of the highest value-added growth. Participants can be selected from relevant public institutions, including ministries of economy; ministries in charge of entrepreneurship and domestic economic development; national and subnational agencies for the promotion of trade, investment, and competitiveness; chambers of commerce; associations of employers; regional development agencies; and so on.

45. It is important to create a detailed road map for starting to implement reforms. For example, a possible strategy could be to identify a list of four to six major initiatives to maximize shared value-added in incorporating global best practices and placing a priority on "quick wins". Various governance models can be used for designing the appropriate institutional setting – for instance, by establishing a working group to

Figure 4.5
Selected policy objectives and performance indicators by focus area

Focus area	Policy options	Selected performance indicators
Entering GVCs	Improving connectivity to international markets Ensuring cost competitiveness Improving drivers of investment Protecting assets Improving domestic value chains and quality of infrastructure and services	LPI (international) – overall and components; efficiency of customs (WDI) Unit labour costs Ease of doing business index - overall (WDI) Ease of doing business index - protecting investors (WDI) LPI (domestic) – quality of infrastructure, quality and competence of services (WDI)
Expanding and strengthening GVC participation	Fostering innovation and building capacity Complying with process and product standards	R&D intensity Diffusion of voluntary standards and ISO certification ownership (WDI, national statistics); surveys/field assessments in country
Turning GVC participation into sustainable development	Developing skills Promoting social upgrading Engineering equitable distribution of opportunities and outcomes	Education statistics Wage statistics; employment statistics; labour standards Indicators on access to information; antidiscrimination laws and rights; social insurance and assistance

Source: Taglioni and Winkler (2016, p. 6). ISO = International Organization for Standardization; LPI = Logistics Performance Index; WDI = World Development Indicators.

In addition, the WBG has developed a model that can be used to identify which policies magnify the value-added gains from GVC integration.

work closely with the president's or prime minister's office, or by devising a plan for strengthening the coordinating mandate of one key ministry.

46. The execution phase of interventions includes revising regulations, reengineering processes, and investing in infrastructure to achieve measurable improvements across all key dimensions and areas of binding constraint identified at the macro and micro levels.

D. Tax policy

47. Among the most important strategic issues to be considered by global enterprise groups is the overall taxation burden on group MNEs. The lead firm could use corporate inversions, use of special purpose entities, transfer pricing, and sale of intellectual property to lower domestic taxes by redirecting income to lower tax foreign jurisdictions. Over time, as tariffs, transport costs, and barriers to capital flows fall and global trade and competition grow, the importance of taxes and lower input costs in foreign direct investment location decisions increase.

48. The growing share of foreign direct investment in lower-tax countries and jurisdictions, falling effective tax rates on corporate income, and high-profile restructuring of multinational corporations of their legal units owning their IPP to significantly lower their effective tax rates have justifiably resulted in international calls for changes in tax codes to curtail such tax avoidance behaviour. However, as the value-added data suggest, there are very large value-added benefits to parent-company countries that should be taken account in designing international tax policy. Much of the final sales value for such products is in the form of domestic services and profits that can be taxed. Changes in tax law that ignored those benefits might not only reduce (rather than raise) net domestic tax receipts, but lower domestic production and employment. More detailed data on domestic value-added derived from globally produced imports would provide the basis for more complete analysis of net revenue losses from alternative tax treatments of foreign source income.

49. Such data will be helpful as policymakers consider such tax reforms as:

- Lowering the corporate rate (near the rates in several tax havens), to reduce the incentive for MNEs to move offshore to lower tax jurisdictions.
- Entering into bilateral tax treaties (wherein countries try to resolve issues of double taxation), or moving from a worldwide to a territorial tax system, where domestic corporations would not be taxed on their overseas income, thereby eliminating the incentive for corporate inversions.
- Adopting a destination-based tax that would tax all goods and services consumed domestically. Such a system would effectively tax imports but not exports and is often described as a border adjustment tax.
- Disallowing the deduction of interest on debt so as to put debt and equity on an equal footing and reduce the incentive towards excessive use of debt (and the risks associated with too much debt). That change would also remove the ability of MNEs to use "interest stripping" to reallocate income to foreign subsidiaries in lower tax countries as part of corporate inversions.

50. Data from GVC accounts that cover both corporate and noncorporate data can be used to assess the impact of tax changes on different corporate structures. Such extended accounts differ from tax-based data where filing is contingent on reparations and provide the complete overseas activities data every year on domestic and overseas operations, investment, income, distribution, financing, assets and liabilities. They would also provide data on the effective tax rates actually paid by MNEs, which

provide better estimates of the effect of changes in statutory tax rates. GVC accounts also provide information on all taxes – direct and indirect (excise and value-added taxes). As a result, they provide a more complete set of data that can be used as control variables to disentangle tax from other effects.

51. Further, more complete analysis of the impact of alternative tax policies would also be provided by integrated financial accounts that allow tax analysts to look behind the existing – mainly counterparty data – to examine the ultimate ownership of assets and liabilities. Such information would facilitate the analysis of the true impact of taxes on international direct and portfolio investment flows.

E. Financial regulation

52. GVCs and the financial system that supports them, have revealed gaps in the existing international financial statistics. In addition to gaps and inaccuracies, concerns about the transmission of operational risks across partner countries in GVCs associated with multinational non-financial affiliate enterprises and financial institutions has prompted calls for GVC financial accounts and balance sheet data that provide breakouts and detail for financial assets and liability positions in GVC global enterprise groups and their relationship with foreign and domestic financial institutions. That analysis can be done at the aggregate national level, using the institutional sector accounts or more specific using the GVC satellite approach with a focus on GVC-specific exposures and risks by isolating MNEs and related firms making up a GVC industry. The analysis can be extended to the microeconomic analysis of financial reports of individual large global enterprises.

53. One of the key recommendations for measurement that came out of the G20 and other analyses of the financial crisis was for more comprehensive financial data that could provide regulators a more integrated picture of systemic risk in the global financial system. Integrated and up-to-date financial accounts based on ultimate creditors and debtors would enable global regulators to better assess the relative levels and transmission of risk and the management of that risk.

54. Transactions and position data in GVC accounts can provide more accurate and timely data for guiding monetary and financial regulatory policy. More accurate identification of ultimate ownership can aid in assessing systemic risk, the transmission of risk through capital flows by partner country and region, and the impact of regulatory changes across countries and across domestic- versus foreign-owned banks.

55. Specific areas that can benefit from more detailed, integrated accounts are portfolio investment statistics, which traditionally have recorded transactions with the first cross-border counter party, which is often not the country of the ultimate buyer or actual seller or issuer of the security. Rather, portfolio investment statistics that are based on country of issuer, country of holder, or ultimate beneficial owners for foreign direct investment, can allow policymakers to correctly identify counterparties that are brokers and dealers (often of MNEs) acting on behalf of companies and investors, in other countries.

56. Moreover, more detailed international transactions data that fully record transactions made on behalf of foreign official investors will help authorities to assess changes in official versus private purchases of assets. Finally, extended transactions data that capture transactions and positions that do not go through standard broker dealer channels, or where assets are held by foreign investment managers or global custodians, would provide more comprehensive information to financial market policymakers.

57. Likewise, foreign direct investment may be channelled through financial centres or through a number of affiliates in several different countries. While in many countries, the country of the ultimate beneficial owner of a MNE is also the country of the foreign parent. However, for some countries, such as Luxembourg, Switzerland and the Netherlands, their investment positions are higher on the parent basis rather than the ultimate beneficial owner basis. Efforts to disentangle the country of the entity that ultimately owns or controls a subsidiary ultimate beneficial owner can be facilitated by profiling large MNEs (see part II) and global initiatives to register MNE groups, such as the United Nations Statistics Division Global Groups Register (see part III), the G20 Global Legal Entity Identifier Foundation and the OECD Analytical Database on Individual Multinationals and their Affiliates.

58. A macroeconomic view on the trade-investment-financing nexus of MNEs is necessary as these MNEs and related affiliated and non-affiliated firms dominate the macroeconomic aggregates in the production, income generation, use and redistribution, capital and financial accounts and balance sheets of most countries. National GVC-specific institutional sector accounts allow for such a detailed assessment of cross-border exposures and risks by isolating MNEs and the related firms of specific GVCs, which can be further enriched in a multi-country presentation of main partner countries in specific GVCs. These traditional sector accounts measures can be further supplemented by financial soundness indicators, such as return on equity and debt to equity ratio for the large MNEs in specific GVCs to do a more in-depth analysis of the health of their financial operations.

F. Macroeconomic policy

59. The data lessons learned from the financial crisis are important not only for financial oversight and regulation, but also for macroeconomic policy. Until the financial crisis, macroeconomists focused much of their research and policy on the real sector. The global financial crisis refocused attention on the role of debt, asset values, liabilities, and global interdependencies on national and global business cycles. After the financial crisis, macro-prudential and other policies focusing on globally coordinated macroeconomic policies received much attention.

60. Beyond better integrated global financial and real data, one of the most important measurement challenges posed by globalization that is important for macroeconomic policy are biases in import prices. Those biases can have a significant distorting impact on measures of inflation and growth used as targets by monetary authorities and by fiscal authorities for budget projections used in evaluating alternative budget proposals and policies.

61. A body of research (Houseman and Ryder, 2010) suggests that domestic survey data fail to capture price reductions when domestic producers switch from domestic to imported inputs. This bias, in turn, understates real imports and overstates real GDP and productivity growth, especially in the manufacturing sector.

62. A focus on direct investment ownership dimensions is also crucial for policy reasons. To fully understand the nature of GVCs and indeed their drivers, it is important to create a story about the trade-investment nexus that is largely driven by MNEs. Moreover, the share of value-added generated by foreign affiliates approaches around half of all business sector value-added in some countries. In fact, in some countries where foreign affiliates generate significant value-added and repatriate significant profits back to parent companies, the policy focus has switched from gross national product (GDP) to gross national income (GNI).

G. Impacts of offshoring on labour markets and welfare

63. The import proportionality assumption used in conventional SUTs, whereby an input used in an industry has the same ratio of imports to domestically-sourced value as does the economy as a whole, can be improved by having firm-level import data and/or price-based measures of imported input use.[65] According to Feenstra, such improved statistics are particularly important when evaluating whether offshoring leads to real losses for low-skilled labour, beyond just changes in the relative wage. Moreover, Feenstra notes that statistics such as the share of imported input in costs must be supplemented with descriptions of job characteristics[66] in order to determine the tradability of various tasks or occupations. Feenstra further suggests that price-based measures of offshoring are needed to infer the impact of offshoring, particularly on aggregate real GDP. The future research agenda will also likely focus on explaining how offshoring affects the inequality of earnings, building on existing work based on heterogeneous-firm models that show that opening trade can lead to greater wage inequality within sectors, while increasing welfare overall.[67]

64. The process of GVC-induced growth entails the reallocation of workers to more productive activities, and this can mean that, even as average employment conditions improve, some workers may experience unemployment or may see their real wages decline. Facilitating the adjustment process is crucial and requires well-designed social policies and a well-functioning labour market. Effective re-employment services and training programmes can help dislocated workers take advantage of new job opportunities. GVCs also have implications for employment, working conditions and labour rights, including the freedom of association and collective bargaining.

[65] See, for example, R. Feenstra, Statistics to Measure Offshoring and its Impact. NBER Working Paper No. 23067, Jan. 2017.

[66] Feenstra cites the O*NET database, which provides information on job characteristics for 812 occupations. Available from www.onetonline.org/. R. Feenstra, Statistics to Measure Offshoring and its Impact. NBER Working Paper No. 23067, Jan. 2017.

[67] Marc Melitz, 2003, "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", Econometrica, 71(6), November, 1695-1725 Helpman, Elhanan, Oleg Itskhoki and Stephen Redding, 2010, "Inequality and Unemployment in a Global Economy", Econometrica, 78(4), 1239-1283. Helpman, Elhanan, Oleg Itskhoki and Stephen Redding, 2013, "Trade and Labor Market Outcomes", in Advances in Economics and Econometrics, Vol, 2, edited by Daran Acemoglu, Manuel Arellano and Eddie Dekel, Econometric Society. Helpman, Elhanan and others, 2016, "Trade and Inequality: From Theory to Estimation", Review of Economics and Statistics.

Part V
Annexes

Annex A
Extended supply-use tables

A. Overview

1. The increasing international fragmentation of production that has occurred in recent decades driven by technological progress, reductions in trade costs, improved access to resources and markets, trade policy reforms and indeed cost factors in emerging economies, has challenged our conventional wisdom on how we look at and interpret globalization. Traditional measures of trade, for example, 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 in a wide range of policy areas. In response to that, the international statistics community has begun to develop new measures of trade on a value-added basis, for example the OECD-WTO TiVA database, World Input-Output Database , Asia-Pacific Economic Cooperation (APEC)-TiVA and the European FIGARO initiative.

2. But important though such initiatives are, they are able to respond to only one aspect of the globalization debate. Significant attention, for example, is focused on the role of MNEs in this new landscape, and, on this, with the exception of recent exploratory initiatives,[68] current available statistics that follow the TiVA approach are silent. Of particular relevance in that context is the ability of MNEs to shift IPP from one economic territory to another, raising broader questions on the ability of GDP to accurately describe "meaningful" economic activity, with concomitant impacts on other macroeconomic statistics, including TiVA. For example, trade in value-added measures purport to show how (in which industries) and where (in which territories) value is generated in the production of a good or service. The simple relocation of an IPP from one economic territory to another[69] can radically alter that view.

3. In addition, the policy debate in recent years has increasingly focused on what has become referred to in many quarters as "inclusive globalization", referring to the growing realization that the benefits of globalization may not have accrued to all members of society equally, even if only as a process of transition. With traditional macroeconomic statistics, it is not immediately clear, for example, which categories of workers in which countries benefit from globalization (and how) and which may have been, even if only temporarily, left behind. This issue has gained particular prominence in recent years.

4. More fundamentally, there is a growing appreciation that the statistical compilation tools and accounting frameworks designed and developed over the last 60 years in various manifestations of SNA, despite their significant advances, may reflect a world that no longer exists. Those tools were originally designed in a world where production was largely self-contained within an economy, with trade reflecting exports and imports, typically, of finished or primary goods. But today much of global trade is in intermediate parts.

[68] See www.oecd.org/daf/inv/investment-policy/trade-investment-gvc.htm.

[69] Albeit a relocation that satisfies the accounting rules regarding economic, as opposed to legal, ownership.

5. In the early days of SNA, integration in a global factory was to some extent not a significant issue, and statistical information systems evolved in kind, with the rest of the world recorded as a separate institutional sector to and from which goods were sold and bought; and such a view was largely sufficient. But over the years as global production chains and interconnectedness grew, there was a growing realization that additional information was needed to properly navigate around the economic landscape, which resulted in the development of new areas of statistics, such as foreign direct investment measures and data collections focusing on inward and outward activities of foreign affiliates. More recently, new data collections, or rather compilations, have focused on linking trade and business registers to provide insights on which firms in which sectors engage in imports and exports (referred to as trade by enterprise characteristics).

6. Those more recent innovations have significantly improved our collective understanding of trade, and indeed investment, but they are still to a large extent only a partial solution to the statistical challenges presented by globalization and international fragmentation of production: partial in the sense that they remain in many countries the poor relations of the core SNA economic accounting framework, with only limited compilation and collection. Moreover, the mechanisms for data collection are often outside of the conventional framework, meaning that differences may arise between the measures collected within these activities and their implicit equivalents included in the core estimates of GDP. For example, foreign affiliates statistics data are collected as separate exercises in many countries but information on the same firms is also collected[70] as part of GDP estimation, and the same results may not always arise from separate collections. And even in cases where the same survey information is used, subsequent adjustments made in the GDP accounting framework (whether reflecting concepts or statistical adjustments) are rarely replicated in the original source data; resulting in implicit inconsistencies in the eventual published data sets (GDP and foreign affiliates statistics).

[70] Even if only implicitly through sampling and grossing techniques.

7. This largely reflects the stove-pipe approach that has evolved over time to respond to the statistical challenges of globalization. Arguably, a more radical approach is needed that fully reflects the need to have a better articulation of globalization in the core accounting framework: one that doesn't, in extremis, relegate its role to the institutional sector of the rest of the world. Such an approach requires that the role of foreign affiliates in the economic territory and affiliates abroad are captured explicitly (and visibly) in the core accounts. It also requires improved information on the trade relationships of categories of firms (for example exporter and non-exporter), and indeed who those firms trade with. As important is the need to fully articulate income flows in and out of the economy and, in particular, from which category of firms (e.g., industrial sector) they arise.

8. But this is not all that is needed. The challenges of inclusive globalization require that the view of people, (in other words, workers), are also captured in the system. That requires information on skills, occupations, and compensation paid to these categories of workers in different sectors. But again, much of this information is collected in different domains, with different surveys, and so, again, there is a risk that the stove-pipe approach may not be consistent across all domains. For example, labour force survey data on jobs within a sector rarely equal the equivalent measures of jobs in the same sector collected via business surveys or other administrative sources.

9. The development of TiVA-type statistics is certainly a step-forward in this area, but these too suffer from the stove-pipe approach used in statistical data col-

lection. TiVA estimates, derived through the construction of a global input-output table, implicitly assume that all firms within a given sector have the same production function (input-output technical coefficients), import intensity and export intensity. This of course has never been true. We know, for example, that larger firms will typically have different production functions to smaller firms, because of economies of scale, and also higher labour productivity. And those firms will also typically be more export- and, indeed, import-orientated than their smaller counterparts (reflecting, in part, the disproportionate costs of trade faced by smaller firms compared with larger firms). The same generalizations hold true for foreign-owned enterprises, or enterprises with affiliates abroad, compared to purely domestic firms. But TiVA estimates, relying as they do on national SUIOTs, cannot reflect those heterogeneities; meaning that key measures, such as the import content of exports are downward biased.

10. Moreover, the very process of globalization has increased the scale of those heterogeneities, driving coach and horses through the assumption of homogeneity within sectors. As firms within sectors increasingly specialize in specific tasks in the production process, they also suck in greater imports from the upstream part of the value chain and have greater export orientation. In addition, globalization has itself led to an increased prevalence of (once rare) categories of firms such as factoryless producers and processers, where recent changes in the accounting system further weaken the case for assumptions of homogeneity in technical coefficients. For example, all other things being equal, a processing firm in one sector will have significantly less (recorded) imports than a non-processing firm producing the same final product. Similarly, a factoryless producer will be allocated to the distribution sector (with limited intermediate consumption of goods), but the same firm that chooses to buy the material goods used by the processing firms will be allocated to the manufacturing sector (with significant intermediate consumption of goods).

11. The ability of national (and international) SUIOTs, based on industrial groupings alone, to describe how demand and supply relationships are related has therefore become more difficult. Typically, in confronting the problem of heterogeneity, the conventional approach has been to provide more detail by aggregating firms at lower levels of the industrial classification system, for example three- or four-digit groupings as opposed to two-digit groupings, subject to confidentiality restrictions being preserved. But that approach may not be optimal, neither in terms of reducing heterogeneity within aggregations (and in a way that best responds to the policy drivers) nor necessarily optimal in terms of processing burdens.

12. That is not to say that industrial classification systems are completely obsolete. It would serve little purpose, for example, to devise an optimal system that did not retain some means of classifying firms on the basis of their activity, (e.g., manufacturing versus services) if only because they remain the key prisms that users look through when analysing production. But it does serve to highlight that other approaches to tackling heterogeneity can, and should, be considered.

13. The tool advocated in SNA for ensuring coherence across various data sources to assure alignment of GDP estimates created by the income, expenditure and production approach is supply-use tables; the same underlying core statistical input required for TiVA estimates. As shown here, through (in principle) simple extensions to conventional supply-use tables, E-SUTs provide the ideal basis for bringing together these various domains into a single integrated economic accounting framework that puts the measurement of the "global" at the heart of the "national".

B. Extended supply-use tables

1. Extended supply-use tables in the 2008 SNA

14. Before beginning, it is perhaps instructive to note that the concept that will be developed here is not radically new. Many satellite accounts, for example, work around similar principals to those advocated below. Indeed chapter 14 of the 2008 SNA provides a presentation of supply-use tables that differentiate production on the basis of market output, non-market output and production for own final use. Such an approach capitalizes on the readily available nature of data in most countries that can support such a breakdown. Obviously, such a breakdown is superior to conventional tables without a breakdown as they provide additional information that can support more granular policies, for example with respect to subsistence farming, but they also provide a means for more coherent accounts, for example, imputations of output for own use and corresponding consumption estimates can be more readily aligned.

15. A few additional "extensions" worth noting in the 2008 SNA presentation (and which provide entry points to analyse impacts on people, while also significantly improving productivity measures) are additional rows showing labour inputs (as hours worked), gross fixed capital formation, and closing stocks of fixed assets.

16. Nevertheless, very few countries currently provide all the additional information specified earlier, despite their importance.

17. Very simple elaborations, building on the existing presentation could be developed, for example, by differentiating activities on the basis of whether the observed units are in the formal sector (however that may be defined), where information is typically drawn from administrative sources and surveys or the informal sector (which typically involves some form of imputation).

18. A few important and instructive points are worth fleshing out here.

19. The first concerns the rectangular[71] presentation embodied in the 2008 SNA. In other words, splits of activities into different categories of firms are not replicated as additional splits of corresponding products by source category of producer: even though a breakdown of activities only into market/non-market/production for own use, would not involve onerous assumptions to trace consumption to the same categories of specific producers – for example, own-account production could easily be traced, by definition, to the consumer.

[71] That is, a different number of rows (products) and columns (industry, or activity groupings) in the SUT.

20. The second concerns the degree to which activities are split. Not all activities are necessarily split. For example, for the category of production for own final use, the 2008 SNA presentation only specifies breakdowns for the agriculture, construction, real estate and private household services sectors, but in theory many other activities (at least in goods) could also be produced. The reason they are not, of course, reflects their generally low economic significance.

21. The third, and perhaps most important takeaway from SNA presentation concerns the underlying, albeit implicit, principle to pursue granularity in a manner that is instructive, cost-effective and feasible. As noted previously, for example, the breakdown advocated in SNA does not, at least in theory, require additional surveys beyond those already collected in developing the accounts.

Figure A.1
Simple extensions (complements) to SUTs

	Complementary items for Supply					
	Imports of goods valued at FOB	CIF/FOB component allocated to specific service category	CIF/FOB domestic adjustment	Residents' expenditure abroad	Goods imported under processing arrangements (i.e., no change of ownership)	Import Duties
Goods						
Services						

	Complementary items for Demand					
	Exports of manufacturing services on goods owned by others	Customs value of goods exported under processing arrangements	Adjustments made for merchanting transactions crossing over two periods	Merchanting services included in goods	Non-residents' expenditure	Re-exports
Goods						
Services						

		Import flow matrix broken down by country/region										
		Intermediate Use										
		Industry 1	Industry 2	…	Industry i	…	Industry N	HHFC	NPISH	GGFC	FCF	(Re) Exports
Country/ Region 1	Goods											
	Services											
Country/ Region 2	Goods											
	Services											
Country/ Region 3	Goods											
	Services											
Country/ Region i	Goods											
	Services											
Country/ Region K	Goods											
	Services											

Note in the above that the reference to "CIF/FOB domestic adjustment" refers explicitly to the adjustment made in conventional supply-use tables to adjust for the transportation and insurance services provided by resident producers. Those expenditures should in theory be removed from the total value of imports to ensure that total imports are valued at FOB prices. Typically, that adjustment is included as a separate row in most countries national supply-use tables (with a corresponding adjustment made to exports). The column referred to as "CIF/FOB domestic adjustment" therefore reflects only the allocation of that component to specific service categories. Note that this is also described in the 2008 SNA but very few countries provide that information by product.

2. Extended supply-use tables for globalization

22. This section builds on the underlying principle described previously, recognizing of course, as always, the limitations imposed by confidentiality restrictions, which are an underpinning principle in statistical dissemination.

23. The section runs through four distinct types of extensions:

- The first category looks at very simple extensions to the core accounts that require no additional breakdown of activities into categories or grouping of more homogeneous (or rather less heterogeneous) firms.
- The second looks at extensions that split activities into more homogeneous groupings of firms.
- The third looks at extensions that provide links between the core production accounts and the distribution of income account, and to other important macroeconomic variables (such as employment).
- The final extension, perhaps the most difficult to do since it may not always be possible to create such breakdowns with existing information, without assumptions, is the breakdown of products by distinct category of producer.

3. Simple extensions

24. There are a number of relatively simple extensions that can be added to conventional supply-use tables in a way that can greatly improve our ability to analyse and understand globalization.

25. Perhaps the simplest of those extensions is to separately show estimates of goods for processing transactions (manufacturing services on physical inputs owned by others) and re-exports (if import flow tables are not also provided). Such extensions are important for TiVA calculations as re-exports typically have only negligible (often zero) domestic content, while information on goods for processing transactions significantly improve the ability to create coherent global supply-use tables.

26. Such information is even further enhanced if breakdowns of activities also separately differentiate between processing and non-processing production (discussed later). Ideally, for goods for processing transactions, it is also helpful to show the value of those goods that have been imported (but whose ownership has not changed) and the full customs value of goods subsequently exported. Similarly, especially because the process of production is significantly different, it is also useful to show separately the value of merchanting with gross values of exports of goods.

27. A second set of simple extensions, albeit slightly more complicated, as such information is not always available or collected at the detailed product level available in supply-use tables, concerns the estimates of residents' expenditure abroad and non-residents' expenditure. In many countries those are shown only within conventional supply-use tables as additional separate items added to total imports and total exports respectively (with corresponding adjustments made to household final consumption). Again, for the calculation of global supply-use tables, it is important to have these items broken down by product. Tourism satellite accounts often provide a good basis for creating such breakdowns.

28. In many countries those items are added as additional rows in national supply-use tables and so it is not necessarily meaningful to describe additional columns broken down by products as "of which" items, and so instead the recommendation made here is that they are added as complementary columns. It is important to note that separate breakdowns have a variety of applications, first and foremost for a better

Figure A.2
Extended supply-use tables (activity breakdown)

Supply

	Industry 1		Industry 2		Industry …		Industry k		Industry …		Industry N		Total Output	Imports		Margins	Taxes and Subsidies	Total Supply
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2		Category 1	Category 2			
Product 1																		
Product 2																		
Product …																		
Product I																		
Product …																		
Product M																		
Total Output																		

Use

	Industry 1		Industry …		Industry k		Industry …		Industry N		HHFC + NPISH	GGFC	FCF		Exports		Total Demand
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2			Category 1	Category 2	Category 1	Category 2	
Product 1																	
Product 2																	
Product …																	
Product I																	
Product …																	
Product M																	
Total IC																	
Value Added Output																	
Output of which: exports																	

Figure A.2
Extended supply-use tables (activity breakdown) (*continued*)

Import Flow

	Industry 1		Industry …		Industry k		Industry …		Industry N		HHFC + NPISH	GGFC	FCF		(Re)Exports		Total Imports
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2			Category 1	Category 2	Category 1	Category 2	
Product 1																	
Product 2																	
Product …																	
Product I																	
Product …																	
Product M																	

understanding of the tourism industry but they also matter greatly for TiVA as the goods transactions do not (generally) involve tariffs, unlike conventional merchandise trade. That matters because analyses that use TiVA, for example, to assess the multiplicative impact of cascading tariffs along a GVC are likely to overestimate these costs if tourism trade in goods (where tariffs do not typically apply) are not separated.[72]

29. A third set of extensions concerns the valuation of imports. Typically, goods transactions are recorded at CIF prices. But global supply-use tables require a common valuation of imports and exports, meaning that import values are also needed at FOB prices. As such, a split of imports of goods into an FOB component and a CIF component is also highly desirable. In addition, in order to analyse the impact of tariffs on global value chains, and indeed to help construct import-flow matrices (particularly those derived using the classic proportionality assumption) complementary information on tariffs/duties paid by product is also highly desirable.

30. A fourth set of extensions concerns the geographical breakdown of the import flow matrix within the supply-use framework (an essential step needed on the way to producing global IOTs, but also, even if not widely used, very useful in constructing national SUIOTs). Countries use a variety of methods to derive their import flow matrices. In some, estimates are based on survey estimates or administrative sources but in many they are based on the assumption of proportionality[73] (ideally calculated at the most detailed product level possible, even if this level is more disaggregated than that used in dissemination and taking into account end-use-type (BEC) classifications). Ideally these tables could also be broken down by partner (or at least major partners or regional groupings). In the simplest case this could be done by also applying a proportionality assumption, but more refined estimates could be derived through linking exercises; in particular through the linking of trade (customs) and statistical business registers at the firm level.

31. Figure A.1 describes all the above extensions in a simple schematic flow diagram. For convenience, and also because national practices in the construction and presentation of supply-use tables differ, all items are described as complementary items.

4. Extensions within activities

32. As noted previously, the concept of breaking down activities into more homogenous or policy relevant groupings is not new. The 2008 SNA, for example, describes breakdowns between market and non-market activities and many satellite accounting systems also embody that principle. The approach advocated in this paper is to develop aggregations of firms (and splits of activities) into those that best respond to the growing demands presented by globalization.

33. It is important in that respect to note that the approach is deliberately not prescriptive. How countries develop E-SUTs that meet the statistical challenges presented by globalization necessarily depends on national circumstances. Those are in the main driven by statistical capacity, but they should also reflect national policy demands.

34. The OECD Expert Group on extended supply-use tables,[74] created in 2014, focused on three broad approaches that could, in theory, be developed by all countries (with varying degrees of complexity). These three approaches were:

- Breakdowns by size-class of firm (statistical unit)
- Breakdowns by trading status (exporter, two-way trader, importer, non-trader)
- Breakdowns by ownership status (foreign owned affiliates, domestic multinational with affiliates abroad, domestic firm with no foreign affiliates).

[72] Note that this is not unique to tourism expenditures. *De minimis* cross-border trade (below customs thresholds) are also, typically, tariff free, and so, some consideration could also be given to exploring whether those too should be shown separately in SUTs. In theory that should be realizable, as in practice, in most countries *de minimis* trade is estimated using broader (often macro) approaches. However, and also in practice, they are not typically also estimated with a breakdown by product. For now, they are thought to be small-scale transactions and so the working assumption is that they are captured in the balancing process to create the SUT but digitalization and intermediation platforms (such as Amazon, eBay, etc.) have democratized access by households to producers abroad, and so the scale of *de minimis* transactions may be increasing.

[73] See United Nations, *Handbook on Supply, Use and Input-Output Tables with Extensions and Applications*.

[74] See www.oecd.org/sti/ind/tiva/eSUTs_TOR.pdf.

Figure A.3
Extended supply-use tables (activity breakdown) for exports

		Exports		Exports of manu-facturing services on goods owned by others		Customs value of goods exported under processing arrangements		Adjustments made for merchanting transactions crossing over two periods		Merchanting services included in goods		Non-residents' expenditure		Re-exports	
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
Country/Region 1	Product 1														
	Product 2														
	Product …														
	Product I					Services									
	Product …														
	Product M														
Country/Region 2	Product 1														
	Product 2														
	Product …														
	Product I					Services									
	Product …														
	Product M														
Country/Region 3	Product 1														
	Product 2														
	Product …														
	Product I					Services									
	Product …														
	Product M														
Country/Region 4	Product 1														
	Product 2														
	Product …														
	Product I					Services									
	Product …														
	Product M														

Figure A.4
Extended supply-use tables (activity breakdown) for investment and capital stock

		Gross Fixed Capital Formation					
		Industry 1		Industry …		Industry N	
		Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2
Domestic	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						
Country/Region 1	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						
Country/Region 2	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						

		Net Capital Stock					
		Industry 1		Industry …		Industry N	
		Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2
Domestic	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						
Country/Region 1	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						
Country/Region 2	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						

Figure A.4 (*continued*)

		Gross Fixed Capital Formation					
		Industry 1		Industry …		Industry N	
		Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2
Country/Region	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						

		Net Capital Stock					
		Industry 1		Industry …		Industry N	
		Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2	Cat-egory 1	Cat-egory 2
Country/Region	Product 1						
	Product 2						
	Product …						
	Product I						
	Product …						
	Product M						

35. Participating countries were also asked to consider variants, including combinations, of the above three breakdowns, for example breakdowns by trading status and size class, and also to consider alternative approaches that better reflected national circumstances. For example Chinese tables were broken down into three categories of firms – exporters operating within the customs processing regime, other exporters, and non-exporters; Mexican tables were developed by grouping firms on the basis of whether they were a global manufacturer or non-global manufacturer; and Costa Rican tables have been broken down into three categories of firms: firms operating within free trade zones, other exporters and all other firms (and work is ongoing to extend those breakdowns to include an ownership dimension).

36. Conceptually the breakdown of activities into more distinct (heterogeneous and/or policy relevant groupings) of firms, is relatively trivial to illustrate (see fig. A.2); it merely involves breaking down existing activities into new disaggregations, where such disaggregations are meaningful.

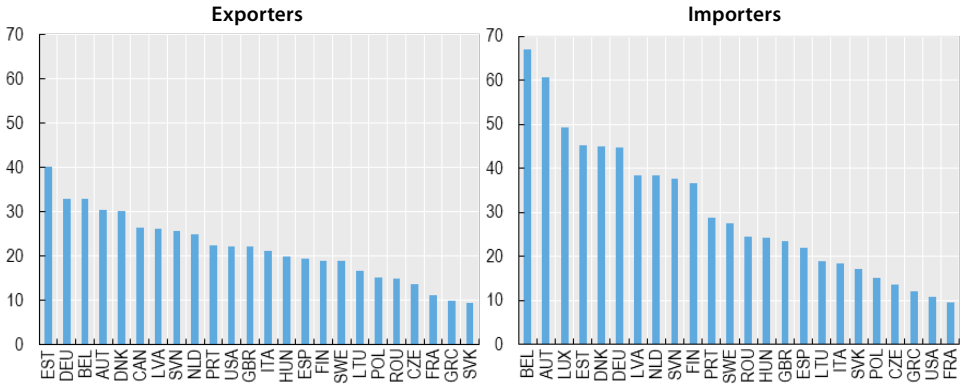
37. For example, it would not be particularly useful, at least with respect to improving homogeneity, to disaggregate a particular activity if the overwhelming majority of output and exports within that activity were conducted by one category of firm. Indeed, in some cases it would not be possible to have disaggregations if the corresponding breakdown resulted in breaches of confidentiality (i.e., statistical disclosure of individual firms). That is another reason why it is preferable not to be prescriptive about the format of E-SUTs.

38. However, challenges presented by confidentiality do provide an opportunity to consider whether current dissemination strategies are necessarily optimal, from a policy perspective at least. For example, it may be preferable to reduce the degree of industrial activity breakdown presented if this provides scope to provide additional breakdowns by other categorizations of firm.

39. Figure A.2 provides a simple illustration of such an E-SUTs with two categories of firms. Note the inclusion of additional breakdowns of fixed capital investment, exports and imports by the relevant categories of firms and the additional row under output, showing the value of output that is exported. Note also, for ease of exposition, that the additional extensions described in paragraphs 24 to 30 are not illustrated in figure A.2, however it follows that it would be preferable to include those extensions with additional breakdowns by category of firm where relevant. That includes, in particular, breakdowns of Imports of goods under processing arrangements; Exports of manufacturing services on goods owned by others; Customs value of goods exported under processing arrangements; and Adjustments made for merchanting transactions crossing over two periods.

40. One additional extension that would be very useful in the current context concerns the geographical breakdown of exports. Standard indicators on GVCs, such as those derived via TiVA, are not able to track the true underlying granularity implicit in the value chain. For example, foreign-owned affiliates seem more likely to have stronger trade relationships with their parent's resident country than independent firms, both with regard to imports and exports, especially when considering the whole of the value chain. That can make a significant difference to trade relationships derived from TiVA measures where the "averaging" effect tends to weaken the strength of those ties. For example, firms in the United States exporting parts for assembly in Mexico often do so with a view to United States markets in mind, but current TiVA estimates are not fully able to capture the granularity of those relationships: a breakdown of the origin of imports by category of firm and, correspondingly, the destination of exports by the same categories of firms would greatly improve the quality of TiVA based estimates, such as

Figure A.5
Share of all firms (industry, 2014) that are exporter or importers



Source: OECD Trade by Enterprise Characteristics

the United States content of Mexico's exports to the United States. Figure 3 provides a schematic of the type of information that it would be useful to provide in E-SUTs.

41. One final complementary extension that would be of considerable use relates to capital flow matrices (see fig. A.4). Although many countries are able to produce estimates of gross fixed capital formation by activity, they are typically available only at a relatively aggregated product level, such as "plant and machinery", "intellectual property" and so on, and rarely at the level of product detail provided in conventional supply-use tables. That is a significant statistical lacuna. It necessarily hinders the development of high-quality KLEMS type statistics as, by definition, it requires relatively aggregated measures of capital stock (derived typically via the perpetual inventory method), but it also limits extensions in the domain of TiVA type statistics.

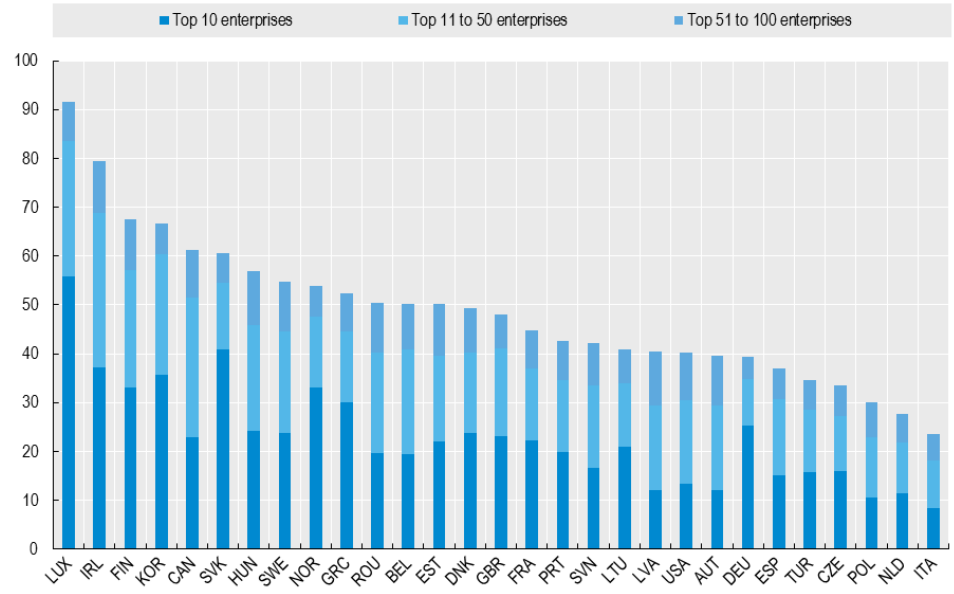
42. For example, and to illustrate, if Germany only exported capital machinery to China, there would be no German value-added embodied in China's exports and so Germany's dependencies with consumption in the rest of the world on that basis could appear to be misleadingly limited. However, a time series of capital flow matrices could be used to construct corresponding measures of capital services such that an extended TiVA system could be developed that recorded Germany's exports of capital investment goods as a flow of a series of capital services payments (akin to treating the purchase by China as if it was an up-front payment operating lease arrangement rather than an acquisition).

43. It is important to stress that in the same way that all activities do not need to be broken down, neither is it necessary for all the additional extensions to be provided. For example, breakdowns by category of exports of manufacturing services on goods owned by others can alone significantly improve the quality of TiVA indicators. Moreover, and again to labour an important point, how countries define the categories of firms necessarily depends on the quality and availability of complementary information.

5. Capitalizing on customs registers

44. One source of information, available in theory in all countries, that provides a rich source are registers of exporting firms used for customs purposes. Typically, but not exclusively, those record imports and exports by exporting enterprises, and in many countries (e.g., China and Costa Rica), complementary information is available on the export regime that the enterprises operate within. For example, in China, as is the case in many countries with large processing-based exports, processing firms are able to import parts duty-free (as long as the final good is subsequently exported).

Figure A.6
Concentration of exports by exporting enterprises, total economy



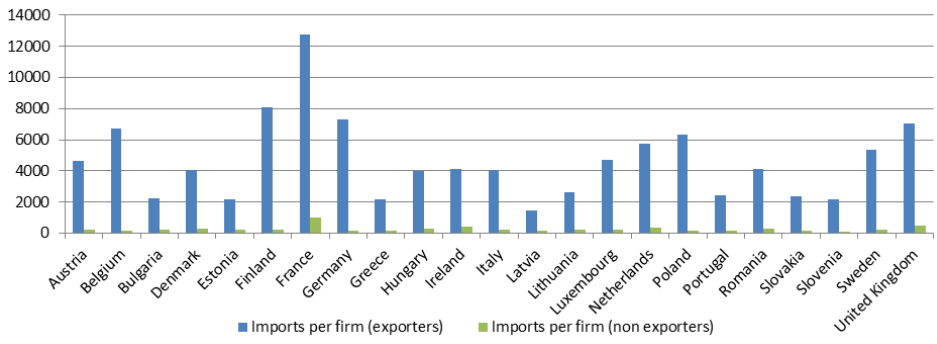
Source: OECD Trade by Enterprise Characteristics

A similar situation exists for firms operating from free trade zones, which forms the basis of firm categorization in Costa Rica's E-SUTs.

45. But even without this additional granularity available in countries with, for example, large-scale processing sectors and free trade zones, customs registers are able to provide an excellent source for E-SUTs because it is, in theory, possible to link the statistical units recorded in customs registers to the corresponding statistical unit recorded in the core statistical business register. Indeed, it is that linking that provides the basis of the "trade by enterprise characteristics" data sets[75] that have been developed in recent years across many countries. Typically, the following data are available by size class and industry through a simple matching exercise: number of exporting and of importing firms, export values of exporting firms, direct imports by product, direct imports by exporting firms. More recently, a number of countries have also begun to collect information breaking flows down by ownership (foreign/domestic) too.

[75] OECD. *Handbook on Linking Trade and Business Statistics* (forthcoming).

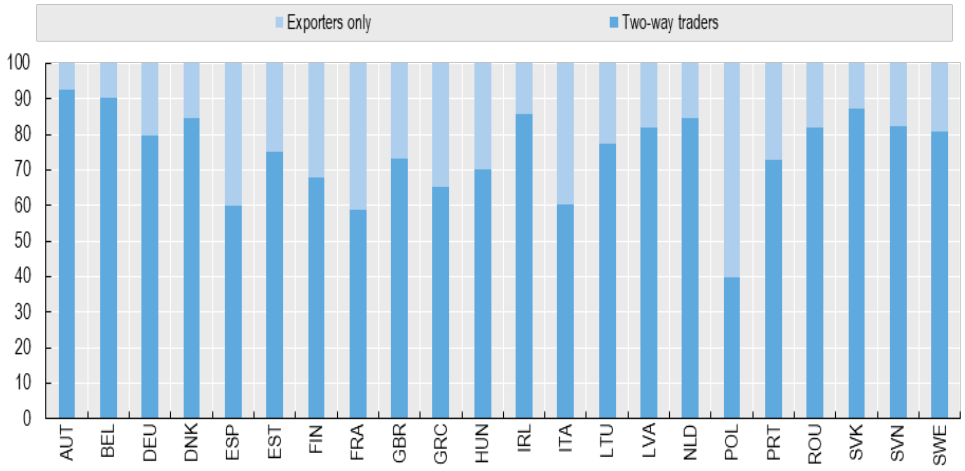
Figure A.7
Imports per firm, 2011



Source: OECD Trade by Enterprise Characteristics

Figure A.8
Incidence of two-way traders, industry

Percentage of two-way traders among trading enterprises, 2015 or latest available year



Source: OECD Trade by Enterprise Characteristics

46. Such a linking exercise can provide the building blocks for creating new aggregations of firms within supply-use tables broken down into:

- Firms that have no direct imports and no direct exports
- Firms that have no direct imports but have direct exports
- Firms that have direct imports and exports
- Firms that have direct imports but no direct exports

47. Regarding heterogeneity of production functions, with respect to measuring facets of globalization, it is clear that such groupings could significantly improve the quality of estimates as they broadly define firm aggregations on the basis of one of the key target indicators of globalization: import content of a firm's exports.

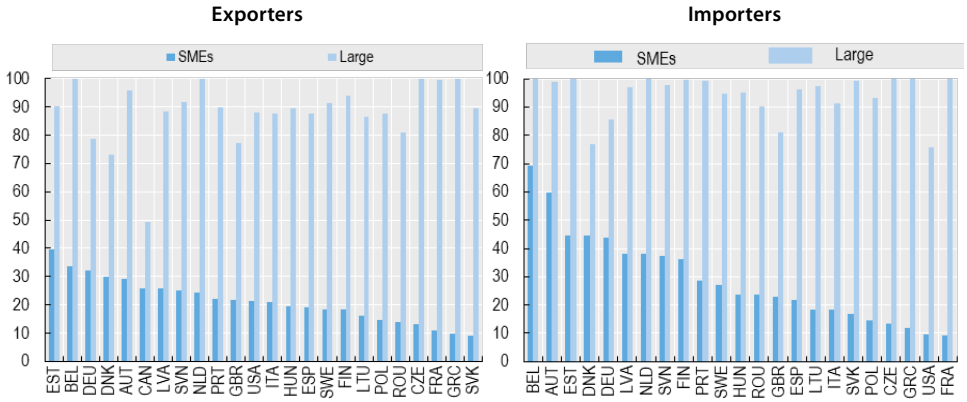
48. In constructing conventional supply-use tables national compilers currently produce aggregations based on activity information alone. By using the above additional disaggregations, it is, at least in theory, a trivial exercise to produce E-SUTs (broken down by trading status).

49. There are, however, a few complicating features that should be borne in mind. The first relates to the statistical unit, which is not always the same in the statistical business register and the customs register, nor indeed necessarily the same as the unit used in constructing conventional national supply-use tables. Customs registers, for example, often, but not exclusively, capture units in line with (or close to) the enterprise concept, but the statistical unit used in statistical business registers is often a legal unit, while in many countries the unit used for conventional SUTs is the establishment. As such it is important to ensure that a common unit is used, or that appropriate links and apportionment methods are made to link across the various data sets. That being said, in many countries this is a relatively trivial exercise as the unit used is the same across all domains. Where the units are not the same, and where the challenges of reliable apportionment are onerous it seems preferable to select the highest common denominator as the basis for the unit across all three domains, for example the enterprise.[76]

50. An additional complication with respect to the use of customs registers in compiling E-SUTs relates to the notion of exporting and importing firms. In most coun-

[76] By way of a small but relevant digression, it is important to note that, partly because of the challenges presented by globalization, and notably those challenges related to intellectual property, the 2008 SNA Research Agenda includes an item to investigate whether the establishment should remain the preferred unit for the construction of conventional supply-use tables.

Figure A.9
Share of all firms (Industry, 2014) that are exporters/importers



Source: OECD Trade by Enterprise Characteristics

tries, for example, a significant share (around half in many countries) of total imports and exports are made by distribution firms (wholesale and retailers). But in constructing supply-use tables those firms are shown only as facilitators of imports and exports, in other words the conventional SUTs show the consumption of those imports by other consumers (e.g., firms, government, households, non-profit institutions serving households) and not the distribution firms themselves, and they also implicitly show the exports as having originated in the actual producing sectors, with the contribution of the distribution sector only added as a distribution margin.

51. If it can be established that the distribution firm is affiliated to an upstream producer, the import and export of the affiliated distribution firm should be allocated to its affiliated consuming or producing partner. If, however, those links cannot be made, and the size of overall exports of a particular product by distributors make up a significant share of overall exports of that particular product, then considerable care is needed in interpretation or at least in terms of terminology. For example, countries should avoid, in those circumstances, referring to firms as being exporters and non-exporters and instead refer to firms as "direct exporters" or "highly export orientated" and "other". The same principle should necessarily be applied for imports, especially because many firms indirectly import via distributors.

52. An additional reason for advocating such precise terminology concerns scale. The shares of firms not engaged in trade are rarely insignificant (see fig. A.5), and moreover a significant share of those firms export either very little or indeed only a small percentage of their output.

53. As such there is a risk that an aggregation of firms purely around the concept of whether they export or import may be too crude an approach to deliver a significant improvement in homogeneity or indeed to deliver meaningful improvements to policy-relevant indicators, such as the import content of exports.

54. A practical approach in this respect is to introduce a size threshold that further differentiates on the basis of the size of the firm or the share of output that is actually exported, for example, differentiating between firms that directly export 20 per cent of output and less than 20 per cent of output or by only creating aggregations of significant large exporters in the country. One strength of that approach is that it can significantly reduce compilation burdens that may arise when full linking and full disaggregation of activities is undertaken. For example, in most countries the top 100

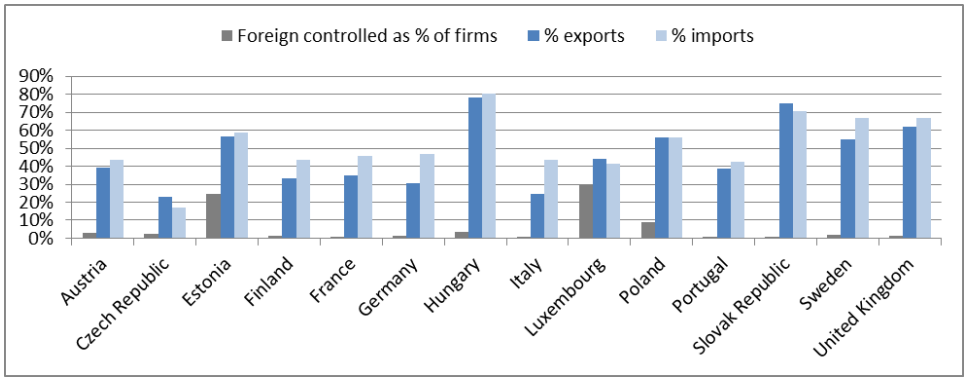
exporting enterprises are responsible for around half of all exports (see fig. A.6). Clearly some care will be needed in adopting that approach as confidentiality issues quickly emerge the higher the threshold for inclusion, but the point is to illustrate that it is able to introduce significant improvements in homogeneity through looking at only a smaller grouping of firms, and indeed targeted activities. That is perhaps of important note for developing economies where compilation burdens may rapidly become onerous if meaningful thresholds are not introduced. Indeed, such an approach is likely to work particularly effectively in some developing economies where exports are oriented around only a handful of core activities and by a handful of key firms.

55. Another reason such an approach is worth exploring is the high correlation between direct imports and direct exports (see fig. A.7), which is perhaps not surprising given that it is one of the key defining features of GVCs and international fragmentation of production more generally. That means that a simpler approach that focuses on a core set of large exporters and activities is also likely to capture the desired homogeneity that would be obtained through additional aggregations of importers. Moreover, in most countries, most exporters also import (see fig. A.8).

56. The approaches used by China and Costa Rica are both examples of that modified "threshold" approach. In the case of China, the approach identifies categories of exporters that differentiate between firms that export under the processing regime, those that export but under the normal regime (both using administrative customs data that identify these firms) and other non-exporting firms. Once identified, the firms are grouped within activities and their respective columns within SUTs can be compiled, using the same data (based on business surveys and other administrative sources) that are used to construct the estimates in conventional SUTs. Costa Rica's approach is similar, except in this case, the split is based on those firms operating (exporting from) free trade zones. In both cases the approach ticks two important boxes.

57. The first reflects improved homogeneity. It is clear, for example, that processing firms and firms operating from free trade zones have very different degrees of global integration than other firms in the same activity. Almost by definition, they have higher import content, reflecting in large part their duty-free nature. But they also differ in many other respects. Processing firms, for example, are often bywords for assemblers, and even if they are classified to the same activity as firms engaged in producing a good from start to finish, it's also clear that the production function (and so input-output relationships) will differ significantly. The same holds true for firms in free trade zones, reflecting a number of factors, including processing, size, degrees of foreign ownership (and, so, access to higher technology, including intellectual property). But that also reflects costs. For example, all other things being equal, the cost

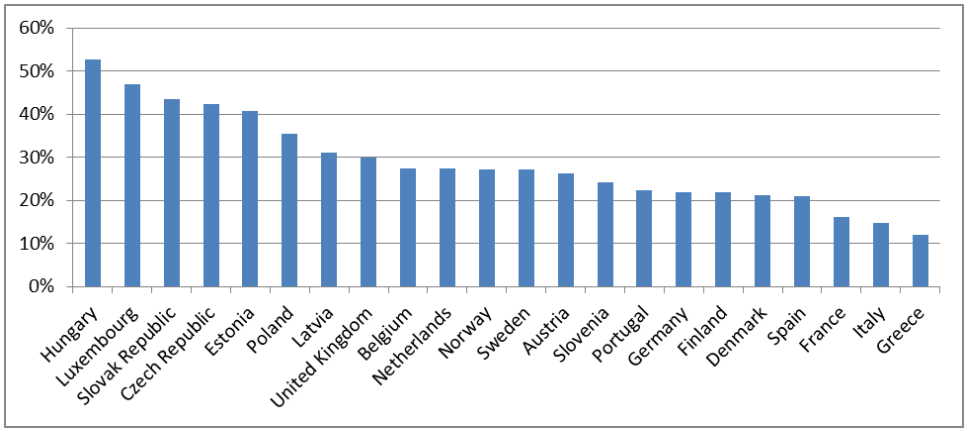
Figure A.10
Foreign-owned firms across economies, 2011



Source: OECD Trade by Enterprise Characteristics

Note: Foreign-owned firms are defined according to foreign affiliates statistics/AMNE 50 per cent thresholds

Figure A.11
Value-added at factor cost of foreign affiliates – share of national total, 2014 (ISIC B-N, ex K)*



* International Standard Industrial Classification (ISIC), Rev. 4, sections B-N, excluding section K (financial and insurance activities). https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf

Note: Includes industries according to International Standard Industrial Classification (ISIC), Rev. 4, sections B-N, excluding section K (financial and insurance activities).

https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf

Source: OECD AMNE database

structure of a firm in a free trade zones, at least with respect to the cost of imports, will by definition be lower than for firms outside of free trade zones.

58. The second reflects policy. It is clear. for example. that there is particular policy and analytical interest in the role of processing firms in China. They have been important drivers of China's integration into GVCs, but their role has been evolving in the last 10 to 15 years and policymakers are especially interested in motivating their graduation up the value-chain to higher skilled activities. The same is true for firms operating from free trade zones. Understanding, for example, their integration into GVCs is of particular interest (including in due course how value-added generated by foreign owned affiliates is repatriated to parents overseas) but so too is better understanding how they integrate, and therefore how they create upstream spillovers in the domestic economy, not least to assess to what extent free trade zones may hinder this (reflecting in part the competitive disadvantages faced by potential domestic upstream providers who have to pay duties on any upstream imports they may require).

6. Capitalizing on structural business statistics for a size class dimension

59. Another area of significant policy interest, but also a long-standing source of heterogeneity, relates to the size of firms. It is a well-known fact that larger firms are typically more capital intensive than smaller firms and also that they are able to capitalize on economies of scale. But it is also true that those economies of scale manifest themselves in a trade context. Larger firms, for example, are more readily able to accommodate any fixed costs (e.g., dealing with regulatory and administrative barriers) involved in international trade, and it is perhaps of no coincidence that in most countries a significantly smaller share of smaller firms is engaged in international trade than larger firms, certainly with respect to exports (see fig. A.9).

60. In practice, it is a relatively trivial exercise to create breakdowns of activities into size class dimensions. Statistical business registers nearly always include those dimensions and together with the activity code, they form one of the most important pillars (stratification variable) of survey sample design. However, of considerable interest in respect of globalization concerns the degree of integration of the various categories of firms within GVCs. For those countries where survey or administrative sources reveal

the share of output that can be exported, one relatively simple innovation is to include that information as an additional row in SUT.

61. However, more can be done. One area that could be explored by countries concerns links at the detailed industry activity level with detailed merchandise trade customs data. Such a matching exercise could, for example, reveal that exports of particular detailed six- or eight-digit HS products are produced only by certain categories of firms that can be described as large, medium or small. Where more than one category of firm size is responsible for production, proportionality assumptions could be used – although not perfect for a number of reasons, not least because there is perhaps a higher probability that larger firms will account for a disproportionate share – when conducted at a relatively detailed product and industry level the impact of the assumption is likely be lessened. That approach provides an ability to split the conventional export column in SUTs into categories of exporters (broken down by size class). It also provides an ability to create a further extension, as shown previously, to include a breakdown by destination. That is of particular relevance as the evidence points clearly to smaller firms exporting disproportionately within neighbouring countries (and with countries where trade agreements exist) compared with larger firms.

62. One avenue that could greatly improve the quality of information on imports and exports broken down by size class is to link structural business statistics data to customs registers, by adopting the same linking methods outlined above. Again, however, some care will be needed in compilation as exports and imports included in customs registers are often recorded as being conducted by distributors but by combining detailed HS data, structural business statistics, data and TEC-type statistics, the quality of the exercise could be greatly enhanced (including through the development of breakdowns that show the origin country of imports and the destination country of exports).

Box A.1

Mexican extended supply and use tables

Mexico published its national E-SUT in November 2018. The disaggregation in Mexican case considered: a) export focus; b) ownership focus; c) size of the economic unit focus; and d) integrated focus.

One of the main characteristics of this E-SUT is the exhaustive use of the economic census. Consequently, the economic unit of study is the "establishment".

Another characteristic is the same structure of the SUT was maintained, so the breakdown of production activities is valued at basic prices; therefore, it is necessary to add trade and transport margins, and taxes on products on the "supply" side (also extended) plus imports of all goods and services. On the "use" side, there is a breakdown only for the intermediate demand, while the components of the final demand will appear unopened.

The results of both supply and intermediate demand are presented below in a general way, for each of the calculated profiles:

Export focus

In 2013, the production was carried out in a greater percentage (58.9 per cent) by the non-exporting economic units, while the lower proportion (9.0 per cent) was made by the exporting units.

Box A.1 (*continued*)

These results indicate that the economic units that have greater participation in the domestic market are the non-formal exporters, both on the supply side and the utilization side.

Ownership focus

For this profile, the highest percentage was produced by national controlled establishments with 30.3 per cent. However, the economic units that are subsidiaries, both national and foreign, maintain very similar participation with 29.5 per cent and 29.9 per cent, respectively, while those of foreign control has only a 10.3 per cent share in production.

In terms of intermediate demand, the proportions change, being the most important both subsidiaries: national with 31.0 per cent and foreign with 32.2 per cent while foreign control establishments remain at 11.2 per cent.

Size of the economic unit focus

In this profile, the highest participation in both production and intermediate demand corresponds to small economic units with 54.4 per cent and 45.2 per cent, respectively. Those establishments generate nearly 90 per cent of jobs in Mexico.

On the other hand, medium-sized establishments generate the lowest percentage of both production and intermediate demand with 12.4 per cent in both cases.

Integrated focus

This profile integrates the three previous profiles. The results show that establishments produced 62.6 per cent of the production in the manufacturing sector with an export profile, of which 55.4 per cent corresponds to the national control units, while the remaining 44.6 per cent is of foreign control. It is worth mentioning that in both cases, for the owner's profile, subsidiaries are being included. Finally, since national controlled establishments are the most representative, 81.7 per cent of them are large.

For more information, see www.inegi.org.mx/temas/coue/.

7. Capitalizing on foreign direct investment and foreign affiliates statistics data, for an ownership dimension

63. Arguably one of the most useful dimensions for constructing E-SUTs concerns breakdowns by ownership structures – e.g., foreign-owned affiliates (FA), domestic MNEs (DM) with affiliates abroad, and domestic firms (DF) with no foreign affiliates.

64. It is clear that foreign-owned firms and multinationals, in general, shape GVCs. It is also clear that foreign-owned affiliates are responsible for considerable shares of overall activity and in particular trade, despite their relatively limited number (see fig. A.10), with a much higher orientation towards international than their purely domestic counterparts. A focus on this small number of firms could therefore prove to be a very effective channel for developing E-SUTs.

65. But a focus on ownership dimensions is also crucial for policy reasons. Thus far, the TiVA database has been able to provide insights into GVC ping by creating a narrative around trade. However, to fully understand the nature of GVCs and indeed their drivers, it is important to create a trade-investment story. 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.[77] Moreover, the share of value-added generated by foreign affiliates approaches around half of all business sector value-added in some countries (see fig. A.11).

[77] Source: Corpwatch.org.

66. Value-added essentially reflects two main components:[78] a) operating surplus (including mixed income), or compensation for capital; and b) compensation for employment. While the latter component largely reflects the direct benefits that accrue and "stick" within the economy through production,[79] the case is not so clear for the former, where foreign affiliates are concerned.

67. 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.[80] 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. That has raised questions – often in emerging economies but also in developed economies – about the actual benefits of foreign MNEs to the host economy. Indeed, more recently it has begun to raise questions about the meaningfulness of GDP itself as a tool for macroecomomic analysis.

68. Particularly important in that regard are transactions in intangible assets: those recognized as produced in SNA (such as R&D, software, etc.) non-produced (e.g., brands) and also other knowledge-based capital (such as organizational capital, e.g., management competencies). Often, in international trade in services statistics, payments for the use of those 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 (e.g., 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) with the "ultimate" beneficiary (the owning affiliate) recording no value-added but instead receiving 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 (at least in theory, as even the very notion of the ultimate owner is a complex issue).

69. Furthermore, the distinction between the two scenarios described 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 TiVA estimates consistently reflect the way those 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, the policy focus has switched from GDP to GNI, and indeed in some countries, such as Ireland, to new accounting concepts.[81]

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

71. Measuring those 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). That requires more detailed data beyond the current purely industry-level

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

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

[80] Such as land and other intangible assets not recognized as IPP in SNA.

[81] See www.cso.ie/en/csolatestnews/pressreleases/2017pressreleases/pressstatementmacroeconomicreleasesyear2016andquarter12017/.

information in the TiVA database. What is required are additional breakdowns of firms classified on the basis of their ownership.

72. Statistical tools to create those breakdowns do currently exist in many countries, in particular those with good-quality foreign direct investment data and also those producing foreign-affiliates statistics data. Definitional issues are of course relevant here. Foreign direct investment data, for example, captures associate firms (where foreign parents hold between 10 and 50 per cent of the company's capital) and subsidiaries (50 per cent and over), while foreign-affiliates statistics data typically capture only subsidiaries. But, as before, the intention is not to be prescriptive, and countries are encouraged to develop breakdowns in line with national circumstances and data availability. Ideally, however, the breakdowns would follow either foreign direct investment or foreign-affiliates statistics definitions, as this would provide the basis for more coherent and integrated accounting frameworks. In addition, as shown in the section that follows, a breakdown by ownership structures would also provide an ideal basis for integrated and detailed balance of payments and national accounts.

73. The United States (Bureau of Economic Analysis) has already begun to develop E-SUTs on the basis of foreign-affiliates statistics, with a three-way breakdown between: FA, DM and DF [82] and Mexico (INEGI) have produced a hybrid variant that incorporates the concept of global manufacturers[83] that a) import the majority of their purchases (imports account for at least two thirds of their export value); b) produce only for exports; and c) are controlled by a foreign owner. Those global firms were responsible for 55 per cent of total imported intermediate consumption and for 71 per cent of gross exports of the Mexican manufacturing sector in 2008. Box A.1 presents more detailed information on Mexico's published E-SUTs. Costa Rica is also beginning to explore that extension.[84]

[82] See http://scholar.harvard.edu/files/jorgenson/files/4a.1_paper.pdf

[83] See www3.inegi.org.mx/sistemas/tabuladosbasicos/LeerArchivo.aspx?ct=44462&c=33654&s=est&f=4

[84] *Integrating foreign direct investment data and extended supply and use tables into national accounts*, Gabriela Saborío and Rigoberto Torres, forthcoming.

8. Extending the core production accounts to the distribution of income account and other macroeconomic variables

74. One of the fundamental drivers behind the development of E-SUTs is to provide the accounting framework for coherent and integrated international accounts. Currently, within SNA and BPM6 there is no requirement to provide an activity breakdown of core economic variables, such as primary income flows. Typically, those transactions, and in particular those relating to the distribution of income, are compiled only on the basis of SNA institutional sectors. That, to a large extent, reflects a current statistical reality concerning the way such data are compiled, and so in some respects the recommendations and discussion presented below are more about looking to the future than what can be done in the present. But through an articulation of a potential framework here it is hoped that countries will be motivated to begin to explore those extensions.

75. One important reflection in that respect concerns the nature of the statistical unit. Although not impossible, through, for example, assumptions and estimations, it is clear it is likely to be more complicated to produce such extensions when the statistical unit used in constructing SUTs is the establishment as compared with the enterprise, as many of the transactions required for the distribution of income account are less readily available on an establishment basis.

76. The extensions also include other macroeconomic variables less affected by the choice of statistical unit, however, and where the feasibility to develop more coherent accounts is higher, chiefly relating to a suite of employment variables. Those extensions relate to conventional measures of employment headcounts, such as persons engaged,

Figure A.12
Property income and other macroeconomic extensions

		Industry 1		Industry …		Industry N	
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
Resources	Property Income						
	Interest						
	Distributed Income of Corporations						
	Reinvested Earnings on FDI						
	Investment Income Disbursements						
	Rent						
Uses	Property Income						
	Interest						
	Distributed Income of Corporations						
	Reinvested Earnings on FDI						
	Investment Income Disbursements						
	Rent						
From Abroad	Property Income						
	Interest						
	Distribut Income of Corporations						
	Reinvested Earnings on FDI						
	Investment Income Disbursements						
To Abroad	Property Income						
	Interest						
	Distributed Income of Corporations						
	Reinvested Earnings on FDI						
	Investment Income Disbursements						

Figure A.12
Property income and other macroeconomic extensions (*continued*)

	Industry 1		Industry …		Industry N	
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
Current Taxes on Income and Wealth						
Persons Employed						
By Occupation (ISCO)						
Employees						
By Occupation (ISCO)						
Hours Worked						
By Occupation (ISCO)						
CO_2 Emissions						

employees and hours worked, but they also include additional information on occupations. Occupational data is a key tool to understanding globalization, providing, as it does, an easily interpretable link to skills, and so provides perhaps one of the most important data mechanisms to analyse heterogeneity across firms and the manner of their integration into GVCs. International fragmentation of production has significantly hampered the ability of conventional activity-based data to provide that view as firms grouped within certain activities may find themselves engaged in significantly different tasks in the value chain, even if they are allocated to the same sector. Factoryless firms for example that purchase material inputs for production by contractors will have a very different set of employees to those firms actually engaged in material production, but such heterogeneity is masked when looking at activity data alone. Occupational data can at least provide some scope to better understand those differences and their implication for growth and employment more generally.

77. The potential to go further in that regard is significant. It is, for example, possible to consider additional extensions that partition workers on the basis of wage and salary cohorts, productivity cohorts, or indeed skills, which are also key to understanding the distributional impacts of globalization. However, it is also possible to develop those additional insights in an ad hoc manner.

78. The OECD's ANSKILL database, for example, provides information on employment and skill composition at the industry level. The database matches industry data at the two-digit level (currently classified according to 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).

Figure A.13
Full extended supply-use table

Supply

		Industry 1		Industry 2		Industry …		Industry k		Industry …		Industry N		Total Output	Imports		Margins	Taxes and Subsidies	Total Supply
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2		Category 1	Category 2			
Product 1	Category 1																		
	Category 2																		
Product …	Category 1																		
	Category 2																		
Product M	Category 1																		
	Category 2																		
Total Output																			

Use

		Industry 1		Industry …		Industry k		Industry …		Industry N		HHFC + NPISH	GGFC	FCF		Exports	
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2			Category 1	Category 2	Category 1	Category 2
Product 1	Category 1																
	Category 2																
Product …	Category 1																
	Category 2																
Product M	Category 1																
	Category 2																
	Value-Added																
	Output																
	Of which: exports																

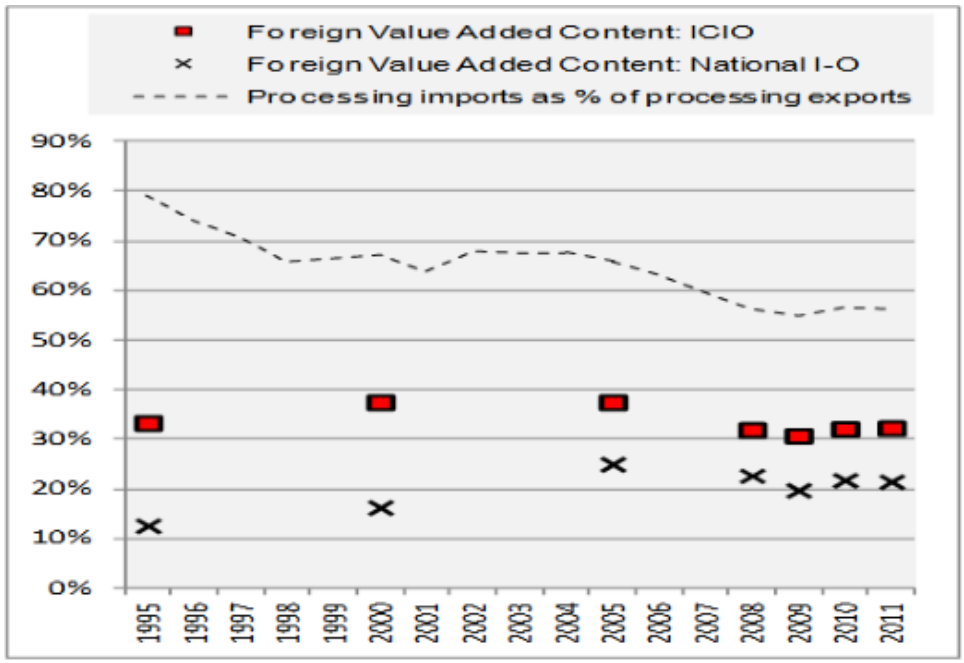
Figure A.13
Full extended supply-use table (*continued*)

		Industry 1		Industry …		Industry k		Industry …		Industry N		HHFC + NPISH	GGFC	FCF		Exports	
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2			Category 1	Category 2	Category 1	Category 2
Resources	Property Income																
	Interest																
	Distributed Income of Corporations																
	Reinvested Earnings on FDI																
	Disbursements																
	Rent																
Uses	Property Income																
	Interest																
	Distributed Income of Corporations																
	Reinvested Earnings on FDI Disbursements																
	Rent																
From Abroad	Property Income																
	Interest																
	Distributed Income of Corporations																
	Reinvested Earnings on FDI																
	Disbursements																

Figure A.13
Full extended supply-use table (*continued*)

		Industry 1		Industry …		Industry k		Industry …		Industry N		HHFC + NPISH	GGFC	FCF		Exports	
		Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2			Category 1	Category 2	Category 1	Category 2
To Abroad	Property Income																
	Interest																
	Distribution Income of Corporations																
	Reinvested Earnings on FDI Disbursements																
	Current Taxes on Income and Wealth																
	Persons Employed																
	By Occupation (ISCO)																
	Employees																
	By Occupation (ISCO)																
	Hours Worked																
	By Occupation (ISCO)																
	CO_2 Emissions																

Figure A.14
Trade in value-added estimates for China, with inter-country input-output and without (national) a breakdown for heterogeneity

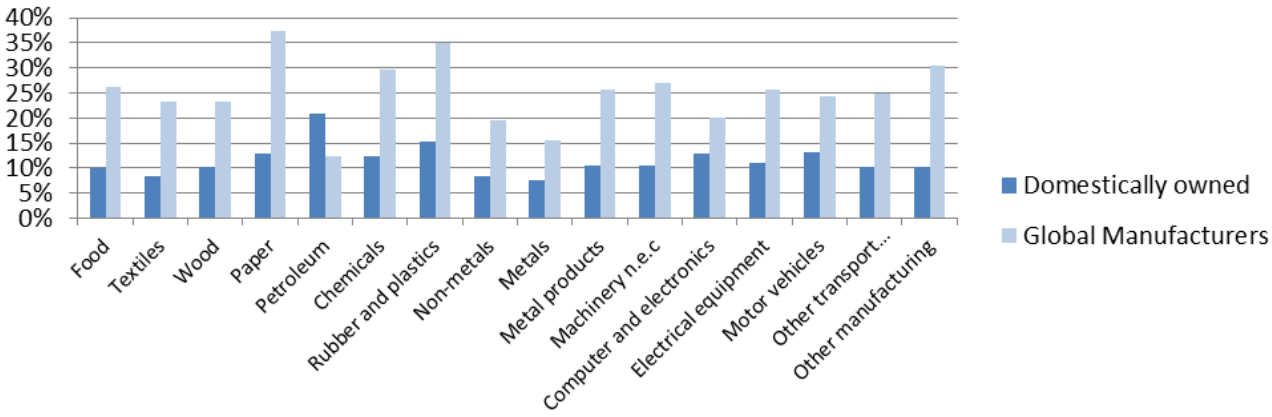


Source: OECD ICIO and balance of payments database.

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

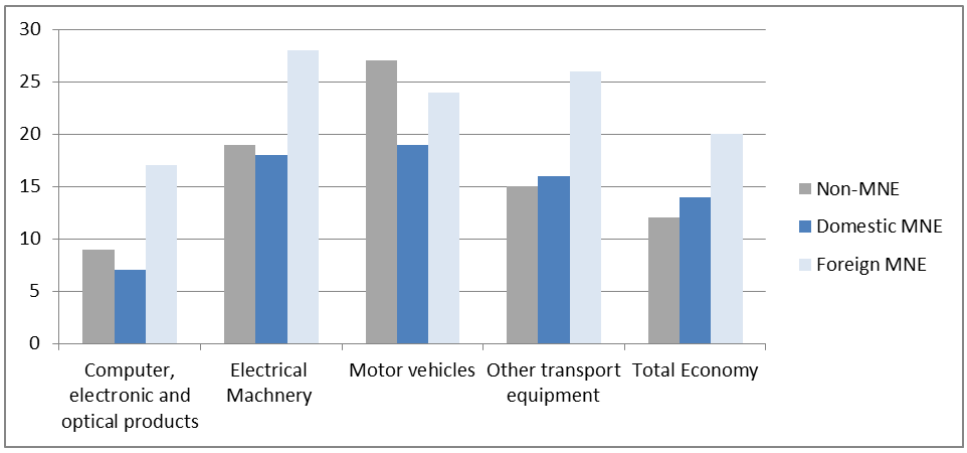
- Categories 1 (legislators, senior officials, managers), 2 (professionals), and 3 (technicians and associate professionals) are regarded as high-skilled.
- Categories 4 (clerks), 5 (service workers and shop and market sale workers), 6 (skilled agricultural and fishery workers), and 7 (craft and related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

Figure A.15
United States value-added content of Mexico's exports percentage, 2011, (by industry and "ownership" of Mexican exporters)



Source: Based on Mexico's value-added of exports of global manufacturing

Figure A.16
Foreign content of United States exports, percentage, 2011 (selected industries)

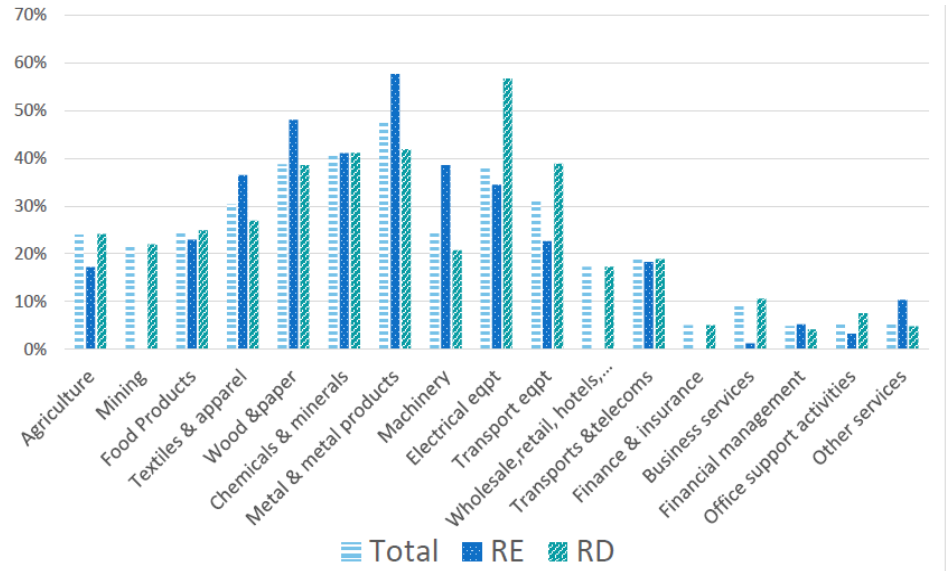


Source: Based on the United States E-SUT.

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

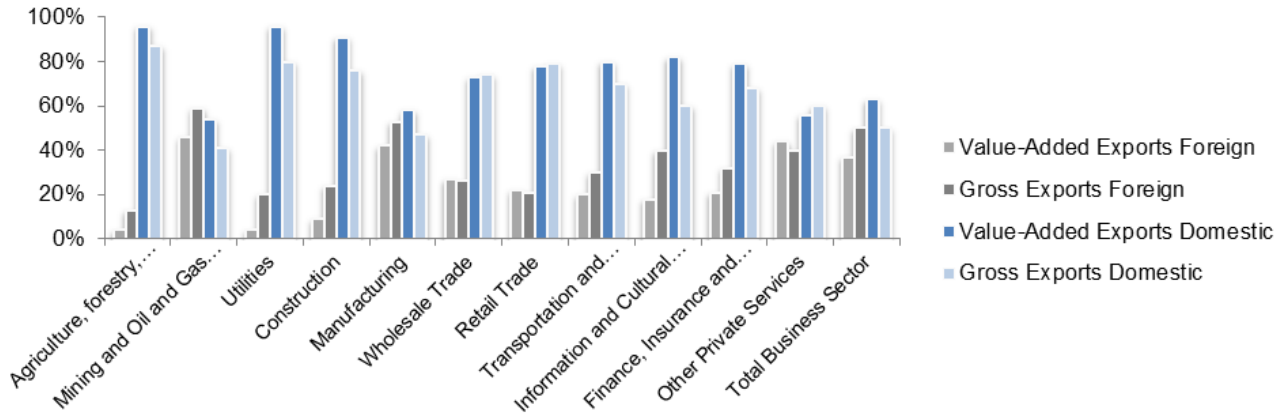
- Categories 1 (primary education) and 2 (lower secondary/second stage of basic education) are regarded as low-skilled.
- Categories 3 (upper secondary education) and 4 (post-secondary non-tertiary education) are regarded as medium-skilled.
- Categories 5 (first stage of tertiary education) and 6 (second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

Figure A.17
Foreign content of Costa Rica's exports, 2012



Source: Prepared with data from the Banco Central de Costa Rica.

Figure A.18
Share of gross and value-added exports by ownership status, 2010 (industries within business sector)



80. Figure A.12 presents an overview of the extensions envisaged. As before, it is important to note that not all items are necessarily needed: extensions, in this respect, should not be seen as an "all or nothing" choice. For example, in the top half of figure A.12, the intention is to develop a set of seamless accounts that take users from the production account through to the distribution of income accounts. Doing this at the level of the total economy is non-trivial but, somewhat fortunately, as this is a key focus, it may be easier to do this for cross-border flows, especially with respect to reinvested earnings and perhaps debt interest.

81. Of additional note in the set of extensions below are the items on "current taxes on income and wealth" and CO_2 emissions, which are both of significant policy interest. The former, in particular when the breakdown of activities is on the basis of ownership, as there is a long-standing and growing interest in understanding whether multinationals are able to generate significant advantages through fiscal optimization and where there are currently considerable information gaps.

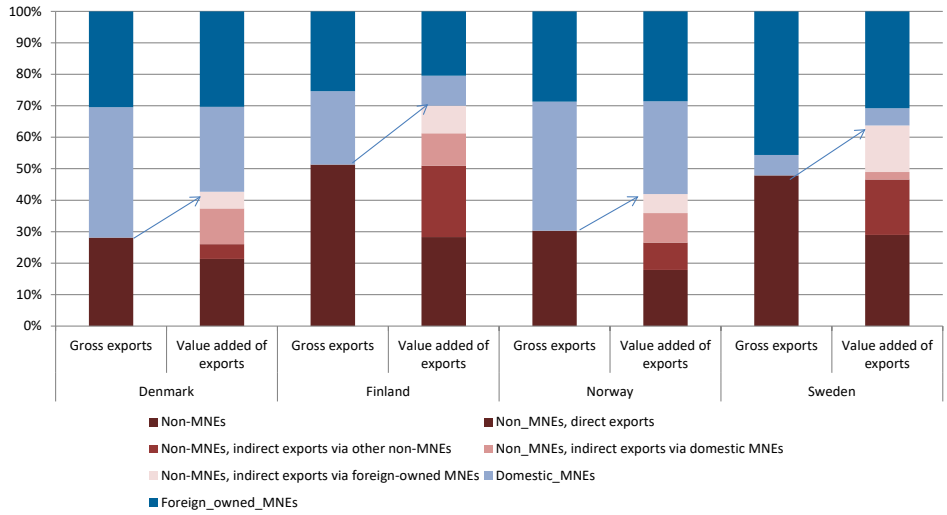
9. Breaking down supply-use table rows by category of producer

82. Perhaps the most complicated feature of full-blown E-SUTs is breakdowns of rows (products) by origin producer. It is of course relatively trivial to provide such a breakdown on the supply side, but doing so by category of consumer is significantly more complex, and the complexity necessarily differs, depending on the nature of the breakdown used for activities.

83. For example, breakdowns by size class require that consumers are aware if they purchased their goods and or services from a small, medium or large enterprise, and that information is rarely collected. In some countries some scope to do this is available from VAT data, but that requires a level of access to firm-level data that is not always forthcoming and entails a not insignificant compilation burden.

84. For other breakdowns the scope is to some extent less (albeit still) complicated. For example, for the E-SUTs produced by Mexico and China, global manufacturers (for Mexico) and processors (for China) produce no output for the domestic market, and so the breakdowns by rows are relatively trivial, as the only items where output of these categories of firms is consumed concerns exports (and marginally changes in

Figure A.19
Shares of firms in exports in gross and value-added terms, 2013, by ownership structure



inventories). That, but to a lesser extent, is partially true for any breakdowns that focus on the exporting status of firms. Certainly, the higher the threshold used to determine "exporting firms" the easier the task. For example, if the thresholds used to determine an "exporter" were 90 per cent of total output then, by design, very little of the output would necessarily have to be allocated to other domestic consumers.

85. More generally, irrespective of the type of breakdown used, the higher the export intensity of a category of firms the lower the impact of assumptions to allocate the residual (non-exported) output to domestic consumers.

86. Regarding the allocation of residuals (output minus exports) to remaining categories of users, how this is done will necessitate the use of some stylized assumption, not dissimilar to the classic proportionality assumption used in constructing import flow tables. Some refinements are of course possible, but those may create circularities that it will be important to keep in mind when presenting results. For example, with regard to breakdowns by size class one could assume that small firms in manufacturing predominantly sell goods and services to larger manufacturers, while their counterparts in certain service activities, such as accounting and legal sectors predominantly sell to households. But those could ostensibly create self-selecting facts that point to better integration of manufacturing small and medium-sized enterprises in domestic value chains than service small and medium-sized enterprises; hence the care needed when presenting results to users.

87. OECD has used a variety of such approaches in its work to develop information on the scale of integration of small and medium-sized enterprises within GVCs,[85] and also regarding the scale of integration of non-trading firms and purely domestic firms.[86] Similar approaches were also used in developing the OECD's Trade and Investment Country Note series, which provides highlights on GVCs using the ownership dimension.[87]

88. For the United States E-SUTs based on ownership breakdowns, the derivation of use relationships was derived using the quadratic programming constrained optimization model adopted in Ma, Wang and Zhu (2015).[88]

89. Although relatively easy to conceptualize without a diagram, figure A.13 presents, for exhaustiveness, a full extended SUT with the requisite product breakdown

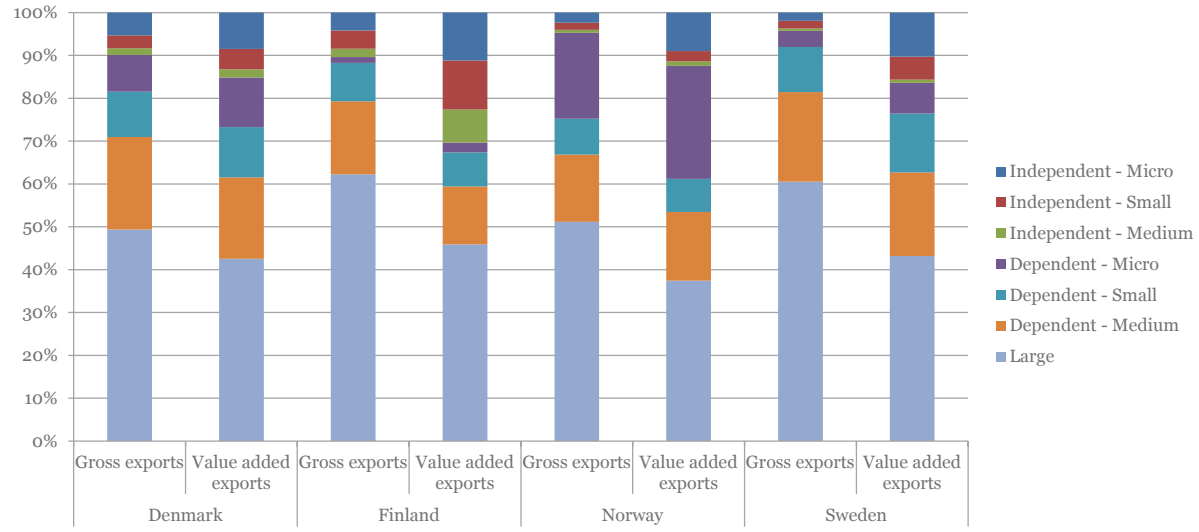
[85] See www.oecd.org/g20/summits/antalya/OECD-WBG-g20-gvc-report-2015.pdf

[86] See www.oecd.org/std/its/enterprises-in-global-value-chains.htm

[87] See www.oecd.org/investment/trade-investment-gvc.htm.

[88] H. Ma, Z. Wang and Zhu, K. (2015). Domestic content in China's exports and its distribution by firm ownership. *Journal of Comparative Economics*, 43(1), 3-18.

Figure A.20
Shares of firms in exports in gross and value-added terms, 2013, by size class

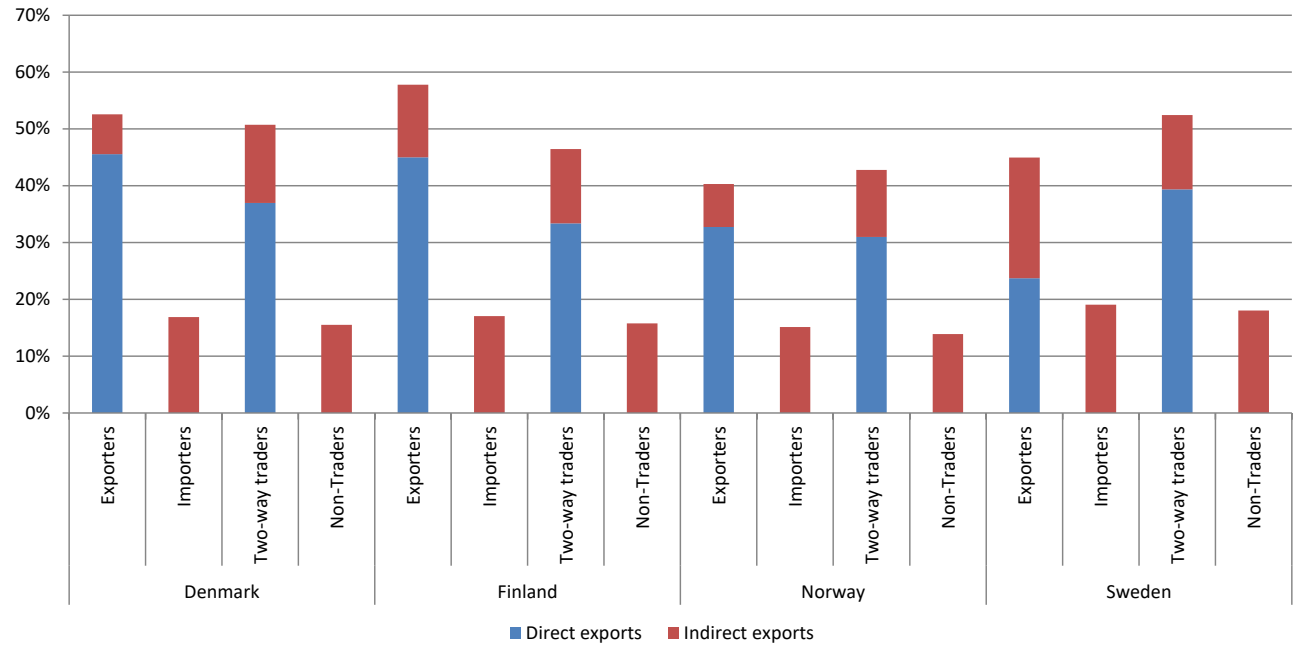


(again with the two-category example used previously). Note that no further breakdowns of import flow tables are required; in addition to those shown in figure A.2.

C. Results from using extended supply-use tables

90. As described previously, a number of countries have already begun to develop E-SUTs that use a variety of approaches. This section provides a summary of the results of those initiatives and their impact, in particular on trade in value-added estimates.

Figure A.21
Jobs embodied in exports, 2013, by trading status



1. Results for China

91. The impact of incorporating an E-SUT has a significant impact on the quality of TiVA results for China. Figure A.14, for example, reveals significantly different movements in the trend of the foreign content of China's exports over the last two decades when comparing estimates based on E-SUTs (referred to as ICIO) and pure national tables without a breakdown (referred to as national).

2. Results for Mexico

92. Almost by definition the import content of Mexico's global manufacturing firms is significantly higher than that of comparable firms in the same sector. That can have a significant difference on highly policy-relevant indicators, for example, on measures of the United States content of Mexico's exports (see fig. A.15), where one quarter of the exports by global manufacturing firms in the motor vehicle sector reflect upstream contributions by the United States, compared with around half that amount for non-global manufacturing firms, a relationship seen across most activities.

3. Results for the United States

93. Results for the United States also reveal significant differences between the foreign content of exports across categories of firms defined by ownership structure. At the whole economy level, the foreign content of United States exports by foreign-owned firms is almost twice that of domestically owned non-MNEs. That partly reflects compositional effects, but the foreign content is higher across nearly all activities (see fig. A.16).

4. Results for Costa Rica

94. A similar picture of strong heterogeneity emerges for Costa Rica, with firms operating from free trade zones (referred to as RE in fig. A.17) displaying a higher import content of exports than firms operating outside of free trade zones (referred to as RD) across a range of important export activities.

5. Results for Canada

95. Results from a recent collaboration between the OECD and Statistics Canada revealed that the impact of compiling E-SUT estimates for the business sector, accounting for either ownership or trading status, was an increase in the overall foreign value-added content of Canada's exports of four percentage points. Figure A.18, which shows that foreign-owned firms are responsible for a lower share of exports in value-added terms than in gross terms, highlights that higher propensity to import by foreign-owned firms; and, of course, the importance of capturing improved firm heterogeneity in national SUTs.

6. Results for Nordic countries

96. In a recent collaboration between five Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) and the OECD, the OECD developed E-SUTs with three variants of firm breakdown:

- By size class: micro, small, medium and large, further broken down by whether the micro, small and medium firms were independent or part of a larger enterprise group.

- By trading status: non-traders, two-way traders, importers and exporters.
- By ownership status: Non-MNEs, domestic MNEs and foreign MNEs.

97. Highlights from that collaboration are presented in figures A.19–A.21. Figure A.19 reveals the significant upstream integration of non-MNEs across all countries, compared with integration seen when looking purely at gross trade relationships. Of note is the fact that in all countries bar Sweden that integration is primarily channelled via domestic MNEs, but in Sweden the main link is through foreign-owned MNEs, in large part reflecting scale. Figure A.20 presents a similar picture showing the higher integration of smaller firms in GVCs when seen in value-added terms, through their upstream integration as suppliers to larger exporting firms. Figure A.21 presents information on jobs sustained through integration in GVCs. A significant insight from that presentation is the fact that even within firms that have no direct exports, around one in six of all jobs in those firms are dependent on foreign markets.

98. It is important to note in that collaborative exercise that the results are unlikely to replicate those that are likely to materialize from national exercises that mainstream the development of E-SUTs in the national statistical information system. The figures produced below, for example, necessarily re-aggregate national data in line with the 34-industry classification used in OECD-WTO TiVA, but national compilers will be able to develop tables with greater granularity.

7. North American TiVA initiative

99. Appendix A at the end of this annex presents a regional example of GVC analysis for North America using OECD's ICIO database.

D. Concluding comments

100. The statistical challenges of globalization are profound, and it has become increasingly clear in recent years 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 those relationships, particularly those with the rest of the world, have become increasingly complex, and, as such, there is an increasing need to consider global production within a global accounting framework. That 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 those national tables to create a global table.

101. Although 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 recognizing the importance of imports to exports, and, so, the hitherto hidden costs of protectionism as well as the benefits of trade liberalization, 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 not recorded, often incorrectly, as receipts from exports of services.

102. The emergence of global value chains therefore also raises arguably profound questions about the way national statistics are currently compiled. In the same way that international organizations increasingly need to think "national" in the way they present and compile their statistics, where "national" reflects the single economic territory comprising the "world" or large parts of it, national statistics institutions need to think globally.

103. 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 of demand but also with regard to the role of multinationals. That requires a rethinking 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".

104. Such considerations are also essential not only to better understand the way that global production is today organized 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.

105. E-SUTs provide an effective tool to respond to those developments and growing needs. Increasing globalization of production raises challenging questions for national statistics. And fundamental and long-standing axioms regarding the nature of production and the way that statistics are necessarily compiled warrant rethinking. Certainly, the evidence suggests that long-standing assumptions concerning homogeneity of firms within industry classifications should be reviewed. The evidence also suggests, particularly for those countries with foreign-affiliate statistics and trade by enterprise characteristics data, that an optimal level of aggregation may be achievable without any significant increase in compilation of reporting burden. But, of course, such reconsiderations need also take into account constraints such as burdens and confidentiality.

106. Supply-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 to being the ideal way in which to resolve those issues. E-SUTs can play a similar role in responding to questions on globalization.

107. Three final comments, providing a broader perspective, are worth making in that respect. The first concerns the quality of national supply-use tables. In many (most) countries, such tables are derived using a series of assumptions at least in some years, reflecting, in part, the often different periodic nature of the large number of data sets needed to construct SUTs. Many of those assumptions are based on some underling view of stability and homogeneity in production functions. As shown, globalization is increasingly undermining the strength of those assumptions. Looking again at how homogeneity is likely to manifest itself across firms and creating SUTs based around those categorizations of firms can greatly help to mitigate the effects and strengthen those assumptions, which will remain necessary, perhaps indefinitely, across most countries. As such, one important benefit of E-SUTs that should not be overlooked is their ability to improve the quality of the core accounts and indeed GDP. In the same way they are also ideally placed to be able to significantly improve the interpretability of the accounts, in particular, when the accounts are affected by phenomena related to globalization, such as relocations.

108. The second comment concerns the potential momentum E-SUTs could provide to the development and improvement of statistical business surveys. The evidence shows that significant heterogeneity exists across all categories of firms, and that the conventional stratification variables used in survey sampling (typically activity and

size) may be suboptimal. It may, for example, be necessary to include additional, but readily available, stratification variables, pertaining for example to ownership (e.g., part of a foreign MNE, domestic MNE, an enterprise group, exporter, non-exporter) in designing tomorrow's surveys.

109. The third comes back to the issue of the statistical unit. The current 2008 SNA preference for the establishment should not be a barrier to developing E-SUTs if, for example, they can be developed only using a different statistical unit, then counties are strongly encouraged to consider doing so. There is an increasing recognition that the arguments for the current SNA preference for the establishment have been weakened because of the changing nature of production and indeed because of the changes made in SNA itself regarding economic ownership. That is further recognized 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.

Appendix A – North American TiVA Initiative: Analysis using the OECD's inter-country input-output database

110. As part of the involvement of Mexico in the North America Trade in Value-added Initiative (NA-TiVA), this document presents the main results of the implementation of three representative indicators of the global value chains (GVCs) under a macroeconomic perspective,[89] using the ICIO database available from OECD for the year 2011,[90] as well as a first exercise for the construction of the regional Supply and Use Table. Such GVCs indicators are:

- Number of production stages
- Distance of final demand
- Participation of Mexico[91] in the GVCs

111. A special focus is set on the automotive industry, but these indicators were developed for the 34 industries available in the ICIO (see the data tables at the end of Appendix A on pages 169–170 for GVC's indicators for all industries).

[89] Our main references are OECD Trade Policy Papers No.159, Mapping Global Value Chains.

[90] Given the data availability, we are currently working on the time series of the GVCs indicators for the period 2003–2011.

[91] Considering North America and the rest of the world as exogenous.

OECD ICIO

112. The OECD Inter-Country Input-Output Tables 2016 edition, were used as the main input for this exercise. The main characteristics of this database[92] are:

- Industry Classification as CIIU_Rev3
- Freely available for download
- 34 industrial sectors
- 71 countries
  - 35 OECD countries
  - 28 non-OECD economies
  - Rest of the world
- The flows of intermediate inputs between countries and industries uses the OECD's Bilateral Trade Database by Industry and End-Use Category.

[92] Disaggregated tables for China (4) and Mexico (3), for processing and non-processing activities.

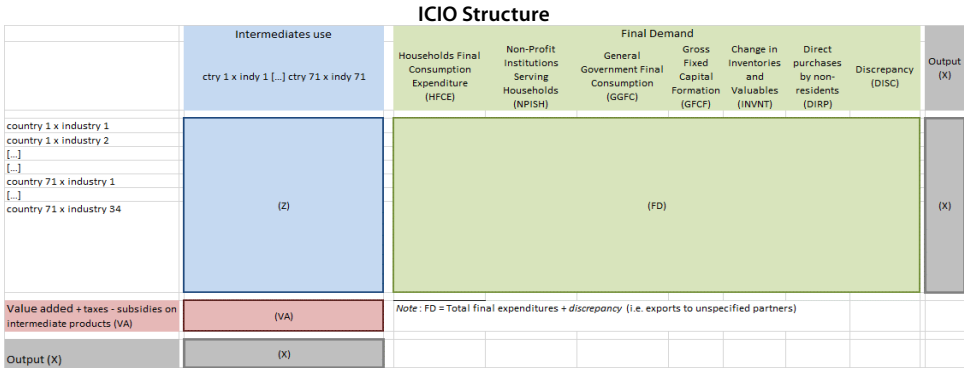
113. We used the ICIO database to form a regional North American Input Output (IO) matrix, consisting of Canada, Mexico and the United States and considering the rest of the world as endogenous to the input-output model. Each of those countries[93] has 34 industries. The dimensions of the global matrix are 136 columns and 136 rows.

[93] We consider the rest of the world as another country.

114. For the development of the indicators, we considered:

- An adjustment to the ICIO database, given a relatively small discrepancy between gross production and total demand. The difference was applied to the value-added.
- The regional North American matrix.
- Partitioned matrices algebra to determine the technical coefficient matrices of each country in the matrix Canada, Mexico, United States, and the rest of the world).

Table AA.1
ICIO Structure



The GVC indicators[94]

Number of stages of production (NSP)

115. Proposed by Fally (2012), this index measures the number of production stages required to make a product or provide a service in a certain final industry. This index is disaggregated between national and foreign stages of production.

116. The requirements matrix was determined by country through the Leontief inverse, and the index was calculated using the following

$$NEP = u * (I - A)^{-1}$$

117. Where N is a vector column with the indices for all countries i and industries k, u is a unitary column vector and $(I - A)^{-1}$ is the Leontief inverse. To determine the national and foreign NSP we used the sum by columns outside the diagonal without the national component (the diagonal) to obtain the foreign production stages.

118. For the motor vehicles, trailers and semi-trailers industry, we found that Canada requires fewer stages than Mexico or the United States. However, Mexico had the biggest index for foreign stages. The importance of the three countries outside the region is marginal (0.1 stages), considering the rest of the world industry.

Number of additional stages of production

Motor vehicles, trailers and semi-trailers industry

	Mexico	USA	Canada	RoW
National	0.4	1.2	0.6	2.2
Foreign	1.2	1.0	0.9	0.1
Total	**1.6**	**2.2**	**1.5**	**2.3**

Distance of Final Demand

119. Proposed by Fally (2012) with reference to Antrás and others (2012), this index indicates where the countries lie in the value chain, measuring how many stages of production are left before the goods or services produced by the industry reach the final consumers. The lower values of the index are related to the specialization in the industry and are therefore closer to the final consumer, while the high values of the index are associated with the initial activities of the GVC.

[94] The references for this section are "OECD Trade Policy Papers No.159, Mapping Global Value Chains", as well as Koopman and so on (2010) and Fally (2012).

120. With the same matrices of coefficients, the requirements matrix was determined by country through the inverse of Ghosh to calculate the distance of countries in trade, using:

$$DDF = u * (I - G)^{-1}$$

121. Where D is a column vector with the indices for all countries i and industries k, u is a column unit vector, I is the identity matrix and $(I - G)^{-1}$ is the inverse matrix of Ghosh.

122. For the motor vehicles, trailers and semi-trailers industry, we found that Mexico and Canada are in the final segment of the GVC, considering that big portion of their automotive exports are directed to the United States market. For the United States, 0.6 stages of production left before the vehicles reach the final consumer. For the rest of the world, they need an additional stage of production to reach the same target.

Distance of final demand

Motor vehicles, trailers and semi-trailers industry

	Mexico	USA	Canada	RoW
Total	1.1	1.6	1.2	2.0

Participation Index

123. Proposed by Koopman and others (2010) this index expresses the proportion of foreign inputs (backward) and national inputs (forward) used in exports from third countries.

124. After obtaining the partitioned matrices, we used Koopman's methodology, that refers to the decomposition of gross exports as a proportion of the national value-added by country through the creation of the GVE matrix and OECD definition to determine the backwards and forward linkages.

$$GVE = V * (I - A)^{-1} * E$$

125. Where V is the diagonal of a vector with the share of value-added in each country and industry, $B = (I - A)^{-1}$ is the inverse of Leontief and E is the diagonal of a vector of gross exports.

126. With the GVE matrix, the share of the value-added backward of the total of the exporting industries is determined, through:

$$NEXFVA_{sh} = \frac{\Sigma VBE_{USAp}}{X_{USA}}$$

127. Where ΣVBE_{USA-p} is the sum of the rows of the GVE matrix from the country of origin to the partner country divided by the gross exports of the country of origin. The forward linkage was determined by difference of the total exports of the country of origin.[95]

128. For the motor vehicles, trailers and semi-trailers industry,[96] we found that of the automobiles exported by the United States and Canada, Mexico participates with 8.4 per cent of foreign inputs and 6.9 per cent of national inputs for its production. Of every export that Mexico and the United States make, Canada contributes with 5.3 per cent of domestic inputs and 3.5 per cent of foreign inputs. Finally, for every vehicle that Mexico and Canada export, the United States participate with 2.4 per cent of domestic inputs and 0.9 per cent of foreign inputs.

[95] This is a different approach from OECD's, considering no regional re-exports.

[96] Only the participation of exports between North America is considered.

Participation Index
Motor vehicles, trailers and semi-trailers industry

	Mexico	USA	Canada
Backward (foreign)	8.4	0.9	3.5
Forward (domestic)	6.9	2.4	5.3
Total	15.2	3.3	8.8

Number of additional production stages

Industry	MEX	USA	CAN	RoW
Motor vehicles, trailers and semi-trailers	1.6	2.2	2.3	2.2
Basic metals	1.1	2.0	1.8	2.1
Electrical machinery and apparatus, nec	1.7	1.4	1.6	2.1
Other transport equipment	1.4	1.4	1.5	1.9
Machinery and equipment, nec	1.5	1.5	1.4	1.9
Rubber and plastics products	1.4	1.4	1.4	1.9
Computer, Electronic and optical equipment	2.0	0.8	1.3	2.0
Fabricated metal products	1.4	1.5	1.3	1.7
Coke, refined petroleum products and nuclear fuel	1.5	1.4	1.5	1.5
Food products, beverages and tobacco	1.1	1.6	1.4	1.6
Chemicals and chemical products	1.3	1.4	1.3	1.8
Wood and products of wood and cork	1.0	1.4	1.4	1.7
Textiles, textile products, leather and footwear	1.2	1.2	1.2	1.8
Manufacturing nec; recycling	1.3	1.1	1.3	1.6
Pulp, paper, paper products, printing and publishing	1.1	1.3	1.0	1.6
Other non-metallic mineral products	0.8	1.3	1.1	1.6
Construction	0.9	1.0	1.2	1.5
Agriculture, hunting, forestry and fishing	0.7	1.2	1.1	0.9
Transport and storage	0.7	1.0	0.9	1.3
Hotels and restaurants	0.5	0.9	0.9	1.2
Electricity, gas and water supply	1.2	0.4	0.4	1.4
Post and telecommunications	0.8	0.9	0.7	0.9
Public admin. and defence; compulsory social security	0.5	0.9	1.0	0.8
Other community, social and personal services	0.6	0.7	0.8	1.0
Financial intermediation	0.5	0.9	0.7	0.8
R&D and other business activities	0.4	0.6	0.6	1.0
Wholesale and retail trade; repairs	0.4	0.7	0.7	0.8
Computer and related activities	0.4	0.7	0.6	0.9
Renting of machinery and equipment	0.4	0.6	0.6	0.8
Mining and quarrying	0.3	0.9	0.6	0.7
Health and social work	0.5	0.7	0.3	0.9
Education	0.2	0.5	0.4	0.6
Real estate activities	0.1	0.5	0.4	0.5
Private households with employed persons	-	-	-	-

Moving forward TiVA indicators

129. The GVCs indicators shown here are a subset of a larger initiative that develops trade in value-added indicators. We are currently working TiVA indicators for Mexico and the North American region through our national IOT and the ICIO, using the OECD methodology (TiVA 2016 indicators - definitions, version 1.1, March 2017). Once the regional SUT for NA-TiVA is developed, these indicators could be replicated easily.

Distance of final demand

Industry	MEX	USA	CAN	RoW
Wood and products of wood and cork	2.1	2.5	2.0	3.1
Mining and quarrying	1.8	2.7	1.6	3.5
Basic metals	1.7	2.9	1.5	3.5
R&D and other business activities	2.4	2.2	2.0	2.9
Pulp, paper, paper products, printing and publishing	2.1	2.1	1.9	3.0
Renting of machinery and equipment	2.0	2.0	2.2	2.8
Other non-metallic mineral products	1.8	2.3	2.1	2.7
Fabricated metal products	1.6	2.4	1.7	2.9
Electricity, gas and water supply	2.0	1.7	1.8	2.9
Rubber and plastics products	1.7	2.2	1.5	3.0
Transport and storage	1.4	2.1	2.0	2.6
Coke, refined petroleum products and nuclear fuel	1.9	1.8	1.5	2.8
Financial intermediation	1.6	1.9	2.0	2.5
Chemicals and chemical products	1.8	1.9	1.4	2.9
Agriculture, hunting, forestry and fishing	1.8	2.1	1.9	2.1
Post and telecommunications	1.6	1.8	1.8	2.3
Wholesale and retail trade; repairs	1.6	1.8	1.8	2.3
Computer and related activities	1.2	2.1	1.7	2.4
Electrical machinery and apparatus, nec	1.1	1.7	1.5	2.4
Machinery and equipment, nec	1.1	1.9	1.4	2.2
Textiles, textile products, leather and footwear	1.3	1.3	1.6	2.1
Computer, Electronic and optical equipment	1.1	1.6	1.2	2.2
Manufacturing nec; recycling	1.2	1.4	1.4	2.1
Other community, social and personal services	1.1	1.5	1.6	1.8
Motor vehicles, trailers and semi-trailers	1.1	1.6	1.2	2.0
Other transport equipment	1.1	1.4	1.3	2.0
Food products, beverages and tobacco	1.2	1.4	1.4	1.8
Real estate activities	1.3	1.4	1.3	1.5
Hotels and restaurants	1.2	1.3	1.3	1.7
Construction	1.1	1.3	1.2	1.3
Health and social work	1.0	1.0	1.5	1.1
Education	1.0	1.1	1.1	1.2
Public admin. and defence; compulsory social security	1.0	1.1	1.1	1.1
Private households with employed persons	1.0	1.0	1.0	1.0

Participation index

Industry	MEX	USA	CAN	RoW
Mining and quarrying	13.4	1.7	19.0	7.9
Wholesale and retail trade; repairs	8.2	9.5	9.4	12.4
Motor vehicles, trailers and semi-trailers	18.7	4.9	9.3	5.7
Computer, Electronic and optical equipment	13.2	6.1	2.4	13.1
Chemicals and chemical products	3.5	8.6	5.6	6.9
Machinery and equipment, nec	6.8	6.3	3.8	6.5
Transport and storage	3.8	7.7	5.2	3.9
Basic metals	6.3	1.9	8.7	3.5
Coke, refined petroleum products and nuclear fuel	1.7	6.2	2.6	3.6
Financial intermediation	0.4	5.9	1.4	6.2
R&D and other business activities	0.1	7.0	3.4	2.9
Electrical machinery and apparatus, nec	7.3	1.5	1.0	2.9
Food products, beverages and tobacco	3.0	3.4	3.4	2.7
Agriculture, hunting, forestry and fishing	2.3	3.1	3.6	1.2
Manufacturing nec; recycling	1.7	3.5	2.3	2.7
Other transport equipment	0.9	4.6	2.7	1.5
Textiles, textile products, leather and footwear	1.6	1.0	0.7	5.0
Pulp, paper, paper products, printing and publishing	0.7	3.6	3.4	0.6
Fabricated metal products	1.6	1.7	2.4	1.7
Rubber and plastics products	1.5	1.3	2.3	1.9
Hotels and restaurants	1.2	2.1	1.4	1.7
Other community, social and personal services	0.1	1.8	1.2	1.1
Renting of machinery and equipment	0.6	2.3	0.2	0.7
Computer and related activities	0.0	0.8	1.0	1.3
Other non-metallic mineral products	0.8	0.5	0.3	0.7
Post and telecommunications	0.2	0.7	0.7	0.4
Wood and products of wood and cork	0.1	0.3	1.1	0.4
Public admin. and defence; compulsory social security	-	0.7	0.4	0.0
Real estate activities	0.1	0.5	0.2	0.3
Education	0.0	0.6	0.3	0.1
Electricity, gas and water supply	0.2	0.1	0.4	0.0
Health and social work	0.1	0.2	0.2	0.2
Construction	0.1	0.2	0.1	0.2
Private households with employed persons	-	-	-	-

Annex B
Data framework of multi-country supply-use and input-output tables

A. Introduction

1. GVCs have become a dominant feature of today's global economy, challenging conventional wisdom regarding trade and trade policy, as well as the analyses of production within economies, which is increasingly dependent upon relationships with producers and consumers abroad. In today's economy, intermediate products produced in country A are increasingly sent to country B before being further processed and sent on to other downstream countries, including potentially country A itself, before finally arriving at country Z. That means that national E-SUTs, are, on their own, no longer able to provide fully comprehensive insights on all global interdependencies between final consumers and producers, or indeed the nature of global production.

2. To better understand those relationships multi-partner supply, use and input-output tables (SUIOTs) are required are required; such tables can range from global to regional and from regional to industry-specific. The OECD developed the OECD-WTO Trade in Value-Added database on the basis of a global ICIO.[97] But constructing global SUIOTs is far from a simple exercise, requiring the harmonization of many national data sets with common classification systems and common conceptual accounting standards, as well as, and perhaps most importantly, the reconciliation of bilateral international trade statistics.

3. Multi-country SUIOTs can also be developed for highly integrated regions covering various countries such as Canada, Mexico and the United States (NAFTA TiVA), the European Union (FIGARO Project) and the APEC countries. The OECD and the respective international partners are developing an initiative to generate such tables collaboratively, ensuring that they are fully consistent with the OECD's global ICIOTs while leveraging the efforts of all partners involved.

4. Those tables can also be developed as industry-specific multi-partner SUIOTs, attempting to provide an integrated picture of interdependencies among the main trading partners in an industry-specific global value chain. With such a purpose, this section provides an overview of how global (and regional) SUIOTs can be constructed, as well as the conceptual and practical data challenges that need to be overcome in their construction.

B. Conceptual and data framework of multi-country supply-use and input-output tables

5. Multi-country SUIOTs are based on five pillars of data sources: national accounts, a national input-output framework, international trade in goods statistics, international trade in services statistics and business statistics.

[97] See http://oe.cd/icio for the OECD's annual global ICIOTs covering the period 1995-2011. Other examples include World Input-Output Database, Eora Global Supply Chain Database, Global Trade Analysis Project and Exiobase.

6. The extension from national to multi-country SUIOTs consists in the split of the national SUTs imports of intermediate and final goods and services among countries of origin (and exporting industries), which in turn produces an indirect estimation of exports of intermediate and final goods and services by country of destination (and importing industry). It could also be the other way around, that is, by splitting national SUTs exports by country of destination and by type of use (intermediate or final), imports of goods and services among countries of origin (and exporting industries) can be derived indirectly. The OECD recommends the latter option owing to the fact that both exports in the national SUTs (at purchaser's prices) and in merchandise trade statistics are valued at FOB, which is the appropriate valuation for the first step of the construction of a multi-country SUT. The two approaches should not differ, in principle, as long as the view of bilateral trade among countries is balanced at the level of each good and service, and both exports and imports are valued in FOB. However, that is not the case in the real world, mostly due to trade asymmetries and the different valuation of exports (FOB) and imports (CIF).

7. Besides national accounts and national SUIOTs, international trade in goods and services constitute the third pillar for the construction of multi-country SUIOTs. Even though there are efforts to overcome bilateral trade asymmetries among countries, the problem still remains. The differences between exports (imports) and mirror exports (imports) can be attributed to product misclassification,[98] time lag between exports and imports (e.g., goods leaving country A in 2016 might reach country B only in 2017); goods passing through third countries (i.e., transit trade, re-exports); goods entering customs warehousing for several months; unallocated trade flows or goods being classified differently; countries having different trade systems (general versus special trade system); and goods passing through industrial processing zones that may or may not be recorded by the exporting country. [99]

8. The construction of multi-country SUIOTs requires a balanced view of bilateral trade statistics among countries for every good or service. Current efforts to accomplish such balanced view of trade are those of the OECD-WTO in preparing a separate database for goods and services aside from the global MCIOTs, the collaborative work among the NAFTA and APEC countries and the work that Eurostat is doing for the countries of the European Union. Those include regular workshops where country representatives sit together and try to get insight into the differences recorded by their trade statistics.

9. Business statistics can complement multi-country SUIOTs with supplementary information on the size of firms, their exporter status, their ownership and type of use (end use or intermediate use) of their goods and services consumed. Additional information on countries of origin and destination of goods and services for intermediate and final uses separately would really make a difference in the construction of multi-partner GVC extended accounts for a specific industry. Moreover, the collection of firm-level data on GVC-specific industries, such as foreign direct investment inflows and outflows, property income received and paid, operating surpluses, gross value-added, output, financial and non-financial assets, exports and imports of processing goods, among others, is absolutely crucial for the construction of the GVC extended accounts and their presentation in a way that permits the role of impact of GVCs to be analysed within a given economy and within a regional or global economy.

10. The construction of multi-country SUIOTs involves different building blocks that are shown in figures AB.1 and AB.2. The full process pivots around four main building blocks of (official) source data (shown in the orange boxes): national accounts (as benchmark), a national supply and use and input-output framework, international

[98] *User guide on European statistics on international trade in goods*, 2016 Edition; Balance of Payments and International Investment Position Manual Sixth Edition (BPM6).

[99] R. Jansen (2014). "Asymmetries in bilateral trade statistics", International Conference on Measurement of Trade and Economic Globalization, organized by INEGI and UNSD in cooperation with OECD, WTO and Eurostat. Aguascalientes (México). Available from https://unstats.un.org/unsd/trade/events/2014/mexico/Asymmetries%20in%20official%20ITS%20and%20analysis%20of%20globalization%20-%20V%20Markhonko%20-%2018%20Sep%202014.pdf.

merchandise (goods) and services trade data and business statistics. All of those are used to construct the three main data inputs (shown in the yellow box) feeding the construction process of multi-country SUIOTs, that is, a balanced view of bilateral trade (for goods and services), a full set of national SUTs and a full set of national IOTs. The desired output data is shown in blue boxes .

11. By definition, multi-country SUIOTs are valued at basic prices, including both exports and imports. The importance of basic prices relies on the fact that, unlike purchaser's prices, basic prices do not include trade and transport margins and taxes less subsidies on products. All these features would distort the input structures of the

Figure AB.1
Balanced view of international trade statistics

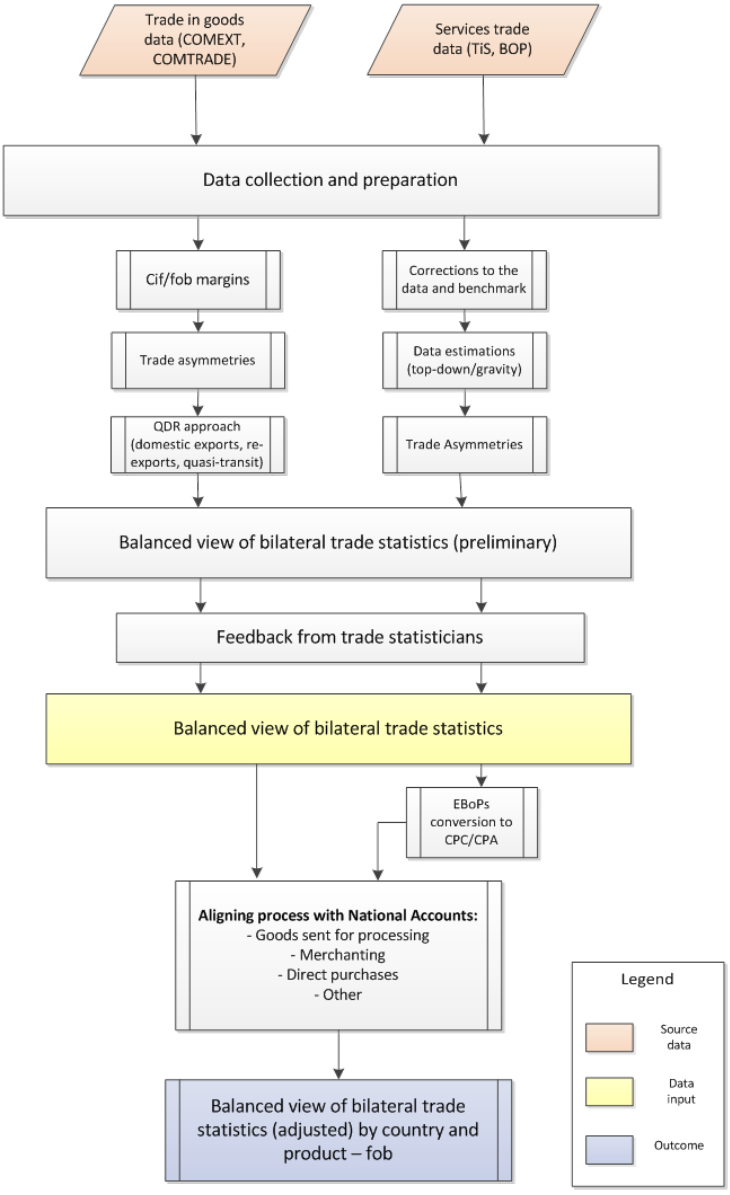
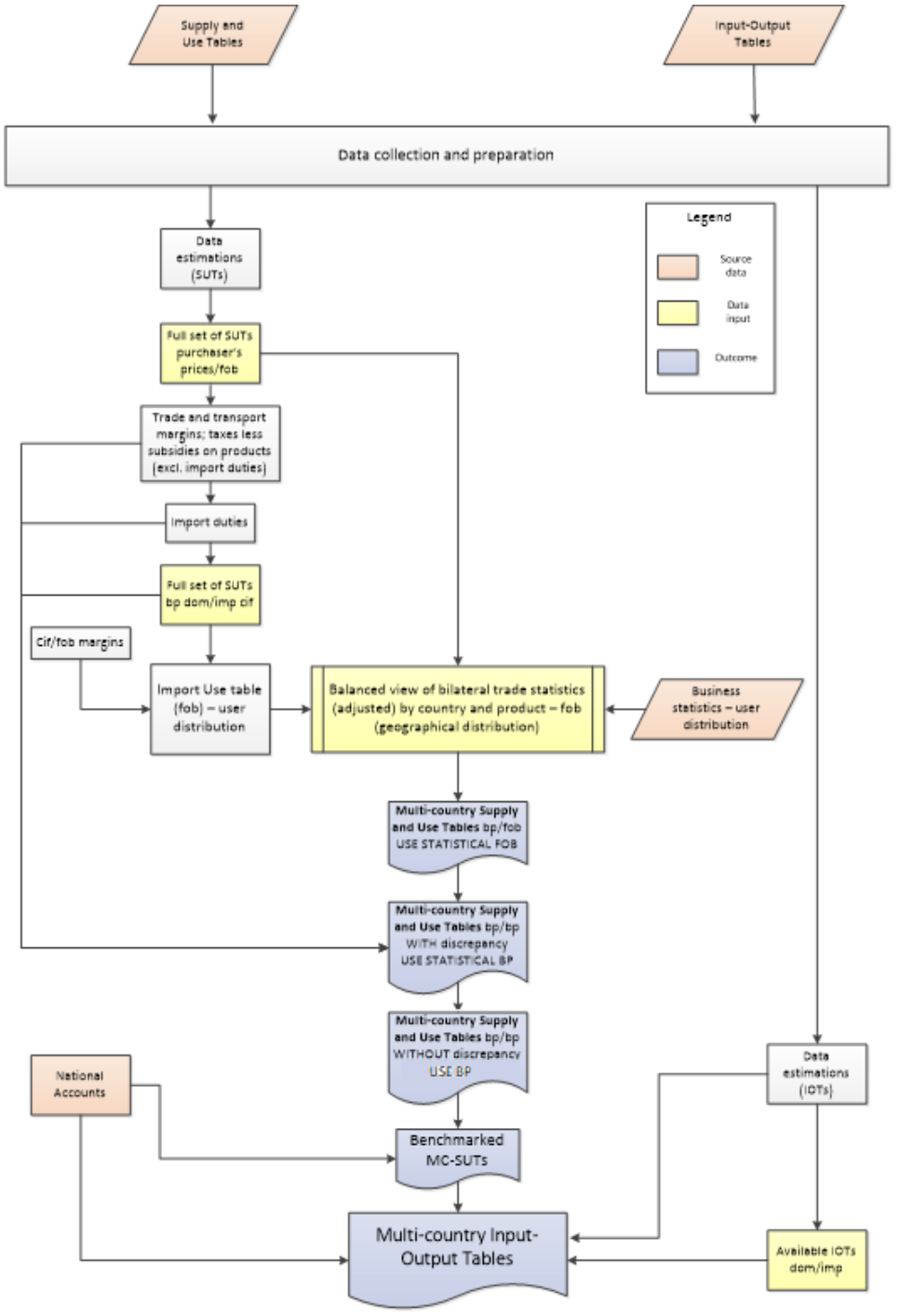


Figure AB.2
Construction of multi-country SUIOTs



multi-country use table in such a way that GVC analyses would not be accurate. However, there is an exception. Basic prices might lead to an inaccurate representation of the position of distribution services in the global value chains.

12. The use tables are generally shown in purchaser's price, which means the price users pay for goods and services for final use or intermediate inputs, including trade and transport margins and taxes less subsidies. That is consistent with the way infor-

mation is collected, that is, mostly through surveys to producer firms and consumers. With the appropriate reallocation of trade and transport margins from the goods to the corresponding trade and transport sectors and the reallocation of the associated taxes less subsidies on products into a separate row, use tables can also be shown in basic prices. As in merchandise trade statistics, exports are shown in FOB prices, including all domestic trade and transport margins from the factory to the border, also including any domestic related tax or subsidy on the products sold. Imports are shown in CIF values in the supply table at basic prices as part of the adjustments from basic to purchaser's prices, thus including international trade margins and freight and insurance costs of international transportation.

13. At the national level, it is therefore crucial to have a set of supply and use tables both at purchaser's prices and at basic prices for the construction of multi-country SUIOTs. Ideally, fully fledged matrices of trade and transport margins and taxes less subsidies on products (with import duties separated) would be desirable.

14. Regarding national IOTs, they are not strictly necessary for the construction of multi-country IOTs, provided the existence of multi-country SUTs. That is, for instance, the experience of the OECD, which produces industry-by-industry global multi-country IOTs on the basis of their previously estimated multi-country SUTs. Standard models described in the Eurostat's Manual on Supply, Use and Input-Output Tables (Eurostat, 2008) such as the product technology assumption (model A) and the industry technology assumption (model B) can serve to produce on a piecemeal basis (country-wise) a product-by-product multi-country IOTs. Alternatively, fixed industry (model C) or fixed product (model D) sales structure assumptions can be used to produce industry by industry multi-country IOTs. The OECD uses model D in its construction of global MCIOTs. However, the situation can be more difficult when official national IOTs are available and consequently, certain parts of the estimated multi-country IOTs need to be benchmarked.

15. While national accounts and national input-output frameworks portray individual pictures of the national economies around the globe, a balanced view of bilateral trade brings all of them together into a consistent framework. Goods and services deserve a different treatment even when both suffer from the same problem of bilateral trade asymmetries, that is, whenever the export values reported by one country does not match the value (mirror exports) reported by its counterpart. The same applies for imports. Besides, in some cases the information is unobserved, unallocated or confidential, which may imply additional estimations in order to have a complete data set.

16. For merchandise trade statistics, exports are valued in FOB[100] and imports are valued in CIF.[101] Consequently, one of the main reasons for a trade asymmetry in goods is just the different valuation, which should be somehow corrected before starting to find solutions for the asymmetries. The OECD has recently published a data set with CIF-FOB valuation adjustments,[102] which can be very helpful for this purpose.

17. Multi-country SUTs require the identification of the country of origin and destination when dealing with bilateral trade. Particularly in the case of re-exports, for instance, the re-exporter country is not the country of origin or, in other words, the country that produced the re-exported goods. Hence, some adjustments should be made in merchandise trade data so that to reflect appropriately the geographical allocation of exports and imports to the producer country. For the European Union, quasi-transit trade must also be addressed with the same purpose. Only once all those adjustments have been made, the treatment of bilateral trade asymmetries should be carried out.

[100] Free on board; the buyer has to bear all costs and risks of loss or of damage to the goods from the border (e.g., port of shipment).

[101] Cost, insurance and freight; the seller must pay the costs, insurance and freight necessary to bring the goods to destination (e.g., port of destination).

[102] See https://stats.oecd.org/Index.aspx?DataSetCode=MEI_TRD.

18. The number and size of bilateral trade asymmetries can be huge and overwhelming. So, the best strategy would be to address manually the largest differences and try to find a consensus on a single figure. All remaining differences can be further reconciled based on a symmetry index (or reliability index) used to compute a weighted average of the two reported values available for each bilateral trade flow. The weights are based on the proportion of each country's total trade that approximately match the other partner's reported trade. That process follows the same philosophy as the OECD reconciliation methodology (Fortanier and Sarrazin, 2016).

19. Regarding international services trade data, there are various reasons why the availability and quality of services trade data are unsatisfactory, certainly when compared to merchandise trade statistics. Unlike goods that can be seen and physically measured and observed as they cross borders, services transactions can be delivered via a variety of modes (Rueda-Cantuche and others, 2016) and typically only the financial flows are observable, although not free from difficulty in trying to single out the corresponding services delivered (Fortanier and others, 2016). Hence, a variety of data sources and estimation techniques are necessarily used in practice, and sometimes they can be different by country. Data confidentiality and the different classification of services (extended balance of payments versus CPA/CPC) can complicate the scheme, too. Once a complete (although unbalanced) data set of bilateral trade flows of services data is achieved, the same balancing approach and principle (symmetry index) set out in Fortanier and Sarrazin (2016) is recommended to be applied to estimate a single value for each bilateral trade flow. Manual adjustments are recommended as well for the largest asymmetries provided sufficient time and resources.

20. It is also recommended to check the quality of the results obtained from the balanced view of trade with national or international trade statisticians, wherever possible, both for goods and services trade. Ideally, a feedback loop could be established in order to derive a first preliminary balanced data set.

21. According to Ahmad (2017), there are still two sources of differences between the balanced view of bilateral trade in goods and services and the comparable view of imports and exports shown in national accounts (and national SUTs): an unallocated component, reflecting the outcome of the balancing process (that can be allocated on a proportional basis if needed for analytical purposes); and the adjustments needed to align the concepts underlying the balanced bilateral trade estimates with the concepts and coverage of SNA. Regarding concepts, differences include the treatment of goods sent abroad for processing and merchanting activities; and differences in coverage, include imputations of unobserved trade (e.g., smuggling, low-level trade below a certain threshold used by Customs officials), re-exports and purchases by non-residents in the recording economy.

22. Once all those adjustments are made (see more details in the next section), the adjusted balanced view of bilateral trade (in FOB values and at purchaser's prices) has to be firstly confronted[103] and benchmarked against the export values of the national use table at purchaser's prices (also in FOB values) allowing for a discrepancy item in those cases where the full match is not possible (this should be normally the case).

23. Secondly, a set of national SUTs at basic prices with a distinction between domestic and import uses is required. Domestic use tables would be placed along the main diagonal of the multi-country Use table.

24. National import flow matrices are valued CIF[104] so they should be converted to FOB[105] values in order to use the previous adjusted and benchmarked balanced view of trade. For instance, the CIF-FOB valuation adjustments database developed by the OECD can be used for that purpose. As a result, the derived national import flows do

[103] Sometimes, this confrontation may lead back to revise the solutions given to the trade asymmetries.

[104] But in basic prices of the importing country

[105] But still including domestic margins and taxes less subsidies of the exporting country from the factory to the border

not necessarily have to match those of the balanced international trade import figures, although those discrepancies could be reduced (but not eliminated completely) through transparent and replicable conversion matrices where the main idea is to allocate differences across products in a way that preserves each country's recorded imports by industry and the geographical allocation of the balanced view of trade.

25. Export values would still need to be converted from FOB to basic prices by reallocating distribution margins and taxes less subsidies on products (excluding import duties) in the exporting countries.

26. The ultimate result of the full process is therefore a multi-country SUT valued at basic prices that can be converted to multi-country IOTs using standard methods already commented on and described in Eurostat (2008).

27. The final multi-country SUIOTs may contain a column (and a row) of discrepancies, as a result of the decision to fully constrain the system to the officially published GDP of each country, and the fact that the sum of global exports included in these GDP numbers is larger than the sum of global imports (i.e., there are "exports to the moon"). Depending on (regional) needs and preferences, this discrepancy column can either remain as such, and even be used as in indicator to identify areas where further work to reconcile national and bilateral statistics is necessary, or can be eliminated by a final, simple balancing procedure (e.g., GRAS). This discrepancy may also include vintage problems between the official SUTs figures and revised figures of GDP and other macroeconomic variables that did not lead to the corresponding changes in the SUTs.[106] Therefore, an additional benchmark to the latest figures of national accounts might be needed at the very end of the process. Again, this can be implemented by a final simple balancing procedure.

[106] One should note that revision practices are not harmonized among countries when it comes to align the latest GDP figures and the latest available SUIOTs. Therefore, a decision should be taken in building up inter-country SUIOTs.

Annex C
Empirical challenges

1. In reality, the construction of a global (or regional) SUIOT is mired in empirical challenges, including the need to make up for the sometimes limited availability of, and level of detail in, national SUIOTs; estimating missing countries, import flow matrices and/or distribution margins matrices; overcoming national data inconsistencies between national accounts and trade statistics, particularly those caused by goods sent abroad for processing and merchanting in the 2008 SNA; estimation of international trade and transport margins matrices; reconciling international trade asymmetries (goods and services) with an appropriate geographical allocation of trade by countries of origin and destination; and harmonizing different classifications for products (HS, extended balance of payments, CPA) and for industries (ISIC versus national systems) differences. This section describes those challenges in detail, as well as the different ways in which they can be dealt with.

A. Estimation of missing countries, import flow matrices and/or distribution margins

2. Although most countries are able to provide national SUIOTs, they typically vary in the level of detail they provide, as well as in their national classification systems. Assuring that the level of industry detail is coherent and comparable across all countries used is an important (although not absolutely essential)[107] first challenge in constructing multi-country SUTs in practice.

3. Moreover, not all countries currently produce SUIOTs. Two approaches lend themselves to dealing with the lack of SUIOTs for all countries. The first, (and preferred approach) for comprehensive analysis of global production is to estimate missing national (or regional) tables using various assumptions and data sources such that they can be included within a multi-country SUIOT. Typically, that involves using the input-output (or input use) coefficients for a similar country constrained to available national accounts information on value-added, production and consumption, which are generally available for all countries, albeit at varying levels of aggregation, coupled with international trade data, which, again, are typically available at a detailed level for all countries.

4. An alternative approach is to treat all other countries as exogenous in the multi-country SUIOT. However, that approach does result in some analytical limitations, particularly if missing countries are also significant traders with "observed" countries (as the imports from the rest of the world may contain significant "content" that originated in "observed" countries and exports from the rest of the world may also include value-added that originated in "observed" countries).

5. Many countries, but not all particularly in developing economies, produce import transaction matrices. Where that information is not available, the classic "import proportionality" assumption is necessarily used, that is, that assumes that the share of intermediate imports in total intermediate consumption for a given imported

[107] Note that the construction of global (and regional) SUIOTs need not have exactly the same level of detail of industries (or products) for all countries included. A table could also be constructed in which one country has a breakdown into X industries (products) and another into Y. However, consistency in that regard facilitates comparisons of results from using the tables across all countries, which is one of the main reasons that most existing global SUIOTs tables are developed in that way.

product is the same for all using industries, with similar assumptions for categories of final demand. Note that that can also capitalize on the ability to differentiate between different categories of imports (intermediates, final demand, and investment, as described in the BEC classification).

6. A study outsourced by Eurostat (Rueda-Cantuche and others 2017) examined a few non-exhaustive methods for the estimation of distribution margins matrices, domestic and import use tables at basic prices and use tables (totals) at basic prices with a selection of auxiliary information and providing an indication of how much the estimates fitted the reality in the absence of other official tables. The main conclusion is that the usage of tables of previous years generally provides the best options in each case. That is mainly because they gather detailed country-specific information that is not expected to change in the short term. Regarding distribution margins, it is better to start with an estimation of matrices of taxes less subsidies on products and then, the trade and transport margins matrix would be calculated by difference with respect to the use table at basic prices, if available. That solution performed better than the other way around. For the split between domestic and imported uses, the availability of a previous year's or current IOT table of imports makes a difference. In the case of missing use tables (total) at basic prices: using the joint structure of the distribution margins matrices of a previous year has proved to be the best option (i.e., difference between the use table at purchaser's prices and the Use table at basic prices from a previous year, if both available).

B. Overcoming national data inconsistencies between national accounts and trade statistics

7. International trade statistics, in particular merchandise trade statistics (but often too, in practice, services trade statistics), do not follow exactly the same concepts as those used for imports and exports in SNA[108] (the key accounting framework used in constructing official national SUIOTs). At present, most countries' available official SUIOTs are based on the 1993 SNA, meaning that the differences between merchandise trade totals and national accounts totals for goods are generally not significant (after adjusting for non-residents expenditures in the domestic economy and residents' expenditures abroad, which are captured in trade in services statistics and not merchandise trade data) facilitating the use of mathematical balancing approaches to resolve asymmetries.

8. But the changes made in the 2008 SNA for goods sent abroad for processing and merchanting in particular, imply significant changes for some countries, notably trading "hubs" (such as Hong Kong, Singapore and the Netherlands) but also countries with large processing sectors (e.g., China and Mexico) and, of course, those countries providing the intermediate inputs and purchasing the output from processing countries.

9. Balances for merchandise trade statistics include all the underlying flows related to goods for processing[109] – the processing services provided by the processing firm and the goods used by the processor in the production that were supplied without a change of ownership taking place between the principal and the processor. National SUTs that conform to the 2008 SNA require that for the processing firm (and country) merchandise trade data exclude the value of the goods imported that have not changed ownership and correspondingly exports of goods by the processing firm reflect only the additional value of the exported product (processing fee) generated by the processing firm. Similarly, for the principal firm (and country) exports should exclude the

[108] Two important differences concern the treatment of "merchanting", recorded under goods in SNA but excluded from merchandise trade statistics and "goods for processing" transactions, where the additional value provided by the processor is treated as a processing services fee and no imports or exports of goods appear in the processing country in SNA. See also #10.17 to #10.23 of the sixth edition of the *Balance of Payments and International Investment Position Manual*.

[109] Annex D provides a full description of the implications of the 2008 SNA treatment of goods sent abroad for processing and merchanting activities.

value of goods supplied to the processor (without a change in ownership) with a corresponding correction for any imports from the processor.

10. Bilateral partner estimates of processing fees are available in the balanced estimates of trade in services produced by countries (extended balance of payments: manufacturing services category). But what is also required for aligning flows of merchandise trade data with comparable flows in SUTs are estimates of those processing services by CPA or CPC and, in addition, estimates of the value of imported and exported goods whose ownership has not changed but are included in merchandise trade data. By definition, in order to produce national SUTs, that information (or at least national estimates of this information) must, in theory, be available. The challenge is to create equivalent estimates of those flows on a partner basis. For instance, suppose the United States exports $100 of a certain good for being processed to Mexico and it comes back to the United States (it can be elsewhere, too) processed for $110. There is no change in economic ownership in the goods exported and imported. Therefore, the United States should have $110 less of imports from Mexico and $100 less exports to Mexico. Ultimately, an import of a processing fee for $10 from Mexico should be allocated to the United States and to a specific service category.

11. Unfortunately, the information needed to make those additional adjustments to international merchandise trade data is limited,[110] for example, how much gross trade is related to those types of goods and how much processing services fees are paid, by country and by type of good traded. For instance, partial information can be found in the balance of payments data – BPM6 – of countries and/or by combining business statistics and merchandise and services international trade data. For that purpose, the trade in goods between countries broken down by economic activity, size class of enterprises, trade concentration, geographical diversification and products traded may allow for assessing more accurately the impact of international trade in goods on the employment, production and value-added of economies that are increasingly interconnected.

12. In practice, a merchanting activity is nothing other than a re-export but without the good crossing the border of the merchanting country. Very few countries are able to produce statistics that identify the origin country of merchanting services. Differently from the 1993 SNA, imports of merchanting services are now included as goods under the 2008 SNA. Moreover, in the balanced merchandise trade statistics, merchanting services are implicitly excluded from import flows and captured instead in what is referred to as the CIF-FOB adjustment. As such, for consistency with national SUTs, merchanting services need to be added to the balanced merchandise trade statistics to align with the national accounts estimates of exports. In the absence of data on imports (by partner), it is recommended that partners' reported export information (available in trade in services statistics on a BPM5 basis and separately identifiable for countries producing SUT tables on a 2008 SNA basis) is used to estimate the value of imported merchanting services by partner (allocated to the same goods category).[111]

13. For merchanting transactions (under the 2008 SNA) adjustments are needed to ensure that exports of goods include the merchanting margin applied by the merchant in the country where it is resident. Under the 1993 SNA, merchanting was included as an explicit item within the Other business services' category of EBOPS (2002). The item is no longer included within extended balance of payments but is typically available/collected in most countries. Assuming the merchanting transaction occurs in the same period,[112] the adjustment to merchandise trade statistics requires a positive entry (export) of goods in the merchanting country and a corresponding import of goods in

[110] For the European Union, for instance, the Eurostat's Integrated Global Accounts (IGA) Project carried out in 2017 a stock-taking on current practices in the Member States on those issues. It is expected that more data on trade of goods sent abroad for processing will be available within the next few years.

[111] Note that this adjustment does not, in general, correct for partner country relationships in merchandise trade data that record goods produced in country A and sold in country C, via a merchanter in country B, as imports by C from A; in theory, the conceptually correct treatment in SNA would record those flows as imports by B from A and exports by B to C. On the rare occasions that countries record negative exports in one period and positive exports in another, with corresponding changes in changes in inventories, the preferred approach will be to adjust SUTs to remove those flows. In other words, in the first period remove the negative for exports and the positive for changes in inventories, and in the second period reduce exports and increase changes in inventories. That helps to preserve the underlying trade in goods bilateral flows with those reflected in merchandise trade data and avoids introducing unnecessarily complicated changes to partner relationships, which may also introduce distortions in measures of GVC participation.

[112] See also chapter 6 of *The Guide on the Impact of Globalization in the National Accounts*.

the counterpart country.[113] In that context it is important to recall that the balanced view of bilateral trade in services explicitly excludes merchanting related transactions from both the estimates of exports and imports of any given country.

[113] And a corresponding negative entry in exports of the principal.

14. For illustrative purposes, suppose a Dutch trader sells fish from a Norwegian ship at Helsinki's harbour for 1.5 million euros, being 0.5 million euros the merchanting fee. The international merchandise trade statistics record Finnish imports of fish from Norway for 1 million euros and Finnish imports of trade services from the Netherlands for half a million euros. However, SNA requires counting for a Dutch import (negative export) of fish from Norway for 1 million euros and a Dutch export of fish to Finland for 1.5 million euros, including the merchanting fee. Hence, the necessary adjustments to align trade statistics with SNA would consist in decreasing Finnish imports of fish from Norway by 1 million euros, decreasing Finnish imports of merchanting (trade) services from the Netherlands by 0.5 million euros, adding (negative) exports of fish from Norway to the Netherlands for 1 million euros and adding Dutch exports of fish to Finland by 1.5 million euros. The difference is considered the output of the merchanting activity recorded in the Dutch economy (merchanting fee). Regretfully, data of goods traded under merchanting is limited and adjustments can only be made in some cases; for instance, extended balance of payments categories in BPM6 can provide only gross trade flows, with that including the merchanting fee.

15. It is also instructive in this context to consider how factoryless producers are recorded in national SUTs, and how they should ideally be treated in global or regional multi-country SUTs. In the strict sense, these are firms that own no material inputs in the production process and instead provide only intellectual property (design, brand, etc.), meaning they are treated in SUTs in the same way that merchanting transactions are recorded. However, when similar firms purchase some of the material inputs in the production process, the firms share similarities with principal firms under goods for processing arrangements. Complications arise, however, when the material inputs purchased by those firms do not cross borders, as they are not recorded in conventional trade statistics, but imputations are made for the purposes of national SUTs. Where such imputations are made, and available on a partner country basis, it would be preferable to make explicit corresponding adjustments to the conventional (balanced) bilateral trade statistics. Where partner country information is not available, however, it would be preferable to exclude the imputations from the national SUTs (affecting imports, exports, intermediate consumption and output).

16. Re-exports are foreign goods imported and subsequently exported without being processed or having substantial transformation from one country to another via a third country (re-exporter). The goods need to cross the borders of the third country. Typically, SUTs/SNA includes re-exports (also denoted as foreign exports) in the export column of the import use table by type of product (although that might not be true for all countries). However, international merchandise (good) trade statistics do not distinguish between domestic and foreign exports (re-exports). Therefore, international merchandise trade data would require some additional information and adjustments to separate domestic exports from re-exports and thus, be aligned with the SUTs/SNA total values of domestic and foreign exports.

C. Estimation of international trade, transport and insurance costs

17. For merchandise trade statistics, imports are valued in CIF and exports in FOB. In national SUTs at basic prices, import flow matrices are typically reported in CIF by product type while total imports (summed over all products) are required to be valued

in FOB.[114] Hence, depending on whether the transport company is resident or non-resident, a CIF-FOB (national accounts) adjustment needs to be made. The adjustment column consists of a deduction from the services items for transport and insurance with an offsetting global adjustment made to imports of goods.[115]

18. However, the construction of multi-country SUIOTs particularly refers to a slightly different concept, which is the so-called CIF-FOB valuation adjustment, defined as the difference between the import flows in CIF and their mirror imports in FOB. One would expect that the difference would just be the amount of transportation and insurance costs paid either by the seller or the buyer in each transaction. Nevertheless, the 2008 SNA requires merchanting services to be added to the value of the imported good (instead of as a trade service), thus leading to a new factor contributing to such difference.

19. Within the multi-country SUTs framework, the costs associated with the international transport and insurance of merchandise trade (also referred to as CIF-FOB margins) are crucial for two reasons: a) to address bilateral trade asymmetries of imports and exports at the same valuation; b) to adjust national import flow matrices to the FOB valuation. For those purposes, the OECD and WTO have recently published a global bilateral database of CIF-FOB margins combining the largest and most detailed cross-country sample of official national statistics on explicit CIF-FOB margins to date with estimates from econometric gravity models and using a novel approach to pool product codes across World Customs Organization Harmonized System (HS) nomenclature vintages. The database shows that distance, natural barriers and infrastructure continue to play an important role in shaping regional (and global) value chains.[116] However, the database is based on BPM5 and therefore, CIF-FOB margins do not capture international trade margins (merchanting) that would need to be estimated differently by looking into available data on goods purchased and goods sold under merchanting, with the support of services trade statistics data.

20. Official statistics on CIF-FOB margins are still far from being regularly produced by NSOs and that would be very much useful to improve the quality of the balanced view of bilateral trade supporting the construction of global (or regional) multi-country SUIOTs.

D. Reconciling international trade asymmetries (goods and services)

21. Perhaps the biggest challenge for constructing a global (or regional) multi-country SUIOT concerns bilateral trade statistics. With very few notable exceptions (such as the United States and Canada, which use a single-flow approach that compiles bilateral trade statistics only on the basis of imports), they are not typically consistent (see fig. AC.3, e.g.). Particularly, European Union statistics have a specific challenge owing to the European Union internal market – the traditional data source, customs declarations, does not exist – leading thus to bigger asymmetries within the European Union. For goods, that partly reflects the price basis (as imports are generally recorded on a CIF basis, which differs from the FOB basis used for exports). But even after adjusting for the price basis, significant differences can remain, reflecting a number of factors, for example: imports are typically recorded on the basis of country of origin while exports are recorded on the country of last known destination, which can be (and is) the source of significant discrepancies, particularly for goods passing through trading hubs such as Hong Kong, the Netherlands and Singapore; differences in the trade system – general trade versus special trade; and the occurrence of unallocated (usually confidential) trade (see Jansen (2014) for additional factors).

[114] (2008 SNA, para. 26.19) Valuation principles are the same in SNA and the international accounts. In both cases, market values are used (…). In the international accounts, the valuation of exports and imports of goods is a special case where a uniform valuation point is used, namely the value at the customs frontier of the exporting economy, that is, the FOB-type valuation.

[115] 2008 SNA, para. 28.10.

[116] For more details on the methodology, see Miao, G. and F. Fortanier (2017), "Estimating Transport and Insurance Costs of International Trade", OECD Statistics Working Papers, No. 2017/04, OECD Publishing, Paris.

Figure AC.3
Examples of large trade asymmetries by chapter of the Harmonized System, 2014

Reporter country	Partner country	Product (HS chapter number)	Reported imports	Mirror exports	Imports -/- Exports
Netherlands	Russia	Mineral fuels and oils (27)	21,650	57,294	-35,644
USA	China	Electrical machinery, equipment and parts (85)	127,093	92,550	34,543
China	Korea	Electrical machinery, equipment and parts (85)	76,674	51,182	25,492
China	Japan	Electrical machinery, equipment and parts (85)	40,572	25,751	14,820
USA	China	Nuclear reactors, machinery & mechanical app. (84)	105,279	90,883	14,396
Germany	China	Electrical machinery, equipment and parts (85)	28,804	14,458	14,346
Germany	Norway	Mineral fuels and oils (27)	8,137	20,105	-11,968
France	China	Electrical machinery, equipment and parts (85)	14,397	5,551	8,846
France	Russia	Mineral fuels and oils (27)	11,641	4,132	7,509
Netherlands	China	Nuclear reactors, machinery & mechanical app. (84)	15,695	22,019	-6,323
Spain	France	Vehicles and parts (87)	10,664	5,105	5,559
Spain	Russia	Mineral fuels and oils (27)	6,971	3,421	3,550

UN Comtrade, millions, United States dollars

22. The OECD, in cooperation with other international organizations, such as WTO, has developed new approaches to balancing bilateral merchandise and services trade statistics, built around the core principles of transparency and replicability (Fortanier and others (2016) and Fortanier and Sarrazin (2016)). This approach derives a "symmetry" index[117] for each country (used as weights) in order to arrive at a coherent view of partner country trade data. The balanced sets of trade data for goods and services are publicly available on the OECD statistics portal,[118] thus greatly facilitating efforts of any institution or individual wishing to produce their own global (or regional) multi-country SUIOTS and/or their own multi-partner GVC extended accounts, too.

23. Besides the CIF-FOB corrections, there is another important issue regarding merchandise trade data (UN Comtrade), that is, domestic exports need to be separated from exports of foreign goods (or re-exports), otherwise they would provide a distorted picture of the geographical allocation of trade required for the construction of multi-country SUIOTs. We can illustrate that with a real example about the crude oil trade between Spain and Portugal. UN Comtrade reported around 576 million euros of Portuguese imports (CIF) of crude oil from Spain and 510 million euros of exports (FOB) of crude oil from Spain to Portugal. The difference can be easily attributed to CIF-FOB margins. However, by looking at the information on country of origin provided by other European trade statistics sources, such as Comext (Eurostat's database on trade in goods statistics), we observe that Portugal reported 505 million euros of crude oil imported from Algeria (country of origin) and 71 million euros really coming from and being produced by Spain (country of origin). That clearly indicates that Spain is re-exporting crude oil from Algeria to Portugal for an amount of 505 million euros. That is confirmed by the total output of mining and quarrying products (including crude oil) from the Spanish supply table, which amounts to around 110 million euros of production, of which 71 million is exported to Portugal (domestic exports). For the European Union, the problem can be sorted out through a well-established database, Comext, which is considered the official reference regarding international trade in goods within the European Statistical System and is well recognized by users as a statistical product. For other countries in the world, the recommendation is thus trying to get additional information from other sources that can quantify the amount of foreign exports (re-exports) in order to come up with a correct geographical distribution of merchandise trade.

24. One last important issue before the final balancing of asymmetries is the treatment of confidential data, not geographically specified trade nor allocated trade, which in some cases can be very important (e.g., trade in Germany and Austria in petroleum and natural gas). Ideally, confidential data should be used as much as possible as long as no disclosure is made. In other cases, proportionality is generally assumed across countries or products. Alternatively, they can be left out separately to transparently

[117] More formally, the symmetry index is calculated as follows. For each reporter *i*, partner *j*, product *k*, in a given year, the asymmetry level (AL) is calculated: $AL_{ijk} = \frac{|X_{ijk} - M_{jik}|}{X_{ijk} + M_{jikt}}$ where *X* and *M* refer to reported exports and imports respectively. Subsequently, only those export and import values for which $AL_{ijkt} \leq 0.10$ are retained (exports (x^r) and imports (m^r). The export symmetry index SI^x is then calculated as the ratio of the sum of retained export values as a share of total exports (by reporter, product and year), while the import symmetry index SI^m is similarly defined as the as the sum of retained import values as a share of total imports, and are used as the country weights: $SI^x_{ik} = \sum_j \frac{x^r_{ijk}}{x_{ijk}}$ *and* $SI^m_{ik} = \sum_j \frac{M^r_{ijk}}{M_{ijk}}$

[118] See https://stats.oecd.org/Index.aspx?DataSetCode=BIMTS_CPA.

identify how much of the international trade did not have enough detail to be allocated to countries or products. Clearly, a fully specified balanced view of trade would be more in line with users' needs, while leaving unspecified trade separated out would have a more statistical ground.

25. For services statistics, where there are currently significant data gaps with bilateral data, the approach also incorporates gravity-based models to generate missing data, before being balanced using the same "symmetry" approach. As mentioned earlier, the estimation process of missing trade data can be more burdensome than for merchandise trade data mainly because typically only the financial flows are observable. Hence, a variety of different data sources and estimation techniques are necessarily used in practice. The OECD (Fortanier and others, 2016) suggests a top-down approach to estimate missing trade flows whenever official data are available (e.g., using structural information over time, simple derivations, mirror data, linear interpolations, moving average based backcasting and nowcasting methods) and otherwise, gravity models for specific items. Total services trade by extended balance of payments category and country are expected to be used as benchmark for the estimation of other sub-items.

26. The gravity models for specific items generally use four types of independent variables: economic (such as GDP of reporter and partner countries, GDP per capita of reporter country and overall exports and/or imports of services by partner and reporter countries), distance, dummy variables specifying: common border (contiguity), language affinity, territorial link (e.g., Czech and Slovakia were one single country not so long ago), membership to a highly integrated region (e.g., NAFTA, European Union, APEC, etc.), and fixed effects for partner and year.

27. Once a complete (although unbalanced) data set of bilateral trade flows of services data is achieved, the same balancing approach and principle (symmetry index) set out in Fortanier and Sarrazin (2016) can be applied to deal with trade asymmetries. At that stage, it is important that the largest trade asymmetries are discussed between the affected countries either on a bilateral basis, trilateral basis (such as for NAFTA countries) or through dedicated workshops such as those organized by Eurostat within the European Union. It is expected that during those meetings trade experts from countries have the opportunity to exchange experiences, discuss bilaterally and decide on specific actions to resolve their corresponding trade asymmetries.

E. Harmonizing different classifications

28. Merchandise trade data are compiled using the HS of products, which, because of the significant disaggregation of data available, are readily convertible to the product classifications used in constructing national SUTs and which are typically much more aggregated, such as the international product standard CPC. However, the same is not true for trade in services data, which is based on extended balance of payments, and where the level of detail collected by countries is often less than the comparable detail used in national SUTs. A combination of extended balance of payments -CPA/CPC concordance tables, SUIOTs and other data sources such as business statistics are normally used to make such conversion.

29. For convenience and ease of exposition the 12 key (aggregated) product groupings used in extended balance of payments (2010), and which is often the only level of detail produced by many economies, are shown below:

1. Manufacturing services on physical inputs owned by others: (goods for processing)

2. Maintenance and repair services not included elsewhere
3. Transportation
4. Travel
5. Construction
6. Insurance and pension services
7. Financial services
8. Charges for the use of intellectual property not included elsewhere
9. Telecommunications, computer and information services
10. Other business services
11. Personal, cultural and recreational services
12. Government goods and services not included elsewhere

30. The challenge for constructing multi-country SUIOTs is converting those data into equivalent CPC (or the typically preferable CPA classifications). For most of the categories above that is not an overly arduous exercise. However, two categories warrant special mention, and indeed attention: "Manufacturing services on physical inputs owned by others" and "Travel".

31. As intimated above, despite the CPC's international coverage, the CPA system is generally preferred in the construction of SUTs as the architecture and structure (by design) mimics that of the corresponding industry classification (NACE, which is closely related to the international standard ISIC). But "Manufacturing services on physical inputs owned by others", in CPA product classifications, is not allocated to the category of products under the services umbrella. Instead, it is recorded under goods classifications (as the output of the manufacturing sector). Similarly, "Travel" which covers non-residents' expenditures (exports) and residents' expenditures abroad (imports), is composed of a number of products (including goods) and is usually shown as a separate item in national SUTs (a negative adjustment item in household final consumption and a corresponding positive entry in exports for non-residents expenditures, and a positive entry to imports and equivalent positive to household final consumption).

F. Direct purchases abroad

32. Direct purchases abroad by residents (imports) and direct purchases in the domestic territory by non-residents (exports) are typically included in national accounts as a lump-sum total but not separated by product, as required to perform conventional input-output analysis. Even though they are available through the balanced view of trade under the "Travel" item in extended balance of payments categories, they still need to be separated from pure travel services using tourism satellite accounts, SUIOTs or any other related source data. The estimated values will then be transferred to the goods categories and partners (i.e., country of origin of the non-resident).

33. Although there will be differences between the spending patterns of tourists in a given country, depending on their nationality, information available in tourism satellite accounts is rarely available at that level of detail, and so, in those circumstances the simplest way of arriving at a global balance of travel expenditures by products, is to assume that all tourists in a given country have the same spending patterns (by product). In other words, they purchase the same basket of goods and services for every $1 spent, using information on the product breakdowns from tourism satellite accounts in that country or, by convention, using fixed assumptions.

34. By extension, import statistics by product are also directly generated through the statistics on exports by partner generated in the balanced set of travel statistics, which in turn automatically generates a coherent and equivalent set of import statistics by partner and product. There may, however, remain a difference between the equivalent national accounts estimates. That difference should be subsequently allocated in a way that the balanced view of trade is preserved by product across countries of origin.

G. To balance or not to balance…

35. Figure AC.3 in the present annex allows for two separate global (or regional) multi-country SUTs, i.e., with or without discrepancy items. The tables with an explicit discrepancy item would provide a perhaps more accurate view of the underlying state of statistics available across countries, and indeed pointers to national statistics agencies on those areas where data improvements could be advanced. However, for most users, the preference is to have a balanced table without discrepancy items (recognizing, too, that the discrepancies above could also be negative and not just positive; which adds another level of complexity when interpreting results from unbalanced tables).

36. Bearing that in mind, it is important to note that any globally (or regionally) coherent and balanced view of trade (consistent with the national accounts concepts) cannot satisfy the dual constraint of no changes in current account balances and GDP (and value-added by industry), if discrepancies exist between total global (or regional) exports and total global (or regional) imports recorded in national SUTs – which is the case. In other words, some residual (discrepancy) item is necessarily needed to overcome this contradiction, unless changes to GDP and the current account balance are made, which should be avoided as the primary focus of a global (or regional) multi-country SUIOT is to analyse the interactions between trade and production and not least because the estimates of output, and factors of production are usually of good quality. As such, whether tables are automatically balanced or not, constraining to published national accounts, at the global or regional level, necessarily requires a discrepancy item.

37. As required by users, perhaps the simplest way to achieve balanced multi-country SUTs without discrepancy items is to use a standard optimization model, such as GRAS, but with a control total for the export discrepancy column set as the difference between total unallocated exports and unallocated imports (equivalent to the total difference of total global exports and total global imports, based on each country's national accounts), when global exports are greater than global imports, and allocated to the import row when the opposite is true.

H. Construction of multi-country input-output tables

38. The construction of the multi-country IOTs shall be based on the estimated multi-country SUTs. For product-by-product IOTs, the final demand component remains unchanged by definition, so no further changes need to be made in the final demand component of the multi-country IOTs. The changes will therefore affect only to the intermediate uses by exporting country, trade partner and product and value-added by country and product (using either the product or the industry technology assumption, Eurostat, 2008). The final multi-country IOT will also have to respect available national IOTs and eventually be benchmarked to the latest national accounts aggregated data (i.e., using GRAS).

39. Regarding industry-by-industry IOTs, intermediate and final uses (from the multi-country SUTs) will have to change by definition while value-added would remain unchanged. In such case, we assume either fixed-product or fixed-industry sales structures (Eurostat, 2008) for estimating the missing IOTs. Again, official IOTs will have to be respected. The final IOT will also have to be benchmarked to the latest aggregated national accounts data.

I. International cooperation in data sources and methodologies

40. Starting from a given national SUT, the same view of balanced merchandise trade and services trade statistics and combined with the same approach for unallocated trade and other adjustments for exports and imports and the same national accounts constraints, should generate the same results for any given country and their partners, in whatever permutation of countries are included within regional or global tables. That is the key point for the development of a coordinated approach to global multi-country SUIOTs that avoids introducing inconsistent views across regional initiatives.

41. A significant cause of those inconsistencies reflects differences in balancing international trade statistics, so it follows that improved coherence across the various existing initiatives can come about through a common view of bilateral trade data. While that will certainly help improve coherence across the various initiatives, the changes adopted in the 2008 SNA also require a common view to avoid introducing implicit distortions in partner country trade statistics, after merchandise trade statistics, for example, have been balanced. The chief constraint in that respect, which cannot be underestimated, as it is a central consideration in the design of the system, concerns the need to ensure additivity (consistency) between the regional tables and the global table comprising the regional dimensions. Relaxing that constraint would result in a significantly simplified schematic but the risk of inconsistencies (and correspondingly confusion) between the regional subcomponents and the global one would be high, especially if independent balancing mechanisms were used. For example, an Asian table may generate a balanced table (and view of trade with the rest of the world) that is inconsistent with the comparable (implicit) transactions recorded within say a European table.

42. Recent years have seen a significant uptake in international efforts to develop measures of trade in value-added, driven by growing demands for better, more comprehensive and more timely data on global value chains, their drivers and impacts and so the global multi-country IOTs underlying them. Examples of initiatives include OECD-WTO TiVA, Eurostat's FIGARO Project, North American TiVA, APEC-TiVA, World Input-Output Database, regional IOTs for Latin America coordinated by UN Economic Commission for Latin America and the Caribbean (ECLAC) and many others. The participants of the so-called OECD's Regional-Global TiVA Workshop convened in March 2017 to take stock of all those initiatives, and to explore the scope to develop synergies, mechanisms for closer collaboration, and a common action plan for the future. There was an agreement to work towards a common consistent data set.

43. Participants agreed that there was significant scope for the creation of synergies across the various initiatives, in particular to avoid duplication of activities and ensure the most efficient allocation of resources at a global level, and to seek to develop guidance on best practices that could be adopted across the initiatives. There was unanimous support, not least to avoid confusion among users, for the principle of developing a single consistent internationally recognized benchmark data set – of TiVA and the underlying global/regional SUIOTs – and that the mechanisms and methodologies used across initiatives should be oriented towards supporting that goal.

Annex D
Conceptual accounting topics

1. The present annex reiterates some of the measurement issues and other challenges identified in the UNECE Guide to Measuring Global Production (2015). The perspective is that of increased activities of GVCs and how outstanding measurement issues impact on arriving at a rounded understanding of these GVCs.

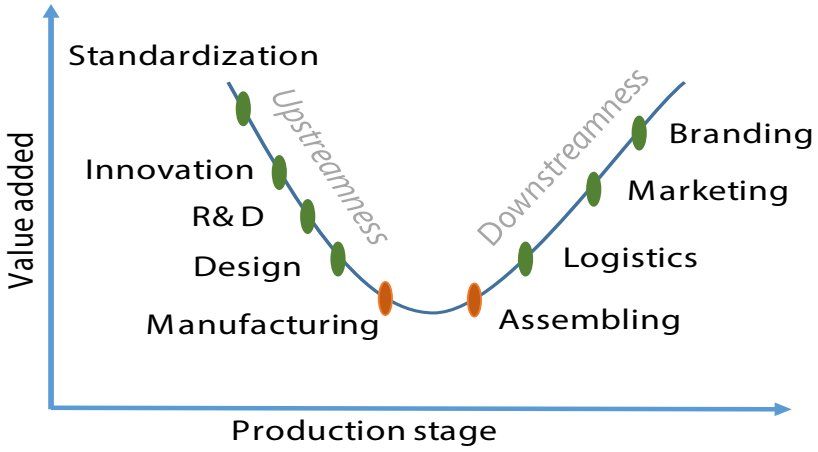
2. Findings of the UNECE Guide to Measuring Global Production are presented in the form of illustrative schemes, where possible. The focus is primarily on the measurement challenges related to contract manufacturing. Contract manufacturing covers goods sent abroad for processing and factoryless goods production. Merchanting, another area of global production where there are measurement challenges is also discussed.

3. The following discussion is in the context of the current accounting standards, the System of National Accounts 2008 (2008 SNA) and the *Balance of Payments and International Investment Position Manual*, sixth edition (BPM6). Those standards follow consistently the change of ownership principle. However, properly applying that principle may be challenging.

4. The measurement of intellectual property involved in interaffiliate transactions by MNEs is another measurement challenge. The chapter will also include an evaluation of how inventories held abroad can be identified and measured in the context of these different trading arrangements of contract manufacturing and merchanting.

5. In figure AD.1, a standard GVC framework is outlined. Contract manufacturing occurs in the manufacturing/assembling stage of production. Merchanting occurs

Figure AD.1
Global value chain



along the stages of manufacturing/assembling and logistics. Although intellectual property is an input to manufacturing, on a contract basis or on own account, it relates to the upstream elements of the GVC and generates substantial value-added for the GVC. In fact, it is clear to see that manufacturing is the lowest value-added generator for the GVC and accordingly it is understandable that an MNE might outsource this element of its GVC – where there is a captive or hierarchical governance structure.

6. Goods sent abroad for processing covers many of the transactions associated with contract manufacturing. The entire model for recording these types of transactions where elements of the production process are outsourced has changed since SNA 93 and BPM5 were introduced. The standard case was where goods went abroad for further processing and then returned to the country of the sender. The treatment was to impute a "change in economic ownership" and recognize the export and import associated with the movement of the good before and after processing abroad. The net of these two transactions accords with the value of the processing service provided abroad.

7. In reality, no change in ownership takes place because the good remains in the ownership of the principal that sent it abroad. In the 2008 SNA and BPM6, it is recognized that no change in economic ownership takes place and the transaction with the processer abroad is recorded as the import of a manufacturing service by the principal.

8. In the case of merchanting a good is bought in one country and then resold to another country without crossing the border of the merchant. The standards changed the way of reporting these transactions. In SNA'93 they were recorded on a net basis under the services heading; the margin on the buy/sell was recorded as a business service. In this case a "no change of economic ownership" was imputed. In the 2008 SNA those buy and sell transactions were recorded on a gross basis under the goods heading, thus recognizing the change in economic ownership that occurs when the merchant buys the good and again when it is sold. However, the two transactions are recorded as positive and negative exports of goods. No overall change to GDP results from this change in recording.

9. Many of the merchanting and goods for processing transactions take place within GVCs and involve outsourcing and procurement between affiliates and third parties abroad. Those GVCs span continents as specialization of stages in the production and distribution cycle are clustered in particular countries or zones.

A. Contract manufacturing in a global value chain

10. IMTS, as one of the main data sources for national accounts and balance of payments, are based on physical movements and need be adjusted to the change of ownership principle. The data items needed to make those adjustments may not be readily available, and statisticians may need to resort to new data collection or estimation. That is not always straightforward, but sometimes even relatively small changes in data collection are helpful. Therefore, data collections should be reviewed to see whether they properly measure processing, merchanting and factoryless goods production. To foster international comparability of national accounts and balance of payments, common guidance is needed for NSIs and other compiling agencies on how to develop data collection and carry out the necessary adjustments in line with the change of ownership principle.

11. Chapter 5 of the *UNECE Guide to Measuring Global Production* examines thoroughly the changes in the accounting standards between the 1993 and 2008 versions of SNA and differences between the fifth and sixth versions of the BPM. The Impact

of Globalization Guide on National Accounts, 2001, on the other hand, explains the conceptual underpinnings of these changes in more detail.

B. Outward processing

12. Outward processing occurs when a resident company (principal) sends goods abroad for processing while retaining economic ownership of those goods. After the processing phase, goods may be sent back to the principal or to its country or be delivered to customers in other countries. The following sections give an overview of data items and corresponding adjustments needed in the context of outward processing.

1. Making adjustments in merchandise trade statistics

13. As a general guideline, IMTS record all goods that add to or subtract from the stock of material resources of a country by entering (imports) or leaving (exports) its economic territory.

14. As the 2008 SNA and BPM6 require only the recording of a fee paid for the delivery of processing services as import of services (will be discussed later), the following BOP adjustments in IMTS are needed :[119]

a) Remove the merchandise trade exports for the goods being sent abroad for processing from the overall trade flows;

b) Remove from the overall trade flows the merchandise trade imports for the goods being returned to the domestic economy following processing.

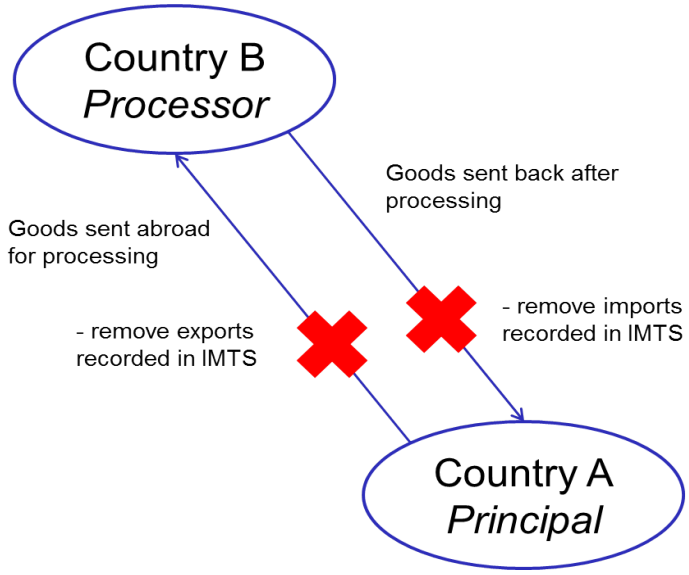
15. To be able to make those adjustments properly other differences of IMTS, in addition to the change of ownership principle, also need be translated to SNA and BPM concepts. That includes especially coverage of goods, time of recording, valuation and country of origin.[120]

16. Additional information available in IMTS may help to make the necessary adjustments. Merchandise trade subject to processing may qualify for exemptions from normal customs duties. Those cases may be identified in customs data with the nature of

[119] For full explanation of the methodology for BOP adjustments, *see* the IMF's *Balance of Payments and International Investment Position Manual, Sixth Edition (BPM6)*. Available from www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf

[120] *Ibid.*

Figure AD.2
Adjustments to IMTS for outward processing



transactions code. In addition to the nature of transactions code, customs data may include other items not currently received or used by statisticians, but which may be important for the required adjustments. Therefore, negotiations with customs agencies are highly recommended for access to additional records on customs documents.

17. The desired additional information for adjustments in merchandise trade statistics includes, for instance:

- Nature of transaction code
- Values and commodity codes of goods sent abroad for processing
- Processing fees paid
- Country of processing
- Destination country of processed goods
- Dates of departure and return of temporarily shipped goods

18. Those data items form the basis for making the adjustment for change in ownership. In addition to collecting or receiving new data items, one-off surveys to understand declaration practices may be very useful.

19. Alternative data sources for making outward processing adjustments in merchandise trade statistics include, for instance:

- **Adding new questions to business surveys** concerning the value of goods sent abroad for processing and the payments of processing fees to foreign processors. This will, however, increase the response burden.
- **Using any existing information** on the payments of processing fees from business surveys and international trade in services surveys.
- **Estimating** data by calculating ratios of processing fees to processed goods for similar firms in terms of ISIC and so on, to approximate the gross flows. In that case, it is important to remember that sometimes goods do not return after processing to the country of principal and that may cause disturbances in the trade balance. One-off surveys that help estimate the importance of those flows would be helpful.

2. Estimating imports of goods purchased abroad for processing

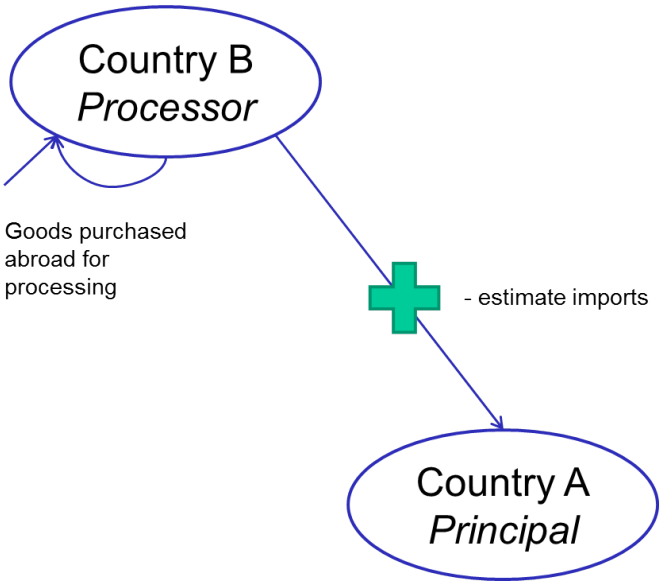
20. Goods purchased abroad for processing (from the country of processor or from other countries) are not recorded as imports in IMTS when those goods do not cross the borders of the country of principal. Therefore, the related purchase needs to be estimated as imports of goods.

21. Possible data sources for estimating imports of goods purchased abroad for processing include, for instance:

- **Adding new question(s)** to business surveys to capture domestic purchases of intermediate goods as a separate item from purchases abroad. To limit response burden, the question could be added only for industries in which outward processing exists more widely.
- **Estimating data by subtracting** the processing fee paid from the value of the imports (after processing) as reported in customs records.

22. It has to be noted that removing imports after outward processing from merchandise trade statistics without replacing them with the actual import value of the goods purchased abroad before processing would cause an error.

Figure AD.3
Estimation of imports of goods purchased abroad for processing

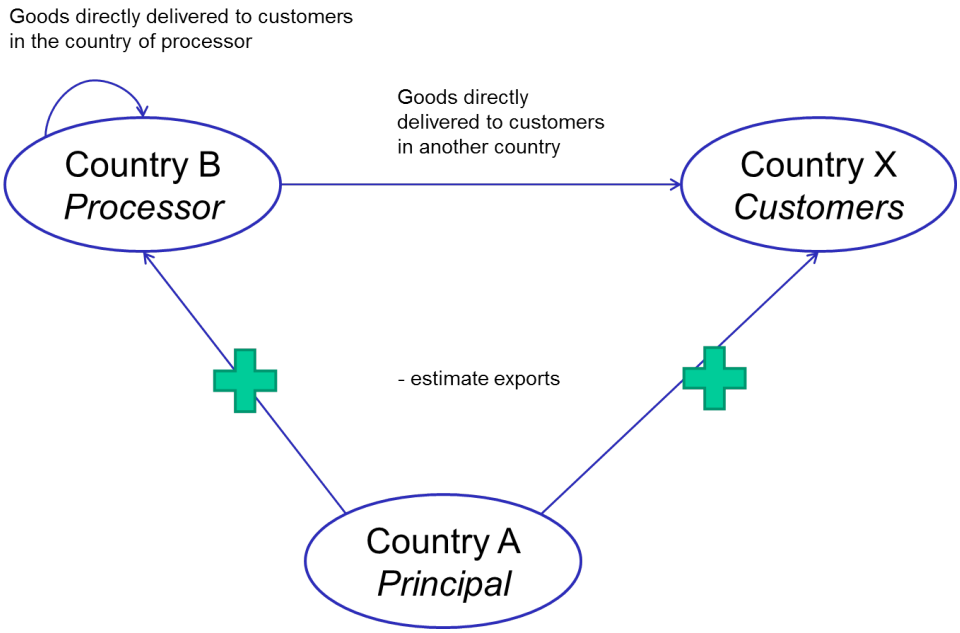


3. Estimating exports of processed goods not returning

23. Processed goods not returning are not recorded as exports in IMTS as processed goods do not cross the border of the principal. Therefore, the related exports need to be estimated.

24. The information that may be useful in estimating the exports of processed goods not returning includes, for instance:

Figure AD.4
Estimation of exports of processed goods not returning



- **Nature of transaction codes** to detect goods sent for processing and not returning from IMTS.
- **Matching** the detected goods sent for processing and not returning with turnover from foreign sales (as reported by the principal in business surveys).
- **Estimating** the transaction value by adding the processing fee to the value of goods reported in customs records at the moment of shipping the goods abroad.

25. Without sufficiently detailed and good-quality information on the nature of transactions, adjustments in IMTS cannot be made without risk. It has to be also noted that removing shipments for outward processing from IMTS without replacing the actual export value of the goods after processing would cause an error.

4. Estimating imports of processing services

26. Instead of the value of physical flows of goods before and after the processing, the 2008 SNA and BPM6 require recording of a fee paid for the delivery of processing services as import of services. That fee is not recorded in IMTS and, therefore, other data sources are needed for estimating it.

27. Main data sources for estimating imports of processing services are business surveys and international trade in services surveys. A variable on purchases of processing services from foreign suppliers could be added in those surveys. In addition to including a new variable, good coverage of firms engaged in (outward) processing need be ensured.

28. Alternatively, the processing fee may be measured indirectly as a difference in the values of the goods before and after processing in IMTS. Further, it has to be noted that in addition to the processing fee, value differences may include holding gains and overhead costs. That method is also problematic if the goods do not return to the home country. It has to be also taken into account that the product classification may change before and after processing. Because of those risks, it is recommended to observe the processing fee directly.

Figure AD.5
Estimation of imports of services (as processing fee)

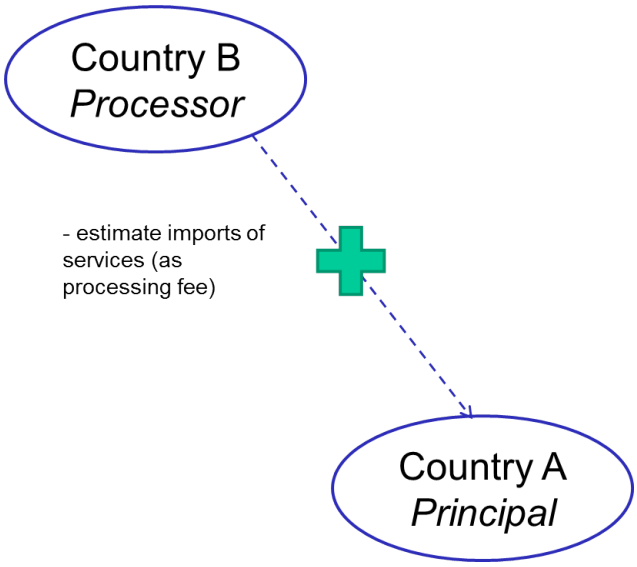
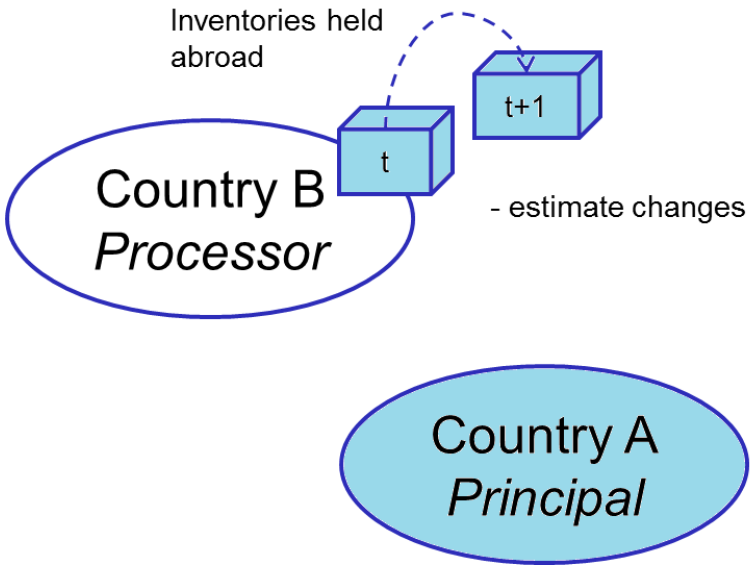


Figure AD.6
Estimation of changes in inventories held abroad



5. Estimating (changes in) inventories held abroad

29. In case of processing, inventories held abroad usually exist and change in their value needs be estimated to be in line with the 2008 SNA and BPM6 recording.

30. Detailed guidance on the recording of inventories under global production is provided in the forthcoming Eurostat-OECD compilation guide on inventories (chapter 8.7). The inventories of raw materials, work-in-progress and finished goods during processing abroad remain property of the principal and will be recorded in its accounts as no change of ownership takes place.

31. In line with that, the raw materials that are sent from the country of the principal to the country of the processor will not be recorded as withdrawals of inventories when crossing the border. During the production process the increase in the work-in-progress equals the corresponding processing service for the same period. If the processing is completed within the same accounting period, countries assume that the respective transactions are offsetting each other so there is no need of specific adjustment. However, that may not be the case in long production processes. If production straddles more than one accounting period, withdrawals and additions from the stock of inventories should be recorded at the price prevailing at that time, and any price differences be accounted as holding gains/losses.

32. The data on inventories are usually collected in the business survey. Other sources of information could be tax records, special inquiries or consolidated financial statements. Ideally, surveys would:

- Capture also inventories held abroad
- Split between domestic and foreign held inventories
- Split between raw materials and work-in-progress/processed goods

33. The latter split between raw materials and processed goods is most useful in providing a broader picture of the commodity flows subject to outward processing and are helpful for proper revaluations.

6. Recording of goods returning to the country of principal

34. Recording of goods returning to the country of principal is more straightforward than the previous cases. Goods delivered to customers in the country of principal are recorded as domestic production. Goods returning to the country of principal, before the delivery to final customers in another country, follow the recording in IMTS. The following scheme presents these flows:

7. Summary of recordings and adjustment

35. The following scheme presents the complicated nature of the recordings and the necessary adjustments:

Figure AD.7
Flows of goods returning to country of principal

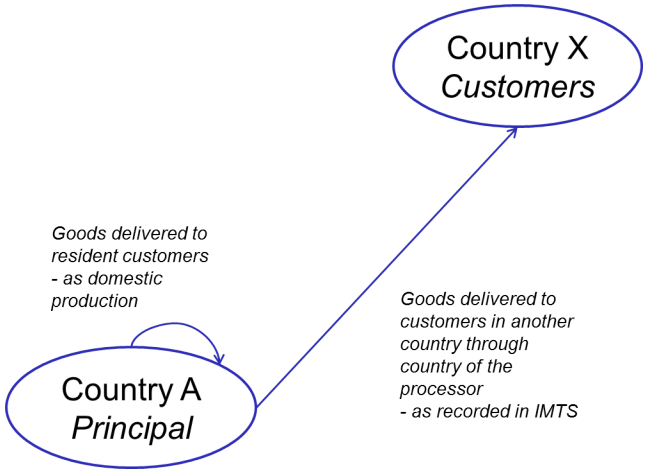
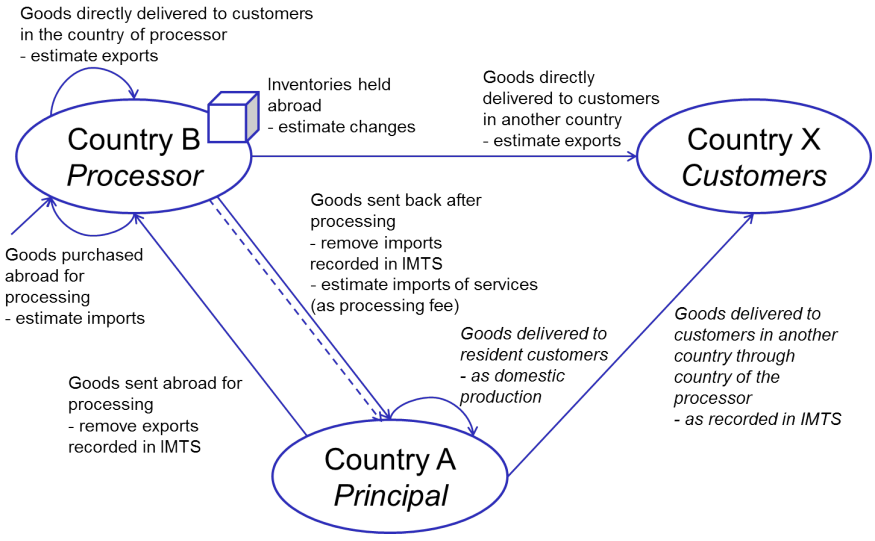


Figure AD.8
Summary of recordings and adjustment for outward processing



C. Inward processing

36. Inward processing occurs when a resident company (processor) is engaged in the physical transformation of goods that are owned by a foreign principal. After the processing phase, the goods may return to the country of principal, or be supplied to customers in other countries. The following sections give an overview of data items and corresponding adjustments needed in the context of inward processing.

1. Making adjustments in merchandise trade statistics

37. As the 2008 SNA and BPM6 require only the recording of a fee received for the delivery of processing services as export of services, the following adjustments in IMTS are needed:

a) Remove the merchandise trade imports of goods received from abroad for processing from the overall trade flows;

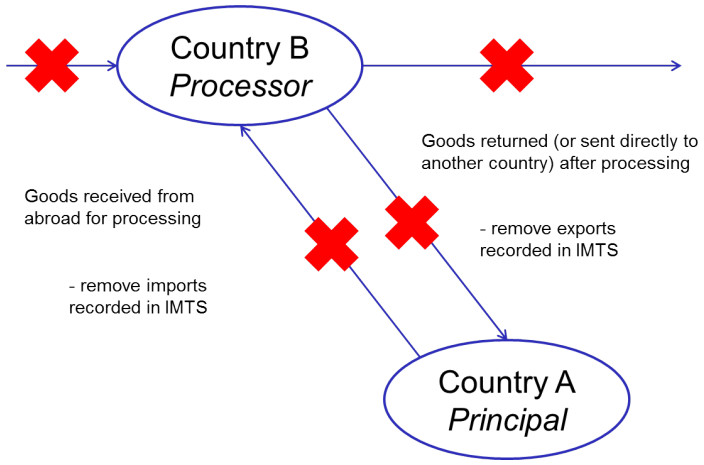
b) Remove from the overall trade flows the merchandise trade exports of goods returned (to domestic economy) or sent directly to another country after processing.

38. Also, here the nature of transaction codes is the best source to detect inward processing. If the codes are not available or are not of sufficient quality, an alternative is to add new variables to business surveys. That would mean asking the respondents about the value of goods received for processing and receipts of processing fees from foreign principals. That would, however, increase the response burden as that type of information may not be readily available. It must be also noted that processors may not have precise information on the value of raw materials and semi-processed goods sent to them for processing, as they are not the owners of those items.

39. Another alternative for making the necessary adjustments to data from merchandise trade statistics to estimate the gross flows is to calculate ratios of processing services to goods received for processing for a sample of similar firms in terms of ISIC and so on. Uncertainty about the amount of goods remaining in the country of the processor will create disturbances in the trade balance.

40. In case of using the above-mentioned estimation, carrying out a one-off survey could help to know the relationship between processing fees received and the value of

Figure AD.9
Adjustments to IMTS for inward processing



goods subject to inward processing. That would also help to obtain an understanding of the significance of those flows that stay after processing in the domestic economy of the processor.

2. Estimating exports for purchases of goods for processing by the principal in the country of processor

41. There is no obvious way to observe principal's purchases of goods in the country of processor which are intended for further processing in that country. Those exports will remain unobserved in IMTS as no cross-border flow of goods is recorded before processing. Since the goods are, however, purchased and owned by the principal in a country of processor before processing, exports of those goods to the country of principal need to be estimated.

42. In that case, surveying may not be very helpful. The domestic processor is not directly involved in the purchase of raw materials, and it would not be reasonable to query the processor about the country of origin of the materials it processes.

43. Estimation by subtracting the processing fees from the value of the export flow after processing (as recorded in IMTS) could be considered as an option. However, that would also be complicated as only part of the processed goods are purchased by the principal in the economy of processor.

3. Estimating exports of processing services

44. Instead of recording the value of physical flows of goods before and after processing, the 2008 SNA and BPM6 require recording of the fee received for the delivery of processing services as export of services. This fee is not recorded in IMTS and, therefore, other data sources are needed for estimating it.

45. The main data sources for estimating exports of processing services are business and international trade in services surveys statistics. For that purpose, they should include variables on production and export of processing services. That is usually easier to observe in the processor's accounts than the principal's intermediate consumption of processing services. Observing exports of processing services directly is recommended rather than measuring it as the difference in the value of the goods before and after processing. The same reasons are valid as in the case of outward processing.

Figure AD.10
Estimation of principal's purchases of goods in the country of the processor

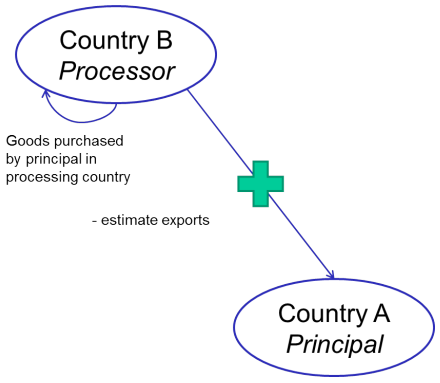
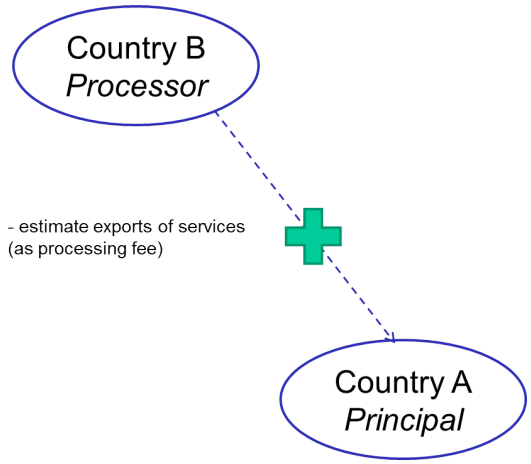


Figure AD.11
Estimation of exports of services (as processing fee)



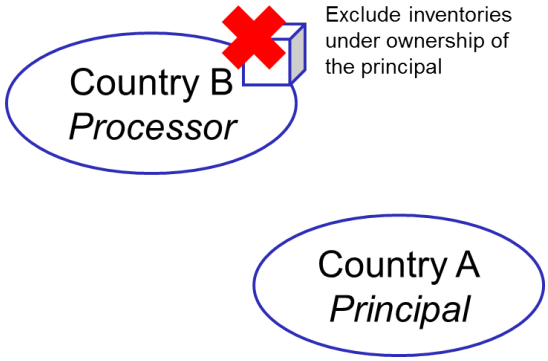
4. Excluding inventories under ownership of the principal

46. In the case of inward processing, inventories of raw materials and processed goods under the ownership of the principal usually exist. If their value, for some reason, is included in the books of the processor, it needs be excluded to be in line with the 2008 SNA and BPM6 recording.

47. The data on inventories are usually collected in the business survey and it should be clearly specified in the instructions of those surveys that the value of inventories under the ownership of the principal need be excluded.[121]

[121] Detailed guidance is provided in the Eurostat-OECD compilation guide on inventories, chapter 8.7, Inventories held under global production.

Figure AD.12
Exclusion of inventories under ownership of the principal



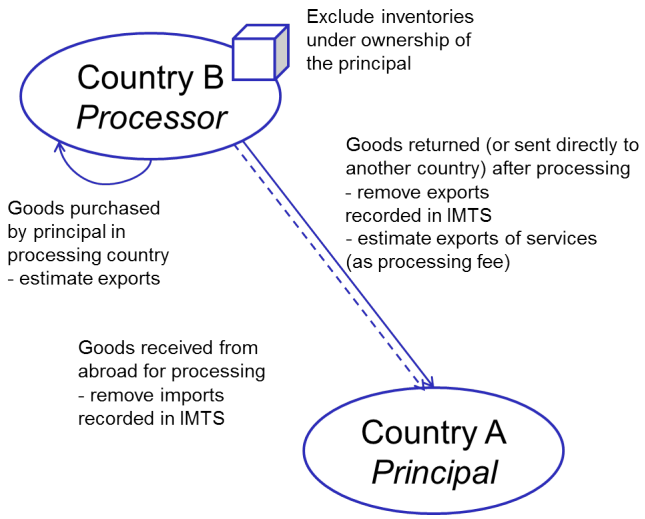
5. Summary of recordings

48. The following scheme presents again the complicated nature of the recordings and necessary adjustments:

D. Merchanting

49. Merchanting occurs when a trader purchases goods from a foreign supplier and sells them subsequently to customers abroad, the goods do not physically enter the domestic territory of the trader, and the trader does not carry out substantial transformation on the goods.

Figure AD.13
Summary of recordings and adjustment for inward processing



50. The 2008 SNA and BPM6 require a net export of goods under merchanting be shown in the accounts of the country in which the merchant is resident. Merchant's purchases of goods from a supplier abroad that are intended to be sold abroad should be recorded as negative exports. Further, the goods directly delivered to customers in the country of a supplier or, yet another country need be estimated as positive exports from the country of principal. Output remains, thus, equal to the trade service, which is also called the trade margin.

51. Merchanting related imports (or negative exports) and exports remain, however, unobserved in IMTS. The main data sources are again possibly business surveys, particularly on the wholesale industry. Achieving the required data most probably requires some adjustments in the survey questionnaires.

52. Data comparisons may also be very useful. That could include, for instance:

- Analysis of business data from different sources (particularly within the wholesale industry) that include international transactions.
- Comparison of detailed banking data on transactions in foreign currency (classified as exports of goods) with customs data on exports for individual enterprises.
- Comparison of data from business surveys with customs data.

53. The required data and adjustments for estimating the trade service of the merchant and the net exports under merchanting are discussed below.

E. Estimating of the trade service of the merchant

54. The main data sources for estimating the trade service of the merchant are business surveys and the survey for international trade in services statistics.

55. Turnover from business surveys on distributive trade and purchases of goods subject to distributive trade allow estimating trade margins as the difference between trade related purchases and sales. The following additional questions on the merchanting portion of trade-related activities would be useful:

- Goods purchased abroad, and sold: a) domestically / b) abroad
- Goods sold abroad, and purchased: a) domestically / b) abroad
- Changes in inventories as a result of timing differences between a) and b)

56. The survey for international trade in services statistics may already include information on some revenues from merchanting (as complementary information). That information (excluding holding gains and losses) would enable a more complete analysis of the international supply of services.

F. Estimating the net exports under merchanting

57. Merchanting-related flows remain unobserved in IMTS. As mentioned previously, adjusting (business or international trade in services) surveys is needed to observe merchanting transactions. The minimum requirement is to measure the trade margin from merchanting. The corresponding product values could be roughly derived by making assumptions. Further, the information on trade service alone provides a reasonable proxy of the contribution of merchanting to the trade balance.

G. Estimating (changes in) inventories held abroad

58. When the transactions straddle accounting period adjustments need to be made, including for price revaluations.[122]

59. The business surveys of wholesale traders will again be considered as the main data sources. In addition to observing purchases and sales of goods under merchanting, the question on inventories held abroad as part of merchanting should be included. That would provide a comprehensive view of merchanting and support making the distinction between trade services and revaluations of related inventories.

[122] Detailed guidance is provided in the Guide on the Impact of Globalization on National Accounts, chapter 6 and in the Eurostat-OECD compilation guide on inventories, chapter 8.7 Inventories held under global production.

H. Factoryless goods production

60. According to the current standards, factoryless goods producers are generally considered as a special case of merchants and are, thus, classified under trade in ISIC, Rev. 4. That is the case when the factoryless goods producer does not provide the production process with any material inputs and the contract processor is a non-affiliated entity. However, if some material inputs come from the factoryless goods producer, the arrangement is considered as goods sent for processing and the factoryless goods producer is classified under manufacturing industries.

61. Even so, a factoryless goods producer typically has a more active role in the manufacturing stages of production than does a merchant. It may own the underlying intellectual property product and control the production process or some of its stages.

Figure AD.14
Estimation of net exports under merchanting

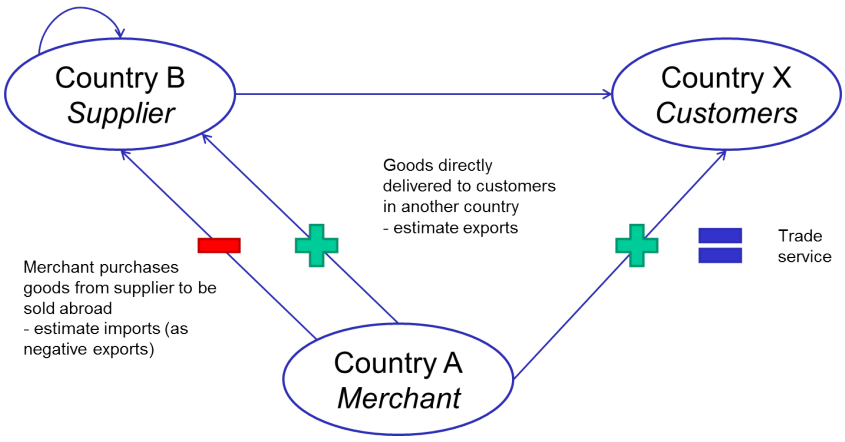
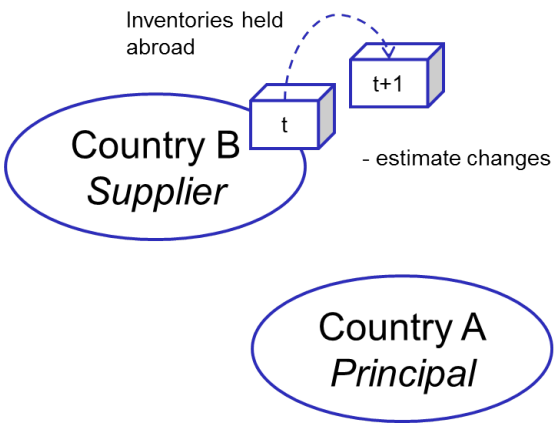


Figure AD.15
Estimation of changes in inventories held abroad



That type of factoryless goods producer would ideally be separately identified to allow further analysis of their characteristics in order to correctly classify them among manufacturing industries. It must be kept in mind, however, that often the same entity is involved in different kinds of production arrangements with its partners. The entity performing the factoryless goods production may also have some production of its own, or it may send some materials or goods to processors for further processing.

62. When factoryless goods producers are classified in trade, their recording will follow the merchanting arrangement discussed in the previous section of this annex and the contract process is considered a non-affiliated entity. The necessary accounting adjustments if factoryless goods producers are to be classified to manufacturing are presented in chapter 2 of the UNECE *Guide to Measuring Global Production*. In addition, chapter 5 of the *Guide* proposes the criteria that could be used to detect such companies.

I. Transactions in intellectual property products

63. Measurement of transactions in IPP can be particularly challenging for the statistical compiler. As outlined in the *Guide to Measuring Global Production*, in the national accounts and the balance of payments statistics, the recording of product transactions on the basis of economic ownership change is a fundamental principle. However, in the context of global production the identification of changes in the ownership of goods and assets can be quite a challenge to statistics compilers. That is particularly true for the globalized production activities of MNEs. The entangled webs of MNE ownership structures, often spanning continents, can be a real challenge for statistics compilers, as it may not always be easy to break down those activities straightforwardly on a country-by-country basis.

64. In particular, the intangible nature of an IPP provides significant scope for an MNE to locate the IPP original in an economy that maximizes the overall post-tax MNE profits. That is not necessarily the same economy as where the IPP original was produced. Nor is it necessarily the same economy where services or copies provided by the IPP are subsequently embodied in, or used to produce, other product.

65. R&D activities mainly take the form of research programmes carried out in universities or other public-sector institutions. R&D is also carried out in the corporate sector and through partnerships between public and private sector companies and

institutions. In addition to R&D, many MNEs fund research and development activities abroad on their behalf.

66. The 2008 SNA explicitly recognizes, for the first time, that expenditures on research and experimental development should be recorded as capital formation. The treatment of R&D activities and the related IPP created by those activities are recorded indistinguishably and capitalized in the national accounts, regardless of whether they relate to outright purchases of R&D IPP or expenditure on R&D activities.

67. Cross-border R&D is also capitalized in the national accounts; however, the activities abroad are treated as an import of services with the result that no overall addition to GDP results from that element of R&D activities. In the case of IPP, the assets being considered are already the outcome of R&D activities. The other cross-border service imports of R&D relate to the activity that might lead to the development abroad of IP assets.

68. Regardless of whether the IP assets were developed abroad by affiliates or purchased outright, they add to gross value-added and GDP once they begin to be used in production activities:

- in the domestic economy

  or

- through the use of contract manufacturing arrangements abroad

  or

- through the export of royalties to other non-resident affiliates

69. *The Guide to Measuring Global Production* provides a decision tree[123] to assist compilers in assigning economic ownership to IP, in particular cross-border IP transactions.

[123] *Guide to Measuring Global Production*, pp. 67 – 68.

J. Base erosion and profit shifting recommendations

70. The base erosion and profit shifting recommendations of OECD were aimed at ensuring greater compliance with the principle that income is taxed where it is earned and received significant support, particularly from OECD member countries.

71. Following on from the introduction of the base erosion and profit shifting recommendations and the associated legal changes, there has been a stream of imports related to cross-border purchases of IP from foreign affiliates by MNEs. However, those same developments will assist compilers in identifying transactions in those intangible assets because a feature of the base erosion and profit shifting recommendations is country-by-country reporting that involves an exchange of information between taxation authorities on those IP flows.

72. Expenditure GDP[124] is the ideal prism through which these corporate events involving IP can be viewed, where changes in investment and exports and imports of goods and services can be observed. However, Income GDP[125] is also very informative. The expenditure variables that were impacted by the outright purchases of IP are imports and capital formation that contribute to GDP. Looking at the impact of additional IP on the income side, particularly where cross-border IP is being considered, means that two separate but definitely linked sets of calculations around gross operating surplus and what is termed primary income in the balance of payments, need to be examined. Primary income is the main contributor to net factor incomes (NFI) from abroad, the key explanatory variable in the transition from GDP to GNI.

73. To calculate gross operating surplus, company depreciation charges are added back. Depreciation is then calculated based on the permanent inventory method and

[124] Personal and Government Consumption of goods and services, Capital formation and net exports C+I+G+(X-M) = GDP

[125] Operating surplus, mixed income, compensation of employees, depreciation plus taxes less subsidies on products and production. GOS+GMI+COE+T-S =GDP

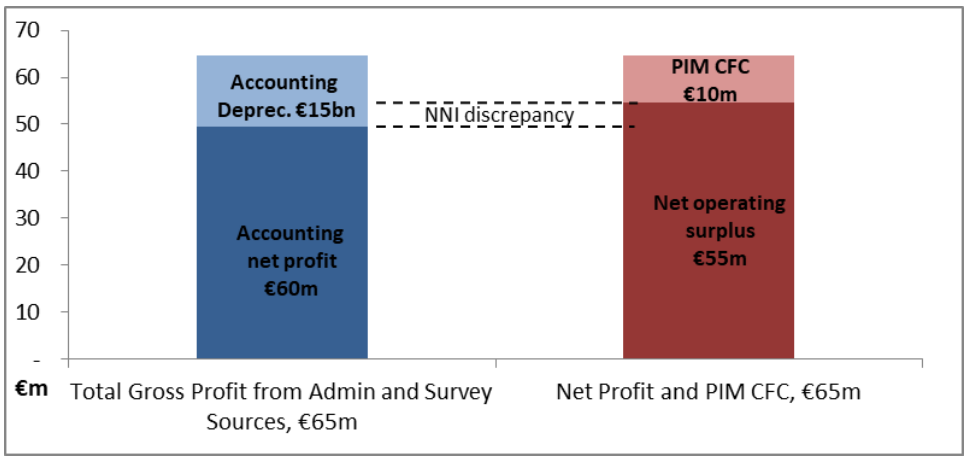
subtracted from the gross operating surplus calculation to give net operating surplus (fig. AD.16). Depreciation is calculated in the permanent inventory method model based on the economic lives of the assets. That differs from the accounting measure used in a company's statutory accounts. In the case of the IP assets related to R&D, the economic life tends to be longer than the accounting life, although assets lives can vary from company to company. The asset valuation at the outset is the same[126] in both approaches but the consequence of the difference in asset lives is that the depreciation from the permanent inventory method model can be smaller than the statutory accounting depreciation annual charge.

[126] Simplification: the asset valuation may be different at the outset. In addition, the annual revaluation, geometric Assumptions and so on of the asset will result in different asset valuations to which to apply the depreciation calculations.

74. When the calculation of primary income for balance of payments is made, the actual company depreciation is normally charged rather than the permanent inventory method based economic charge. The permanent inventory method model usually produces depreciation estimates at the level of economic activity sector (NACE) rather than company by company. Therefore, the depreciation charge for all the entities engaged in the same economic activity are grouped together rather than producing company-specific estimates within the permanent inventory method model.

75. Consequently, there are different depreciation estimates used in the operating surplus permanent inventory method model-based calculations used in GDP and, for balance of payments primary income calculations, which generally use the depreciation as reported by the company (see fig. 16 for an illustration of the differences). GOS is an addition to GDP of income earned in the domestic economy and the NFI attributes those same profits or income to the foreign direct investor in the transition from GDP to GNI because those earnings are not ultimately the income of national compiler but instead accrue to the country of the owner of the corporation. That is particularly relevant for MNEs that are generally wholly owned by a foreign direct investor. In those cases, primary income earned are incorporated into the net factor income from abroad when the transition from GDP to GNI is presented in the national accounts. Owing to the use of different estimates of depreciation at different stages in the accounting framework, there will be an over- or underestimate in GNI. If those differences are significant, some balancing adjustments will be necessary. In general, a coordinated approach to ensure that that does not occur requires a focus on asset lives, asset valuation and the method of calculating depreciation, that is, geometric or straight line.

Figure AD.16
Company accounting and national accounts operating surplus



76. If there are large depreciation charges arising from IP assets, there is clearly a need to actively manage the consistency and coherence of depreciation charges between national accounts and balance of payments.

77. Addressing the challenges of identification and recording IP transactions in R&D represents a major challenge for national compilers and, in line with the OECD's base erosion and profit shifting recommendations, some sharing of information will probably be necessary to ensure a symmetrical recording of those activities in a given economy's accounts. The decision tree already discussed provides an ideal tool to evaluate the economic residence of those assets for statistical compilers.

K. Summary

78. Having common guidance on the measurement challenges related to goods sent abroad for processing, merchanting and factoryless goods production is essential for the quality and comparability of statistics. Different national solutions may hamper international comparability of national accounts and balance of payments statistics. Furthermore, the activities of those firms may be on a large scale, so the related measurement decisions can have a significant impact on national statistics and if not recorded symmetrically add to the discrepancies in global trade. It is extremely important to discuss data issues and sources both nationally and internationally, and reconcile data between different economic statistics.

79. A major practical challenge, discussed earlier, is the adjustment of IMTS data to the required recording in the 2008 SNA and BPM6. The first step should be to analyse the additional information items that are available in IMTS but may not be fully utilized.

80. Arriving in accordance with the 2008 SNA and BPM6 requirements is also likely to require estimation especially if reliable nature of transaction codes is not available from customs data.

81. While the use of multiple data sources combined with estimation is essential for making the adjustments, proper data adjustments will also require some new variables to be collected by surveying. That tends to increase enterprises' response burden and, thus, has to be carefully planned. Additional information (such as on trade services connected to merchanting, processing fees, exports of goods directly following processing, inventories held abroad, etc.) could be, for instance, first collected only annually or even as a one-off survey. That would already give a better basis for estimations.

82. As some data sources are incomplete or unreliable, using the integrated business register for data matching and validating can be helpful. Another very useful further step would be to advance data exchange among NSOs. Exchange of microdata is, however, quite a challenge because of confidentiality issues and other legal constrains.

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World Input-Output Database. Available from www.wiod.org/home.

Glossary

Accumulation accounts

Accounts that record flows that affect the entries in the balance sheets at the start and end of the accounting period, and comprise the capital account, financial account and other change in the volume of assets account and the revaluation account.
Reference: 2008 SNA para. 1.20.

Affiliate

Entities in an immediate or indirect direct investment relationship with each other, or that have the same immediate or indirect direct investor. Affiliates of an enterprise consist of: a) its direct investor(s), both immediate and indirect; b) its direct investment enterprises, whether subsidiaries (including branches and other quasi-corporations), associates and subsidiaries of associates, both immediate and indirect; and c) fellow enterprises, that is, those enterprises that are under the control or influence of the same immediate or indirect investor, but neither fellow enterprise controls or influences the other fellow enterprise. Often the direct investor and fellow enterprises are all in different economies, but sometimes the direct investor is in the same economy as one of the fellow enterprises (in which case, it is not a direct investor in that fellow enterprise). That situation is more likely to arise in economies that do not use a local enterprise group as the statistical unit for direct investment purposes.
Reference: BPM6, para. 6.17 and box A6a.1.

Ancillary corporation

Ancillary corporations as described in the 1993 SNA are named as artificial subsidiaries in the 2008 SNA. Artificial subsidiaries are subsidiary corporations wholly owned by the parent corporation and created to provide services to the parent corporation, or other corporations in the same group, often in order to avoid taxes, to minimize liabilities in the event of bankruptcy, or to secure other technical advantages under the tax or corporation legislation in force in a particular country. An artificial subsidiary is not treated as an institutional unit unless it is resident in an economy different from that of its parent. Like other direct investment enterprises, an ancillary corporation in another economy to that of its owners is a separate entity from its owners, even though it is not, in practice, autonomous.
Reference: 2008 SNA, para A3.6 and BPM6, para. 4.19.

Asset

A store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another.
Reference: 2008 SNA para. 3.30.

Associate

A direct investment enterprise over which the direct investor is able to exercise a significant degree of influence, but not control. *See Control and Influence. Reference: BPM6, para. 6.15 b) and para. 6.12 a).*

Balance of payments

A statement that summarizes economic transactions between residents and nonresidents during a specific time period; that is, a statistical system through which economic transactions occurring during specific time periods between an economy and the rest of the world can be summarized in a systematic way. The IMF *Balance of Payments and International Investment Manual* provides conceptual guidelines for compiling balance of payments statistics according to international standards.
Reference: BPM6 Compilation Guide, IMF 2014 para 1.13 and OECD Benchmark Definition of Foreign Direct Investment: Fourth Edition.

Basic price

The amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer.
Reference: 2008 SNA, para 6.51.

Bilateral trade asymmetries

Bilateral trade asymmetries (both in goods and services) occur when the reported exports from country A to country B do not match the reported imports to country B from country A. The asymmetries can have multiple causes, including differences in the time of recording, differences in the classification of commodities, partner-country attribution, trade system, confidentiality and so on.
Reference: IMTS 2010 Compilers Manual, Rev. 1, para 9.12 and UNSD (https://unstats.un.org/unsd/tradekb/Knowledgebase/50657/Bilateral-asymmetries).

Branch

A local unit not constituting a separate legal unit in the country where it operates and being dependent on a foreign-controlled enterprise. Moreover, a branch is an unincorporated enterprise that belongs to a non-resident unit, known as the parent.
It is resident and treated as a quasi-corporation.
Reference: Guidelines on Statistical Business Registers, UNECE, para 4.143 and 2008 SNA para 26.30.

Business functions

The activities controlled by the lead firm; they can be divided into core functions and support functions and are undertaken by the lead, affiliate and non-affiliate firms in the GVCs. Business functions can be conceived as an aggregation of certain tasks/products and/or services carried out by the enterprise. They are equally applicable to goods-producing and services-producing enterprises. The concept is similar to the concept of occupations but is focused on business activities rather than the activities of individual workers (a specific business function will typically involve a range of job categories and tasks).
Reference: Using Business Functions to Measure International Trade and Economic Globalization, Nielsen and Sturgeon; and *Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 32, part IV, para. 21–22.*

Business lines

Business lines are characterized by a sequence of business processes that brings a product from its conception to its final consumers. Describing the various business lines is an integral part of the profiling the enterprise, and for which data is collected for each business lines separately. For instance, Philips N.V. is known for its consumer electronics, but it also produces medical devices as a second line of business; Unilever is known for producing food items, but also for non-food products such as toothpaste, shampoo, soap and detergents. However, enterprises can adopt different criteria in defining their business lines. They can use a production process, a technological or client portfolio or a geographical market segmentation, as relevant criteria, including a combination of them.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part III, para. 2 and 15.

Business model

A firm's decision regarding how activities such as task allocation, coordination and supervision are directed towards the achievement of organizational aims.
Reference: Pugh, D. S., ed. (1990). Organization Theory: Selected Readings. Harmondsworth: Penguin.

Captive financial institution

Captive financial institutions consist of institutional units providing financial services other than insurance, where most of either their assets or liabilities are not transacted on open financial markets.
Reference: BPM6, para. 4.82 and 2008 SNA, para 4.113.

Captive production

Production arrangement in which a captive contract processor is engaged by a single principal and is entirely dependent on this relationship to obtain work for its plant or plants. In such scenarios, control exerted by a principal on a captive contract processor can be practically the same as the control exerted by the MNE parent on its affiliate in a direct investment relationship, which means that the difference between an affiliate and a captive contract processor can be very unclear.
Reference: UNECE Guide to Measuring Global Production para. 1.36.

Contract processor The contract processor manages the transformation process by typically supplying material inputs and transforming the material inputs. It is a manufacturer that delivers prespecified goods to a factoryless goods producer at predetermined prices and cannot sell the goods to parties other than the factoryless goods producer; therefore, the key in this arrangement is that the transaction is conditional, which makes the contract processor captive.
Reference: UNECE Guide to Measuring Global Production para. 2.43 and 2.116 and 2.71.

Control and influence Control is determined to exist if the direct investor owns more than 50 per cent of the voting power in the direct investment enterprise. Such a direct investment enterprise is a subsidiary. A significant degree of influence is determined to exist if the direct investor owns from 10 to 50 percent of the voting power in the direct investment enterprise. Such a direct investment enterprise is an associate. The control or influence may be immediate (through ownership of voting power) or indirect (through ownership of enterprises that in turn have voting power).
Reference: BPM6, box A6a.1.

Core business functions The activities of an enterprise in the global value chain that yields income: the production of final goods or services intended for the market or for third parties. Usually, the core business functions make up the primary activity of the enterprise, but they may also include other (secondary) revenue-generating activities if the enterprise considers these as part of its core functions. The core business function represents the revenue-producing activity of the enterprise and in most cases, equals the main activity of the enterprise classified and registered within the business register. It includes production of goods or services intended for the market.
Reference: Eurostat Statistics Explained-Glossary: Business Functions (https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Business_functions) and Eurostat Reference Metadata in Euro SDMX Metadata Structure: International sourcing statistics - all activities.

Corporate inversion The corporate restructuring of a transnational enterprise group such that the original parent company in one economy becomes a subsidiary of the new parent in another economy. In addition, ownership of a group of enterprises may be shifted to the new parent company.
Reference: BPM6, para. 8.19.

Densification of a GVC Involves engaging more local actors (firms and workers) in the GVC network. In some cases, this could mean that performing lower value-added activities (or functions and tasks) on a larger scale can generate large value addition for the country.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, Part IV, para. 20.

Direct investment enterprise An entity subject to control or a significant degree of influence by a direct investor. A direct investment enterprise is either a subsidiary or an associate.
See Control and Influence.
Reference: BPM6, box A6a.1.

Direct investment relationship A relationship in which direct investment arises, when an investor resident in one economy makes an investment that gives control or a significant degree of influence on the management of an enterprise that is resident in another economy. It covers positions and transactions in equity and selected debt instruments between entities in a direct investment relationship. Direct investment relationships are classified according to the criteria of the Framework for Direct Investment, measuring corporate activity relationships, which covers both direct and indirect relationships along the chain of ownership.
See Control and Influence.
Reference: BPM6, box A6a.1 and 2008 SNA, para. 21.37.

Direct investor An entity or group of related entities that is able to exercise control or a significant degree of influence over another entity that is resident of a different economy.
See Control and Influence.
Reference: BPM6, box A6a.1.

Economic ownership

Economic ownership takes account of where the risks and rewards of ownership lie. Rewards of ownership usually include the right to use, rent out or otherwise generate income, or to sell the asset. The risks include the potential losses caused by damage, theft and holding losses; that management, transfer or maintenance costs are greater than anticipated and, in the case of financial assets, default of the counterparty. A change in ownership from an economic point of view means that all risks, rewards, and rights and responsibilities of ownership in practice are transferred. In general, a change in "legal ownership" also involves a change in economic ownership. In some cases, a change of "economic ownership" takes place even though the "legal ownership" remains unchanged (e.g., financial leases and transactions between an enterprise and its foreign branches). In other cases, there is no change in economic ownership, even though there is a change in legal ownership.
Reference: BPM6, para. 3.41 and para. 5.3 and 2008 SNA para A3.43.

Enterprise

An enterprise is the view of an institutional unit as a producer of goods and services. It corresponds to a legal unit (or the smallest set of legal units) that produces goods or services and that has autonomy with respect to financial and investment decision-making. An enterprise may be a corporation (or quasi-corporation), a non-profit institution or an unincorporated enterprise. An unincorporated enterprise is household or government unit in its capacity as a producer of goods or services.
Reference: System of National Accounts 2008 para. 5.1 and *Guidelines on Statistical Business Registers., UNECE, para. 1.56.*

Enterprise group

A set of enterprises controlled by the group head. The group head is a parent legal unit which is not controlled either directly or indirectly by any other legal unit. An enterprise group comprises the group head and subsidiaries. The subsidiary enterprises of a subsidiary enterprise are considered to be subsidiaries of the parent enterprise. An enterprise group is an association of enterprises bound together by legal and/or financial links. Enterprise groups may be either global or local. A global enterprise group refers to an investor and all the enterprises under that investor, whereas the local (or territory-specific) enterprise group refers to an investor and the legal entities under that investor that are resident in the reporting economy. The global enterprise group is also called an MNE.
Reference: BPM6 Chapter 6 and para. 4.55 and 2008 SNA, chap. 21.

Establishment

An enterprise, or part of an enterprise, that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value-added.
Reference: 2008 SNA para. 5.14.

Extended supply-use tables

Supply and use tables expanded with additional detail to account for firm heterogeneity. Such tables may include breakdowns for the following: distinguishing between exporting and non-exporting firms; industries broken down by other firm characteristics (e.g., size, ownership); more detailed breakdowns of value-added; and supplementary rows on "Beyond GDP" dimensions (e.g., property income flows; emissions; employment, jobs, wages and business functions; taxes on income; capital flow matrices; and additional final demand breakdowns (e.g., separately identified re-exports; non-resident expenditures by product; gross flows related to global production arrangements)).
*References: OECD Expert Group on Extended Supply-Use Tables, 2017 (*presentation by Nadim Ahmad*) and OECD TiVA website* www.oecd.org/sti/ind/measuring-trade-in-value-added.ht*m*.

Factoryless goods producer

A company that has outsourced all aspects of material transformation but owns the IPP concerned. A factoryless goods producer is a principal that controls the outcome of production of a good by undertaking the entrepreneurial steps and providing the technical specifications required to produce the good. The factoryless goods producer concentrates on innovation and marketing decisions. While the factoryless goods producer does not supply material inputs into the production process, the factoryless goods producer does supply substantial service inputs in the form of technology, know-how and product design. Likewise, the factoryless goods producer maintains control over the outcome of the production process by providing technical specifications that are essential for the transformation of the material inputs. The factoryless goods producer controls access and delivery of the final output to consumers.
Reference: UNECE Guide to Measuring Global Production para. 1.7 and 2.42.

Fellow enterprises Those enterprises that are under the control or influence of the same immediate or indirect investor, but neither fellow enterprise controls nor influences the other fellow enterprise. The "common parent" must be a direct investor in at least one of enterprises in question. *Reference: BPM6 para. 6.17 and OECD Benchmark Definition of Foreign Direct Investment: Fourth Edition*.

Financial assets Consists of all financial claims, shares or other equity in corporations plus gold bullion held by monetary authorities as a reserve asset. Gold bullion held by monetary authorities as a reserve asset is treated as a financial asset even though the holders have no claim over other designated units. Shares are treated as financial assets even though the financial claim their holders have on the corporation is not a fixed or predetermined monetary amount. Financial assets can be delineated from financial instruments in that: a) Examples of instruments not recognized as assets are one-off guarantees not yet activated and unrealized commitments such as lines of credit, loan commitments, and letters of credit; and b) When held as monetary gold, gold bullion is a financial asset that is not created by an instrument and that does not represent a claim on another entity. It is considered to be a financial asset because of its role as a means of international payments and store of value for use in reserve assets.
Reference: 2008 SNA, para. 3.36 and BPM6, para. 5.9.

Firm heterogeneity The concept that all firms within the same industry do not necessarily have the same production technology nor use the same proportion of imported materials. Exporters versus non-exporters, large firms versus small and medium-sized enterprises and foreign-owned versus domestic-owned firms are some dimensions of heterogeneity. For example, exporting firms differ along many dimensions from firms that only serve the domestic market. Firm heterogeneity matters for productivity to the extent that large firms can exploit increasing returns to scale, and thereby productivity typically increases with firm size.

Foreign affiliates *Reference: OECD Entrepreneurship at a Glance (2016) p. 62; and OECD Firm Heterogeneity and Trade in Value-added,* STD/CSSP/WPTGS(2015)23 *, (March 2015), pp. 3 and 9.*
Enterprises in a direct-investment relationship with each other are called affiliates or affiliated enterprises. A direct investment relationship arises when an investor resident in one economy makes an investment that gives control or a significant degree of influence on the management of an enterprise that is resident in another economy. In addition, all enterprises that are under the control or influence of the same direct investor are considered to be in a direct-investment relationship with each other.
Reference: BPM6 para. 6.9.

Foreign affiliates statistics Statistics describing the overall activity of foreign affiliates. Although 10 per cent ownership of the voting power is recommended as the lower threshold for foreign direct investment relationships, international guidelines (i.e., MSITS 2010, OECD Handbook on Economic Globalisation Indicators and OECD BD4) recommend that foreign affiliate statistics are compiled, as a first priority, for the foreign-controlled subset of foreign affiliates, (i.e., control of more than 50 per cent of the voting power at each stage of the chain of ownership). Foreign affiliates statistics contain two components: inward and outward foreign affiliates statistics. Inward statistics on foreign affiliates represent those statistics describing the activity of foreign affiliates resident in the compiling economy. Outward statistics on foreign affiliates represent statistics describing the activity of foreign affiliates abroad controlled by the compiling economy. foreign affiliates statistics cover both financial and non-financial industries. Variables collected within the foreign affiliates statistics framework are, for example, turnover, value-added, purchases of goods and services, R&D expenditure, personnel costs, number of employees, gross investment in tangible goods and international trade.
Reference: Manual of Statistics on Trade in Services, para. 4.6; UNECE Guide to Measuring Global Production para. 5.117; and Recommendations Manual on the Production of FATS, Eurostat, para I.2.1.

Foreign direct investment

Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy (BPM6 6.8). Foreign direct investment reflects the objective of establishing a lasting interest by a resident enterprise in one economy (direct investor) in an enterprise (direct investment enterprise) that is resident in an economy other than that of the direct investor. The lasting interest implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the enterprise. (BD 117).
See Control and Influence.
Reference: BPM6 para.6.8 and OECD Benchmark Definition of Foreign Direct Investment, fourth edition. para 117.

Global enterprise (group)

An enterprise group comprising at least two enterprises or legal units located in different countries. The global enterprise group is also referred to as an MNE.
Reference: Eurostat Statistics Explained
http://ec.europa.eu/eurostat/statistics-explained/index.php/EuroGroups_register)

Global group head

An entity that controls a global enterprise. The global group head is defined as the unit (legal or natural person) that controls all legal units of the group and is not controlled by any other legal unit. The parent legal unit, which is not controlled by any other unit and thus the head of the enterprise group, does not necessarily need to be subject to accounting obligations. This may be the case if the group head is a natural person or the government. Consequently, the unit at the highest consolidation level is not in every case identical with the group head.
Reference: Guidelines on Statistical Business Registers, UNECE, para. 4.39.

Global value chain (GVC)

Consists of the full range of activities that firms and workers do to bring a product (good or service) from its conception to its end use and beyond. That includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms in a local economy or among a group of countries.
Reference: Gereffi, Gary and Fernandez-Stark, Karina, Global Value Chain Analysis: A Primer, Second Edition, The Duke
Center on Globalization, Governance & Competitiveness, July 2016.

Goods for processing

Goods that are sent abroad or brought into a country under a specific arrangement between the involved parties (which may or may not include the change of ownership) and for specific operations as defined by the statistical authorities of the compiling country. Usually, those operations entail further transformation that is changing the characteristics of the goods. Goods for processing without change of ownership are a subset of this general category. Goods for processing may be brought into a country under special customs procedures, such as inward processing or processing of goods for home use (see annex B of the IMTS 2010 for definitions of those procedures), as well as be declared for home use. Goods resulting from processing might be returned to the sending country, sold in the country of processing or sent to a third country.
Reference: IMTS 2010, para. 1.19.

Granularity

The extent to which a system contains separate components, for example the fineness or coarseness with which data fields are subdivided in data collection, transmission, and storage systems. The more components in a system, the more flexible it is. In more general terms, the degree to which a volume of information is finely detailed. It represents the level of detail or grain of data. The lower the level of detail, the finer is the data granularity.
Reference: Guidelines for Smart Grit Cybersecurity Vol. 1, NISTR 7628 Rev. 1, National Institute of Standards and Technology, page 158; and Paulraj Ponniah. Data Warehousing Fundamentals (2001), page 28, 236-239 and 560.

Group head

See Global group head.

GVC governance

The set of interrelated activities, or business functions, across countries and coordinated by a lead firm, that brings a product from its conception to its final use and beyond. The governance structure of a GVC consist of the set of relationships that are in place between the firms involved in the GVC.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, Part II, para. 12.

GVC satellite account

Consists of a set of national and/or multi-country GVC-specific SUTs/IOTs and GVC-specific institutional sector accounts. Such an account is compiled from national SUTs with a common breakdown of industries and products involved in a GVC among the partner countries. In addition, to reflect the governance structure of the GVC, the accounts include a further breakdown on whether the lead, affiliated and non-affiliated enterprises in the GVC network are foreign or nationally controlled and/or a foreign or national associate. In a similar way, the list of products explicitly identified in the SUTs reflects the GVC-related products, which includes the final product of the GVC and the intermediate goods and services that are used for the production of the final product. Those satellite accounts do not change the underlying concepts of the core SNA but rather provide an expanded perspective on a particular sector, group of products or activity. The concepts and boundaries are consistent with the core SNA, but additional detail, classifications and presentational changes are used to better identify and articulate GVCs. It involves a rearrangement of the classifications or data (e.g., more detail or alternative aggregations) and possible addition of complementary information to the existing core accounts.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, Part I, para. 44 and Part II, para. 3.

GVC-specific institutional sector accounts

The sequence of national accounts (e.g., production, generation of income, etc.) with a breakdown of the sectors to reflect the governance structure of a GVC.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part I, para. 48.

GVC-specific Supply and Use Tables (GVC SUT) and multi-country GVC-SUT

Such tables explicitly show the supply and use of GVC-relevant products by GVC-specific industries and, in the case of multi-country GVC-specific SUTs, for the GVC-related main partner countries. Further, multi-country GVC-SUTs harmonize the GVC-SUT bilaterally among trading partners, which would allow them to zoom into a global or regional chain of supply and use of products by industries for the specific GVC.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 49.

GVC upgrading

Gaining competitiveness in higher value-added-intensity products, functions, and sectors via skills, capital, and process upgrading.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, Part IV, para. 20.

Head offices

Head offices (ISIC Rev. 4, Section M, class 7010) may oversee and manage the activities of (foreign) subsidiaries by undertaking the strategic or organizational planning and decision-making role of the company or enterprise; exercising operational control and managing the day-to-day operations of their related units.
Reference: ISIC Rev. 4, in section K, class 6420.

Holding company

A unit that holds the assets (owning controlling-levels of equity) of a group of subsidiary corporations and whose principal activity is owning the group. The holding company in this class does not provide any other service to the enterprises in which the equity is held, i.e., it does not administer or manage other units.
Reference: ISIC Rev. 4, Section K, class 6420.

Input-output tables

Input-output tables (IOTs) describe the sale and purchase relationships between producers and consumers within an economy. They can either show flows of final and intermediate goods and services defined according to industry outputs (industry x industry tables) or according to product outputs (product x product tables). IOTs cannot be compiled without passing through the supply and use stage (except under very restrictive assumptions). They are therefore analytical constructs that inevitably involve some degree of modelling in their compilation.
Reference: 2008 SNA para. 28.2 and OECD www.oecd.org/sti/ind/2673344.pdf.

Institutional unit

The main attributes of an institutional unit are that: a) it is entitled to own goods or assets in its own right (it is, therefore, able to exchange the ownership of goods or assets in transactions with other institutional units); b) it is able to take economic decisions and engage in economic activities for which it is itself held to be directly responsible and accountable at law; c) it is able to incur liabilities on its own behalf, to take on other obligations or future commitments, and to enter into contracts; and d) either a complete set of accounts, including a balance sheet, exists for the unit, or it would be possible and meaningful, from both an economic and legal viewpoint, to compile a complete set of accounts if they were to be required.
Reference: 2008 SNA, Chapter 4, para. 4.2, Institutional Units and Sectors.

Intellectual property products (IPP)

Products that are the result of research, development, investigation or innovation leading to knowledge that the developers can market or use to their own benefit in production because use of the knowledge is restricted by means of legal or other protection.
Reference: 2008 SNA para. 10.98.

Intermediate goods and services

Goods and services that are used for the production of a final product.
Reference: GVC Guidelines, part I, para. 47.

International investment position (IIP)

A statistical statement that shows at a point in time the value of financial assets of residents of an economy that are claims on nonresidents or are gold bullion held as reserve assets and the liabilities of residents of an economy to nonresidents.
Reference: BPM6, para. 2.8

Intra-group transactions

The transactions between the various units active in the MNE.
Reference: UNECE Guide to Measuring Global Production para. 3.22

KLEMS (capital, labour, energy, material and services)

A multi-factor productivity measure that relates gross output to primary (capital and labour) and intermediate inputs (energy, other intermediate goods, services).
Reference: Measurement of Aggregate and Industry-Level Productivity Growth, OECD Manual, p. 12.

Large cases unit (LCU)

A unit within an NSO where profiling (or the process of delineating of the statistical units within an enterprise group) is carried out for large multinational enterprises. A large case unit is established nationally to ensure the consistency of the economic data in relation to a small number of very large MNE groups. These large case units are typically located in the business statistics directorate and/or in national accounts directorate.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 3 and box 2.
See *Profiling*.

Lead firm

The firm that has the ultimate decision-making authority regarding the operation of the supply chain. It can be a domestically owned or a foreign-owned company. Often it is the globally consolidated parent enterprise in an ownership chain. The lead firm, the principal, normally exerts some amount of control and contributes market knowledge, intellectual property, system integration and cost management skills. The lead firm's brand name usually reflects its reputation for quality, innovation and customer service.
Reference: UNECE Guide to Measuring Global Production para. 1.26 and Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 13 and UNECE Guide to Measuring Global Production para. 1.26.

Licensing firm

Firm where the IPP assets have been lodged, whose main purpose is to concentrate the receipts from intellectual property (e.g., IPPs, trademarks), usually on behalf of an MNE, and they are generally created to benefit from tax advantages by transferring legal ownership of intellectual property (and their returns) to a low tax country.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 28 and UNECE Guide to Measuring Global Production, para. 3.56.

Manufacturing services on physical inputs owned by others

Activities including processing, assembly, labeling, and packing, and so on that are undertaken by enterprises that do not own the goods concerned.
Reference: BPM6, para. 10.62.

Merchanting The purchase of a good by a resident (of the compiling economy) from a non-resident and the subsequent resale of the good to another nonresident, without the good entering the merchant's economy.
Reference: 2008 SNA para A3.158.

Multinational enterprise (MNE) An MNE can consist of many units producing an array of products across several countries and the accompanying accounting relationships can be complex. An MNE is also referred to as a global enterprise group.
Reference: UNECE Guide to Measuring Global Production para. 2.114.

Multinational enterprise (MNE) group An enterprise group that crosses national boundaries.
Reference: 2008 SNA chapter 21 and Guidelines on Statistical Business Registers, UNECE, para. 4.10.

Multi-territory enterprise An enterprise operating as a seamless operation over more than one economic territory typically for cross-border activities, such as airlines, shipping lines, hydroelectric projects in border rivers, pipelines, bridges, tunnels and submarine cables. Such an enterprise, even though it has substantial activity in more than one economic territory, cannot be separated into a parent and branch(es) because it is run as a seamless operation and cannot supply separate accounts for each territory.
Reference: BPM6, para. 4.41 and 2008 SNA, A3.8.

Non-financial assets Nonfinancial assets do not have a corresponding liability. Two different categories of non-financial assets are distinguished from each other: produced assets and non-produced assets: a) Produced assets are non-financial assets that have come into existence as outputs from production processes that fall within the production boundary of SNA. b) Non-produced assets are non-financial assets that have come into existence in ways other than through processes of production. Transactions in non-produced non-financial assets are recorded at the time economic ownership of these assets changes.
Reference: 2008 SNA para. 10.9 and BPM6 para. 3.53, para. 5.8.

Original equipment manufacturer A manufacturer selling its goods to a company reselling them using own labels.
Reference: United Nations Directories for Electronic Data Interchange for Administration, Commerce and Transport Available from www.unece.org/trade/untdid/d00a/tred/tred4043.htm.

Other investment (less other intercompany financing (OIF)) Other investment less OIF is a residual category that includes positions and transactions other than those included in direct investment, other intercompany financing, portfolio investment, financial derivatives and employee stock options, and reserve assets. To the extent that the following classes of financial assets and liabilities are not included under direct investment other intercompany financing or reserve assets, other investment includes: a) other equity; b) currency and deposits; c) loans (including use of IMF credit and loans from the IMF); d) nonlife insurance technical reserves, life insurance and annuities entitlements, pension entitlements, and provisions for calls under standardized guarantees; e) trade credit and advances; f) other accounts receivable/payable; and g) SDR allocations (SDR holdings are included in reserve assets).
Reference: BPM6, para. 6.61.

Partner country attributionPass-through funds (or "funds in transit") It is recommended that imports be attributed to the country of origin and exports to the country of last known destination (see IMTS 2010, para. 6.25). This partner-country attribution can explain many differences between the statistics of trading partners in cases when goods move from the country of origin to the country of destination through third countries. Types of partner country attributions: For imports: country of purchase, country of consignment, country of shipment, country of origin, and for exports: country of sale, country of consignment, country of shipment, country of last known destination and country of consumption.
Reference: IMTS 2010 Compilers Manual, Revision 1. Para. 9.C.8 and IMTS Concepts and Definitions 2010. Chapter 6, Section B.
Funds that pass through an enterprise resident in an economy to an affiliate in another economy, so that the funds do not stay in the economy of that enterprise. Those funds are often associated with direct investment. Such flows have little impact on the economy they pass through. Special purpose entities, holding companies, and financial institutions that serve other non-financial affiliates are particularly associated with funds in transit, but other enterprises may also have pass-through funds in direct investment flows.
Reference: BPM6 para 6.33.

Portfolio Investment (less OIF) Cross-border transactions and positions involving debt or equity securities, other than those included in direct investment, other intercompany financing or reserve assets.
Reference: BPM6, para. 6.54.

Production chain Linkages within or among groups of enterprises for producing specific goods or services. It represents how lead enterprises arrange their particular network of suppliers to produce a given good or service. A production chain becomes global when the linkages fragment across countries.
Reference: UNECE Guide to Measuring Global Production, para. 1.24.

Profiling The practice of using company accounts, often accompanied by interviews with senior enterprise officials, to build and define the structure of enterprises, mainly those involved in large complex enterprise groups. The resulting profiles are used to produce a reporting structure appropriate for the surveys conducted by the NSO. Profiling usually involves establishing contact with the enterprise being profiled to develop a good understanding of its structure. It is possible, however, to complete smaller profiles simply using published accounts.
Reference: UNECE Guidelines on Statistical Business Registers.

Purchaser's price The amount payable by the purchaser, excluding any deducible VAT or similar deducible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.
Reference: 2008 SNA, para. 3.147.

Quasi-transit trade Trade that occurs when goods enter an economy and are declared as imports for customs purposes at values that differ from those that are declared when the goods leave the same economy, without the transit economy having acquired ownership of the good. That phenomenon is most relevant in customs unions. According to the *Balance of Payment and International Investment Position Manual, sixth edition (BPM6),* those goods should not be recorded as imports in the balance of payments goods account.
Reference: UNECE Guide to Measuring Global Production para. 1.14, 9.1-9.2.

Re-exports Exports of foreign goods that were previously recorded as imports. Do not confuse with a) goods temporarily admitted without being previously recorded as imports or b) the export of foreign goods that have acquired domestic origin through processing and which, therefore, should be recorded as exports of domestic goods.
Reference: IMTS, 2010, para. 2.18.

Reserves (reserve assets) Those external assets that are readily available to and controlled by monetary authorities for meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes (such as maintaining confidence in the currency and the economy and serving as a basis for foreign borrowing).
Reference: BPM6, para. 6.64.

Residence (or resident and non-resident firm) The economic territory with which each institutional unit has the strongest connection, expressed as its centre of predominant economic interest. An institutional unit is resident in an economic territory when there exists, within the economic territory, some location, dwelling, place of production or other premises on which or from which the unit engages and intends to continue engaging, either indefinitely or over a finite but long period of time, in economic activities and transactions on a significant scale.
Reference: 2008 SNA, chap. 4, paras. 4.10 and 4.14.

Resident artificial subsidiaries A company set up to avoid taxes, to minimize liabilities in the event of bankruptcy, or to secure other technical advantages under the tax or corporation legislation in force in a particular economy.
Reference: BPM6, para. 4.18.

Reverse investment Investment that arises when a direct investment enterprise owns some, but less than 10 percent of the voting power in, or has lent funds to, its immediate or indirect direct investor.
Reference: BPM6, box A6a.1.

Satellite accounts Provide a framework linked to the central accounts and that enable attention to be focused on a certain field or aspect of economic and social life. One type of satellite account involves a rearrangement of the classifications or data (e.g., more detail or alternative aggregations) and possible addition of complementary information to the existing core accounts. Those satellite accounts do not change the underlying concepts of the core SNA but provide an expanded perspective on a particular sector, group of products or activity. The second type of satellite account seeks to change the underlying concepts of the core SNA. That would involve, for example, changing the concept of production (e.g., including volunteer activities or household work as production), consumption or capital formation.
Reference: 2008 SNA, Chapter 29, Satellite Accounts and Other Extensions and Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part I, para. 44.

Smile curve of GVCs Reflects the higher share of value-added generated by upstream and downstream business functions as compared with the core production functions of GVCs.
Reference: Global Value Chain Analysis: A Primer 2nd Edition (Gereffi and Fernandez-Stark, 2016).

Special purpose entities There is no common definition of a special purpose entity but some of the following characteristics may apply. Such units often have no employees and no non-financial assets. They may have little physical presence beyond a "brass plate" confirming their place of registration. They are always related to another corporation, often as a subsidiary, and special purpose entities, in particular, are often resident in a territory other than the territory of residence of the related corporations. In the absence of any physical dimension to an enterprise, its residence is determined according to the economic territory under whose laws the enterprise is incorporated or registered.
Reference: 2008 SNA, paras. 4.55-4.56.

Specialized intermediate goods Intermediate goods that are made specifically for the production of the final product in a particular GVC.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics.

Subsidiary A direct-investment enterprise over which the direct investor is able to exercise control. Corporation B is said to be a subsidiary of corporation A when: a) Either corporation A controls more than half of the shareholders' voting power in corporation B; or b) corporation A is a shareholder in corporation B with the right to appoint or remove a majority of the directors of corporation B.
See control and influence.
Reference: BPM6, para. 6.15 a) and 2008 SNA 4.73.

Suppliers (end-tier, second tier and first tier) Multiple levels of suppliers may be needed by the lead firm for producing its specific goods or services. The lead firm works directly with the first-tier supplier. The first-tier supplier generally provides design and innovation capabilities. The second-tier supplier is an entity that supplies directly to the first-tier supplier without supplying directly to the lead firm. Raw materials are generally supplied by the end-tier supplier. That grouping can also include original equipment manufacturers.
Reference: UNECE Guide to Measuring Global Production para. 1.27.

Supply and use tables Matrices that record how supplies of different kinds of goods and services originate from domestic industries and imports and how those supplies are allocated between various intermediate or final uses, including exports. The supply and use tables provide the main macroeconomic aggregates such as GDP, components of value-added and output by industry, import, final consumption, gross capital formation and export. Supply and use tables are a powerful tool with which to compare and contrast data from various sources and improve the coherence of the economic information system. They permit an analysis of markets and industries and allow productivity to be studied at that level of disaggregation. When, as is usually the case, supply and use tables are built from establishment data, they provide a link to detailed economic statistics outside the scope of SNA.
Reference: 2008 SNA para. 14.3, and OECD Glossary and Eurostat http://ec.europa.eu/eurostat/statistics-explained/index.php/Supply_and_use_tables_-_input-output_analysis.

Support business functions

Support business functions are ancillary (supporting) activities carried out by the enterprise in order to permit or to facilitate the core business functions, its production activity. The outputs (results) of support business functions are not themselves intended directly for the market or for third parties. Support business functions can be further subdivided into: distribution and logistics; marketing, sales and after-sales services; ICT services; administrative and management functions; engineering and related technical services; and R&D.
Reference: Eurostat Statistics Explained – Glossary: Business Functions (https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Business_functions).

Trade credits and advances

Trade credits and advances consist of a) credit extended directly by the suppliers of goods and services to their customers and b) advances for work that is in progress (or is yet to be undertaken) and prepayment by customers for goods and services not yet provided.
Reference: BPM6, para. 5.70.

Trade in income

Bilateral trade in primary income (from whom to whom) statistics broken down by type of income (in particular reinvested earnings and interest).
Reference: UNECE Guide to Measuring Global Production para. 7.61.

Trade in jobs

Estimates of employment measures (employment, employers, actual hours worked) consistent with international trade flows with the underlying value-added estimates produced by national statistics offices in their supply-use tables.
Reference: *UNECE www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.20/2013/Working_Paper_9.pdf.*

Trade in value-added (TiVA)

Trade in value-added (TiVA) measures purport to show how (in which industries) and where (in which territories) value is generated in the production of a good or service for final use. Supply, use and input-output tables from different countries that are harmonized with one another and linked with balanced bilateral trade data can be used to estimate trade in value-added terms, or the share of domestic value-added both in exported and imported goods and services. Examples of such tables include the joint OECD-WTO Trade in Value-Added (TiVA) initiative, Eurostat's FIGARO tables and the World Input-Output Database. The joint OECD – WTO Trade in Value-Added (TiVA) initiative addresses this issue by considering the value-added by each country in the production of goods and services that are consumed worldwide. TiVA indicators are designed to better inform policymakers by providing new insights into the commercial relations between nations.
Reference: Compendium chap. 3; OECD (www.oecd.org/sti/ind/measuring-trade-in-value-added.htm); and OECD-WTO concept note (2012): www.oecd.org/sti/ind/49894138.pdf.

Trade margin

The difference between the actual or imputed price realized on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of.
Reference: and 2008 SNA para. 6.146.

Transfer pricing

The transaction value for a good or service between related enterprises may not always reflect market values. Transfer pricing refers to the distortion between transaction values and market values. It can be motivated by income distribution or equity injections or withdrawals. Where the distortion is significant and data is available to do so, it is recommended that adjustments be made to remove the impact of transfer pricing.
Reference: OECD Benchmark Definition of Foreign Direct Investment: Fourth Edition, para. 307.

Transit trade (goods in transit)

Goods are considered as simply being transported through a country if they a) enter and leave the compiling country solely for the purpose of being transported to another country, b) are not subject to halts not inherent to the transportation and c) can be identified when both entering and leaving the country. This definition includes goods under "in transit" or "in transshipment" customs procedures but are not limited to them.
Reference: IMTS, 2010, para. 1.41 and 1.42.

Two-way trader A firm that exports and imports.
Reference: UNECE Draft Guidelines on the use of statistical business registers for business demography and entrepreneurship statistics, ch. 4. (www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.42/2017/Chapter_4_linking_SBR_with_other_sources_-_2017.09.21.pdf).

Ultimate investing country A geographical allocation determining the location of the ultimate source of control of the stocks of inward foreign direct investment for a reporting economy.
Reference: OECD Benchmark Definition of Foreign Direct Investment: Fourth Edition, Annex 13 page 243.

Ultimate investor (or ultimate controlling parent) The enterprise that has the ultimate control over the enterprises that are in a direct investment relationship.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part II, para. 15.

Unbundling of production The parts and components that now make up a final product, being either a good or service, are produced in different countries.
Reference: Accounting for Global Value Chains: GVC Satellite Accounts and Integrated Business Statistics, part I, para. 1.

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