

Efforts to Measure Trade in Value-Added and Map Global Value Chains: A Guide

Andrew Reamer

George Washington Institute of Public Policy
George Washington University

Industry Studies Association Annual Conference
Portland, Oregon
May 29, 2014

Efforts to Measure TiVA and Map GVCs

- **Emergence of GVC research & analysis (2000-present)**
- Efforts to measure TiVA (2009-present)
 - Calls to action
 - Building measurement and analytic capacity
 - Macro: International Input-Output Modeling
 - Micro: Enterprise Characteristics
 - Developing international frameworks
- Implications for ISA members

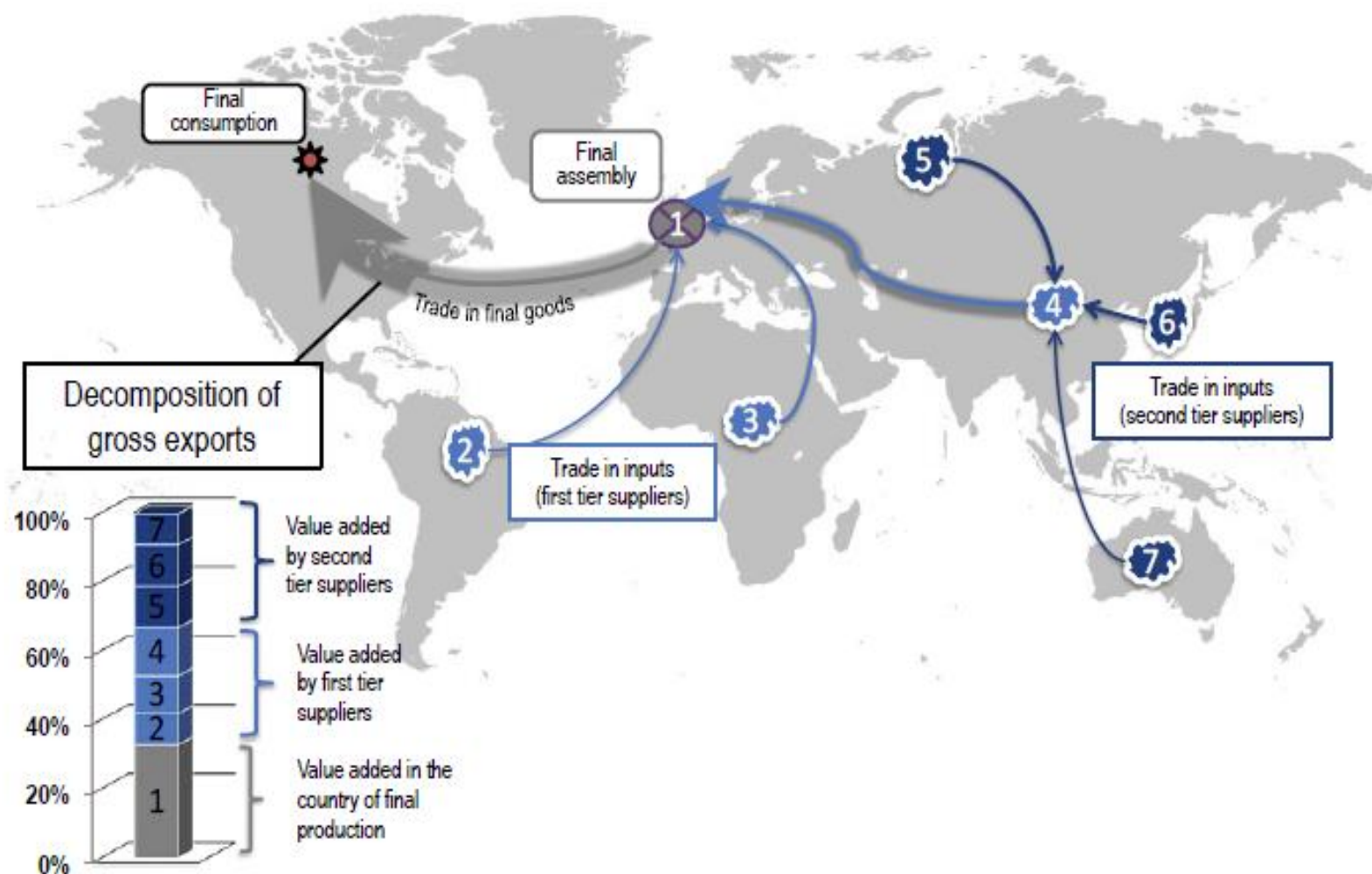
GVC Research & Analysis

- Analysis of GVC development, dynamics, typologies (2000-present)
 - Duke GVC Initiative
 - MIT Industrial Performance Center
- Global events, comprehensive reports (2010-present)
 - Multinational—OECD, World Bank, WTO, UNCTAD
 - National—USITC
 - Global nonprofits—World Economic Forum, Fung Global Institute

Embodied GVC—Trade in Tasks



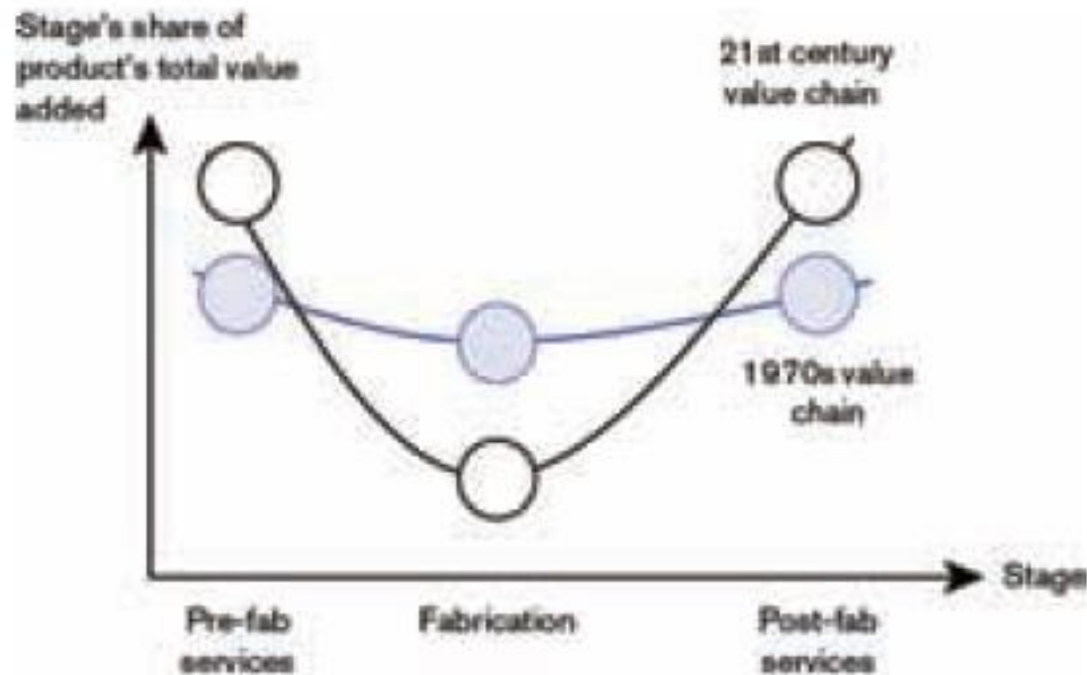
Figure 2.2. A simple global value chain



Source: OECD (2012). Map source: © ARTICQUE – all rights reserved.

Value-added by GVC Stage

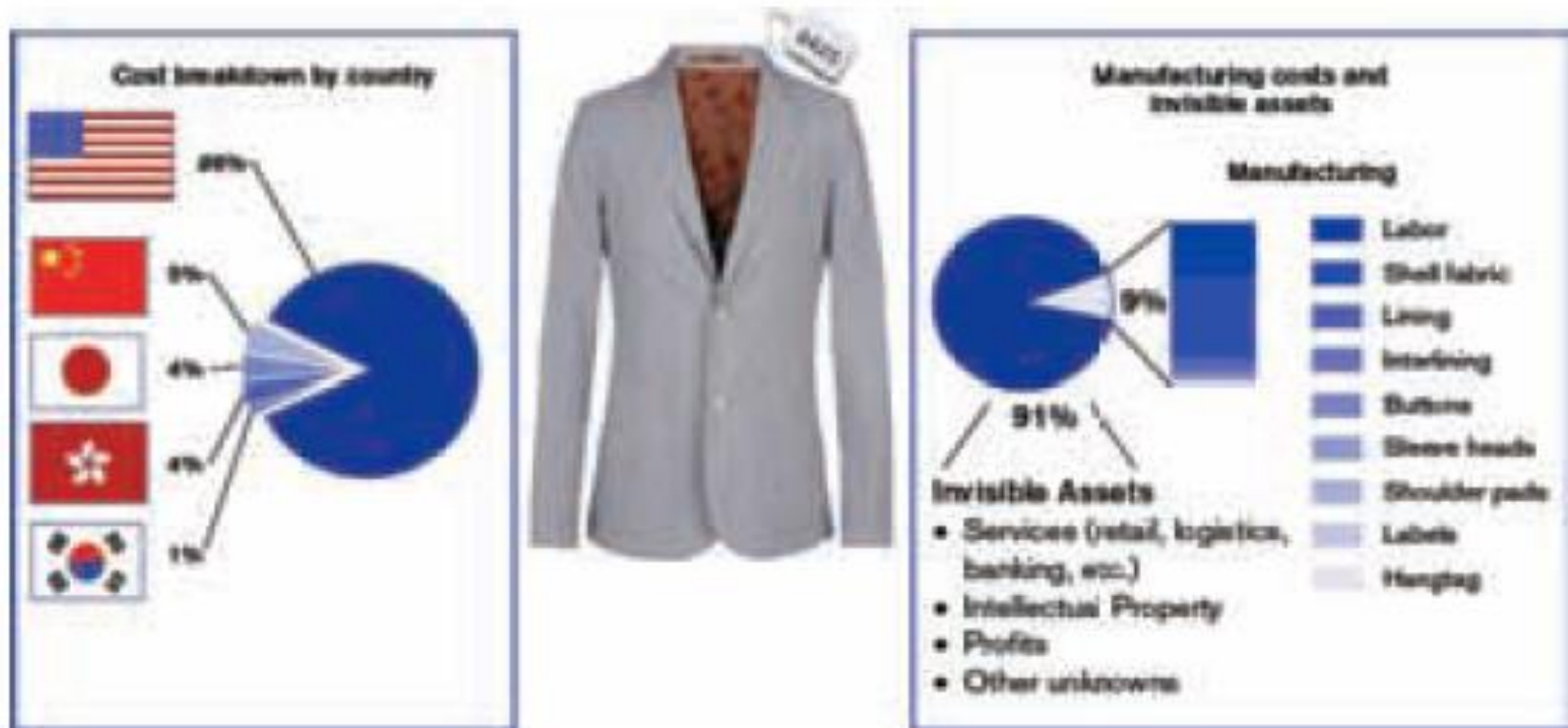
FIGURE 1.16: The smile curve: good and bad stages in the value chain



Source: Richard Baldwin

Value-added by GVC Stage

FIGURE 2.2: A suit made in China and sold in the United States



Source: Fung Global Institute Li & Fung case study.

Table IV.3. Types of GVC governance **Lead-firm perspective**

| Governance types | Key characteristics of TNC-supplier relationship | Typical examples | Explicit TNC coordination |
|------------------|---|--|---------------------------|
| FDI (ownership) | <ul style="list-style-type: none"> • Complex transactions • Information on product or process specifications proprietary, or not easy to codify and transmit • Lead firm may require full managerial control for risk management | <ul style="list-style-type: none"> • Products with high intellectual property content, high quality risks, high brand value | High |
| NEMs: | | | |
| - Captive | <ul style="list-style-type: none"> • Relatively simple transactions • Lead firm tends to have significant buying power • Lead firm exercises significant control over production | <ul style="list-style-type: none"> • Tiered supplier structures in the automotive industry | Medium-high |
| - Relational | <ul style="list-style-type: none"> • Complex transactions • Information on product or process specifications not easy to codify and transmit • Working in partnership | <ul style="list-style-type: none"> • Relationships between suppliers and buyers of retailers or major apparel brands | Medium |
| - Modular | <ul style="list-style-type: none"> • Complex transactions • Information on product specifications easily transmitted • Lead firm prefers coordination partner/supplier management firm | <ul style="list-style-type: none"> • Turnkey supplier relationships in electronics industries | Medium-low |
| Trade (market) | <ul style="list-style-type: none"> • Relatively simple transactions • Information on product specifications easily transmitted • Price as central governance mechanism | <ul style="list-style-type: none"> • Commodities and commoditized products | Low |

Source: UNCTAD, based on Gereffi, G., J. Humphrey and T. J. Sturgeon (2005) "The governance of global value chains", *Review of International Political Economy*, 12:78-104.

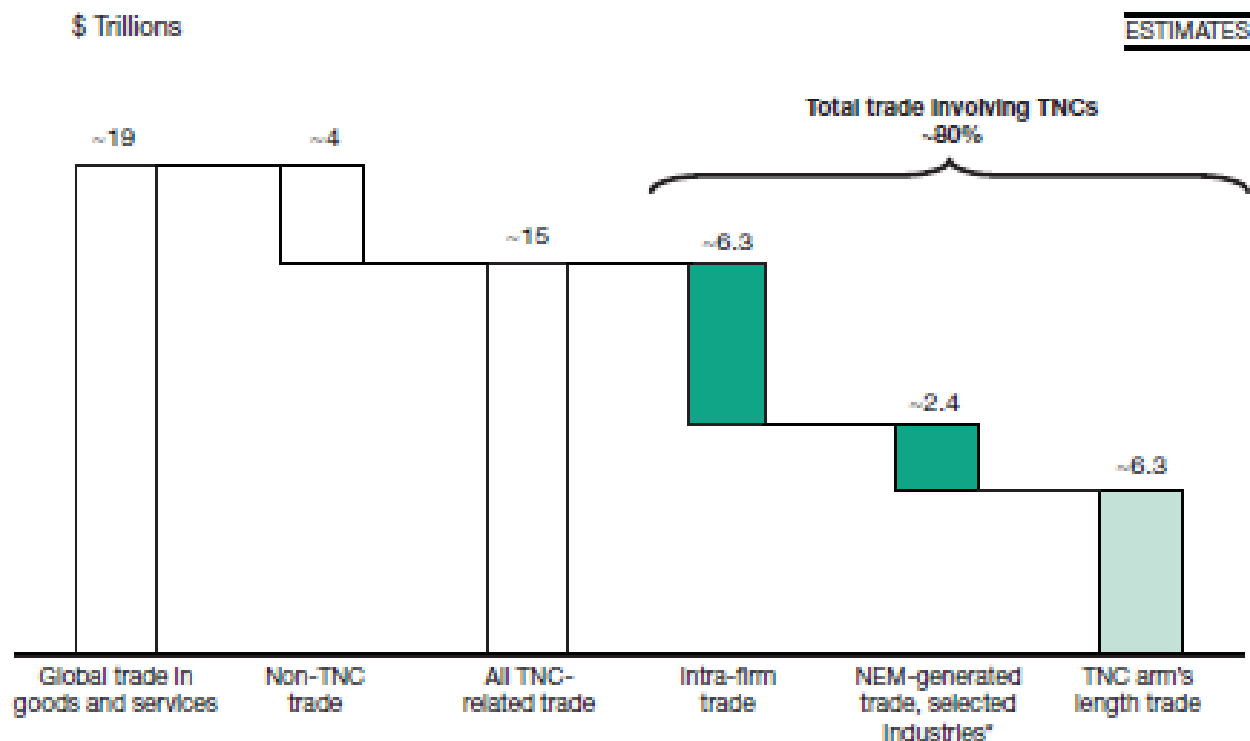
Table IV.4. Types of GVC governance: supplier perspective

| Governance types | Key implications for suppliers | Key GVC development implications |
|------------------|---|---|
| FDI (ownership) | <ul style="list-style-type: none"> Supplier is fully vertically integrated and under full managerial control | <ul style="list-style-type: none"> Fastest and often only approach to gaining ownership advantages required for GVC access Business linkages required to widen the scope of technology and knowledge transfer |
| NEMs: | | |
| - Captive | <ul style="list-style-type: none"> Relatively small suppliers; high degree of power asymmetry High degree of monitoring and control by lead firm Knowledge sharing focuses on efficiency gains | <ul style="list-style-type: none"> Can generate relatively high degree of dependency on few TNCs that may have low switching costs Knowledge transfer takes place (due to mutual benefits) but limited in scope |
| - Relational | <ul style="list-style-type: none"> Degree of mutual dependence between partners Frequent interactions and knowledge exchange between partners Supplier more likely to produce differentiated products | <ul style="list-style-type: none"> Degree of knowledge transfer and learning relatively high More stable demand due to higher switching costs for lead firms |
| - Modular | <ul style="list-style-type: none"> Lower degree of dependence on lead-firms; suppliers tend to operate in more than one GVC Limited transaction-specific investments (e.g. generic machinery that can be used for more than one client) | <ul style="list-style-type: none"> Substantial scope for linkages Relatively high volume of information flowing across firm linkages |
| Trade (market) | <ul style="list-style-type: none"> No formal cooperation between partners Low switching costs for customers | <ul style="list-style-type: none"> Full exposure to market forces Learning options limited to trade channels |

Source: UNCTAD, based on Gereffi, Humphrey and Sturgeon, 2005 (ibid.).

Dominant Role of Transnational Corporations in Global Trade

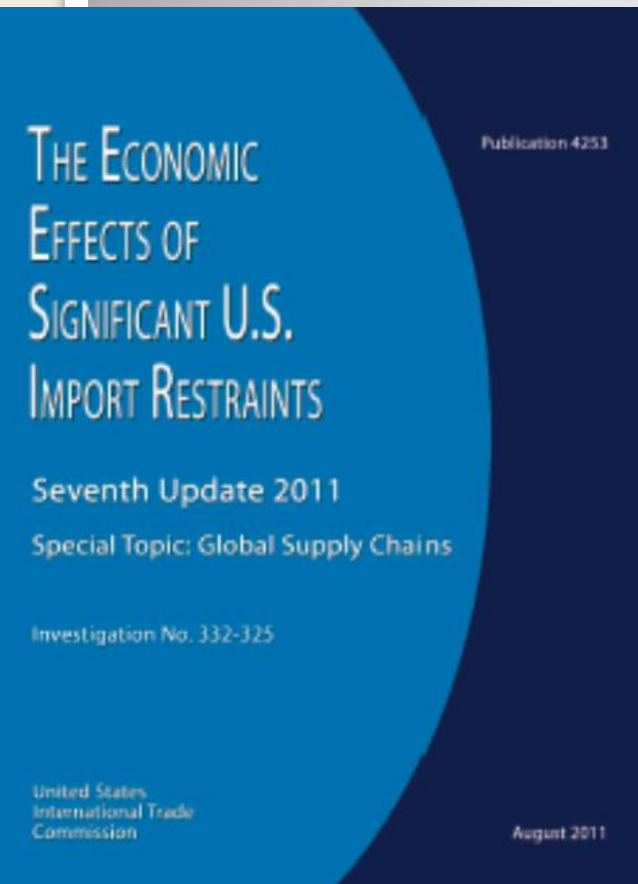
Figure IV.14. Global gross trade (exports of goods and services), by type of TNC involvement, 2010



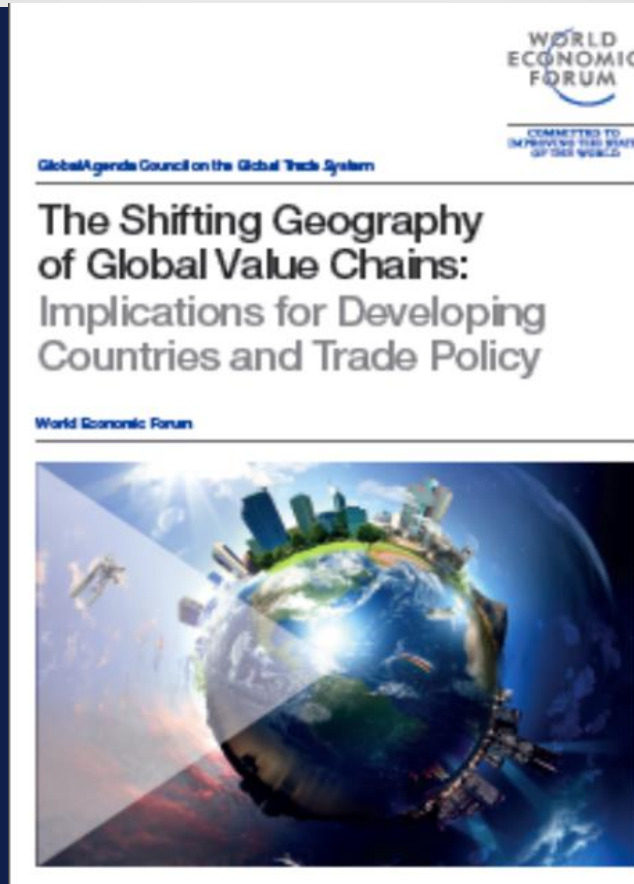
Source: UNCTAD estimates (see box IV.3).

Note: * Including contract manufacturing in electronics, automotive components, pharmaceuticals, garments, footwear, toys; and IT services and business process outsourcing (see WIR11). TNC arm's length trade may include other NEM trade.

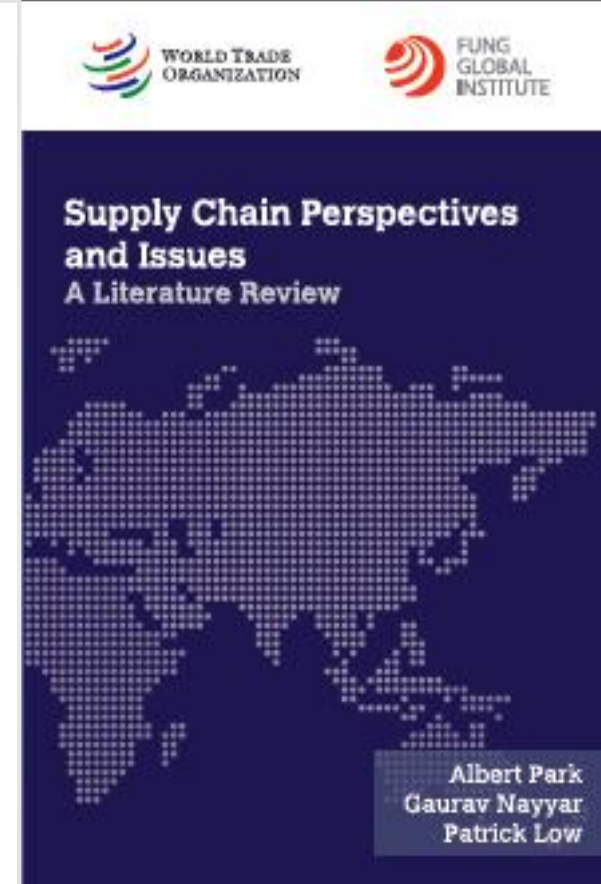
Recent Reports on GVCs



USITC Aug 11



WEF Jun 12



WTO/FGI Mar 13

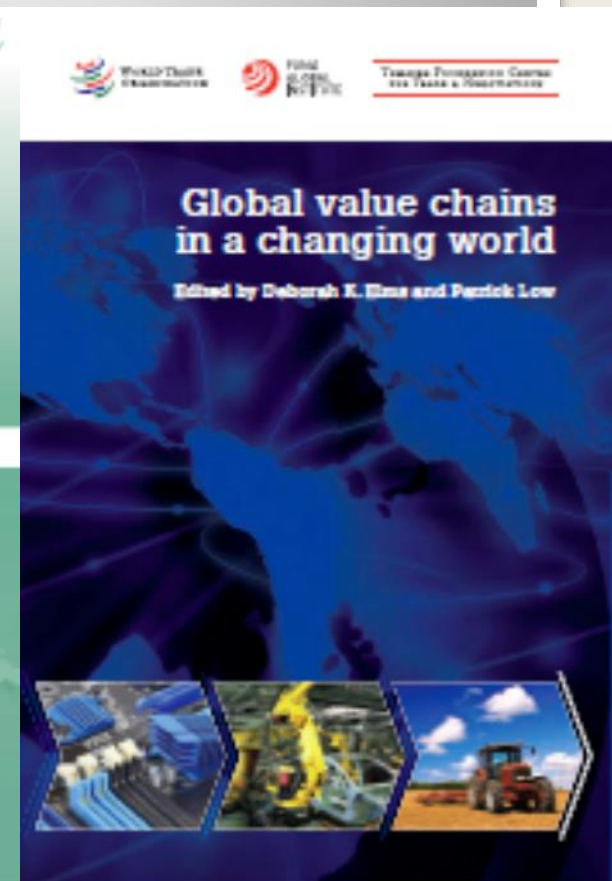
Recent Reports on GVCs



OECD May 13



UNCTAD Jun 13



WTO+ Jun 13

GVC Research – Key Findings

- Today, “what you do” (the activities a firm or country is involved in) matters more for growth and employment than “what you sell” (the final product). GVCs allow firms and economies to “do” the part of the process they are best at, using intermediate goods and services from elsewhere without having to develop a whole industry. (OECD, 2013)

GVC Research – Key Findings

- Countries with a greater presence of FDI relative to the size of their economies tend to have a higher level of participation in GVCs and to generate relatively more domestic value added from trade.
- There is a positive correlation between participation in GVCs and growth rates of GDP per capita. GVCs have a direct economic impact on value added, jobs and income.

GVC Research – Key Findings

- A select number of manufacturing industries have been at the forefront of value chain segmentation and of associated trends such as outsourcing and offshoring.
- The electronics and automotive industries, where products can be broken down into discrete components that can be separately produced, easily transported and assembled in low-cost locations, have led the way in shaping GVCs.
- Industries that incorporate and process outputs from extractive industries and traded commodities (e.g. petroleum products, plastics, basic chemicals) follow closely behind.
- The extractive industries rank much lower as they require little imported content of exports apart from some services. (UNCTAD, 2013)

Importance of Understanding GVC Dynamics

GVC research/analysis can:

- Improve measures of bilateral trade imbalances, employment content of trade, environmental impacts of trade
- Guide developing and developed nation policies on strategy, trade, investment, competitiveness, environment
- Guide multinational economic and environmental efforts
- Inform firm and industry actions and norms

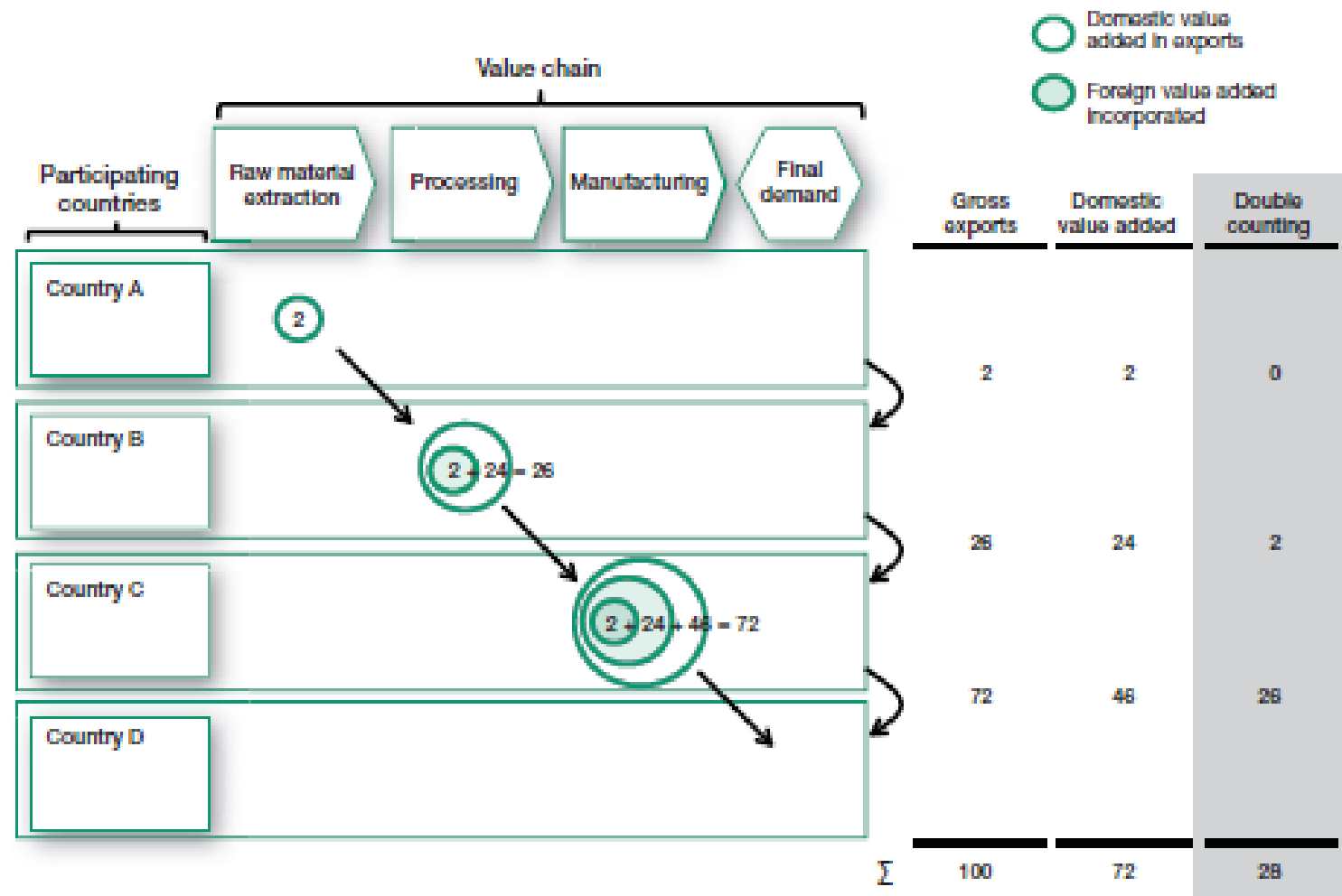
Efforts to Measure TiVA and Map GVCs

- Emergence of GVC research & analysis (2000-present)
- **Efforts to measure TiVA (2009-present)**
 - Calls to action
 - Building measurement and analytic capacity
 - Macro: International Input-Output Modeling
 - Micro: Enterprise Characteristics
 - Developing international frameworks
- Implications for ISA members

Measuring TiVA – Rationale

- As traditional trade statistics measure gross flows, GVCs lead to a significant amount of double counting in global trade. Some 28 per cent of gross exports (\$5 trillion of the \$19 trillion) consist of value added that is first imported by countries and incorporated in products or services that are exported again.
- Patterns of value added trade in GVCs determine the distribution of actual economic gains from trade between individual economies and are shaped to a significant extent by the investment decisions of TNCs.

Figure IV.1. Value added trade: how it works

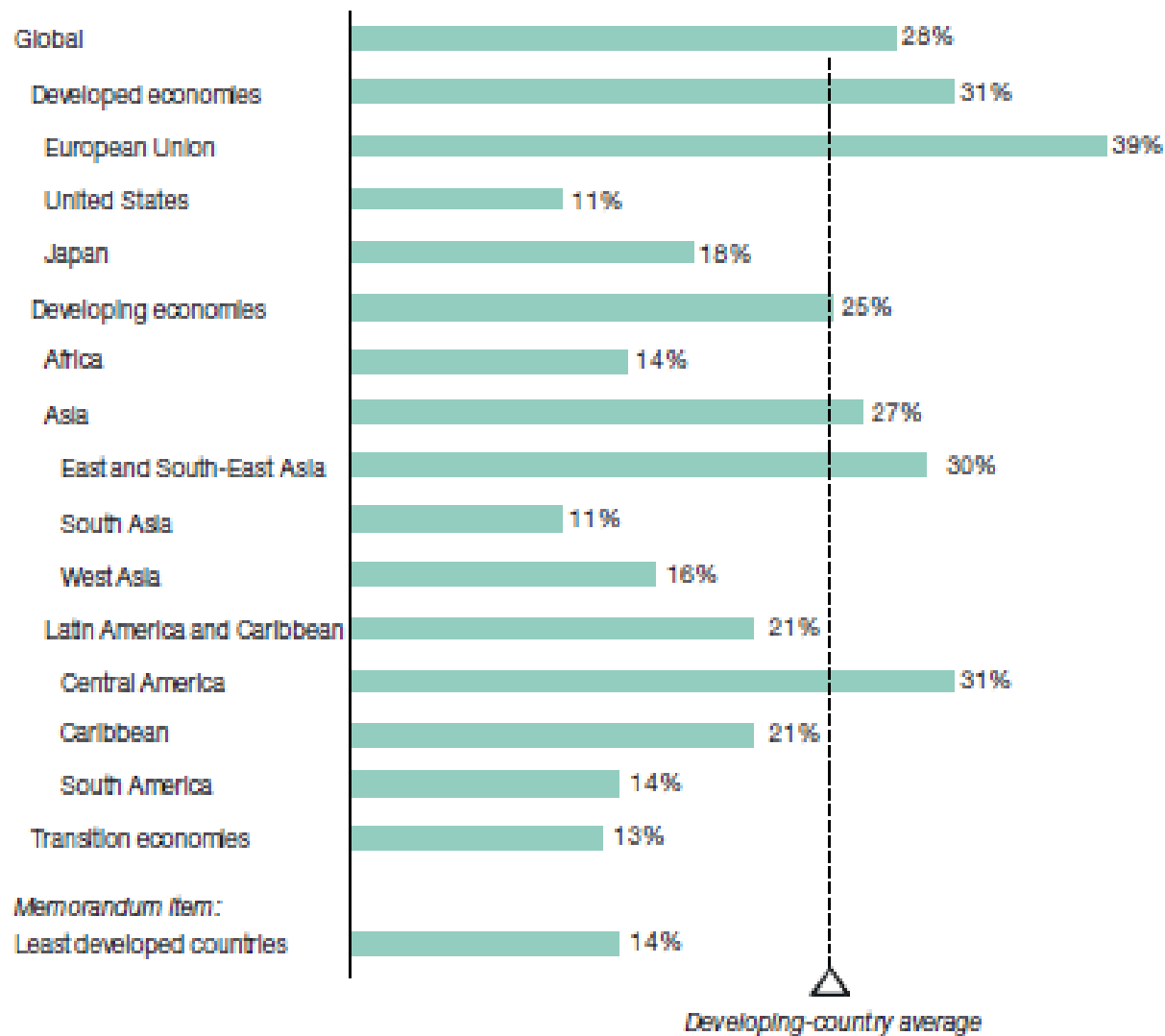


Source: UNCTAD.

Measuring TiVA – Rationale

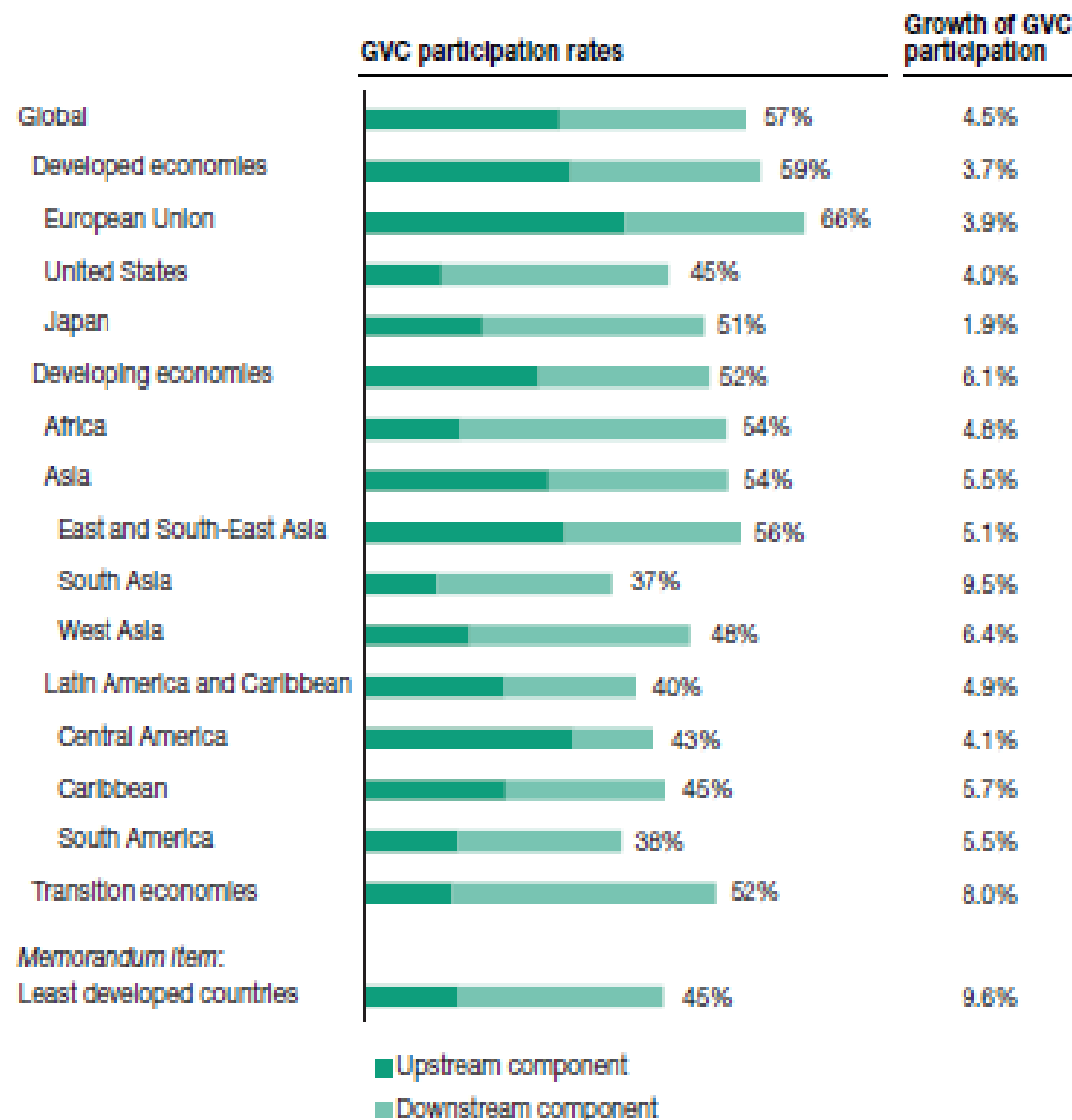
- The average foreign value added share of exports and the degree of double counting in global exports of an industry provide a rough indication of the extent to which nations and industries rely on internationally integrated production networks, as it proxies the extent to which intermediate goods and services cross borders until final consumption.

Figure IV.3. Share of foreign value added in exports, by region, 2010



Source: UNCTAD-Eora GVC Database.

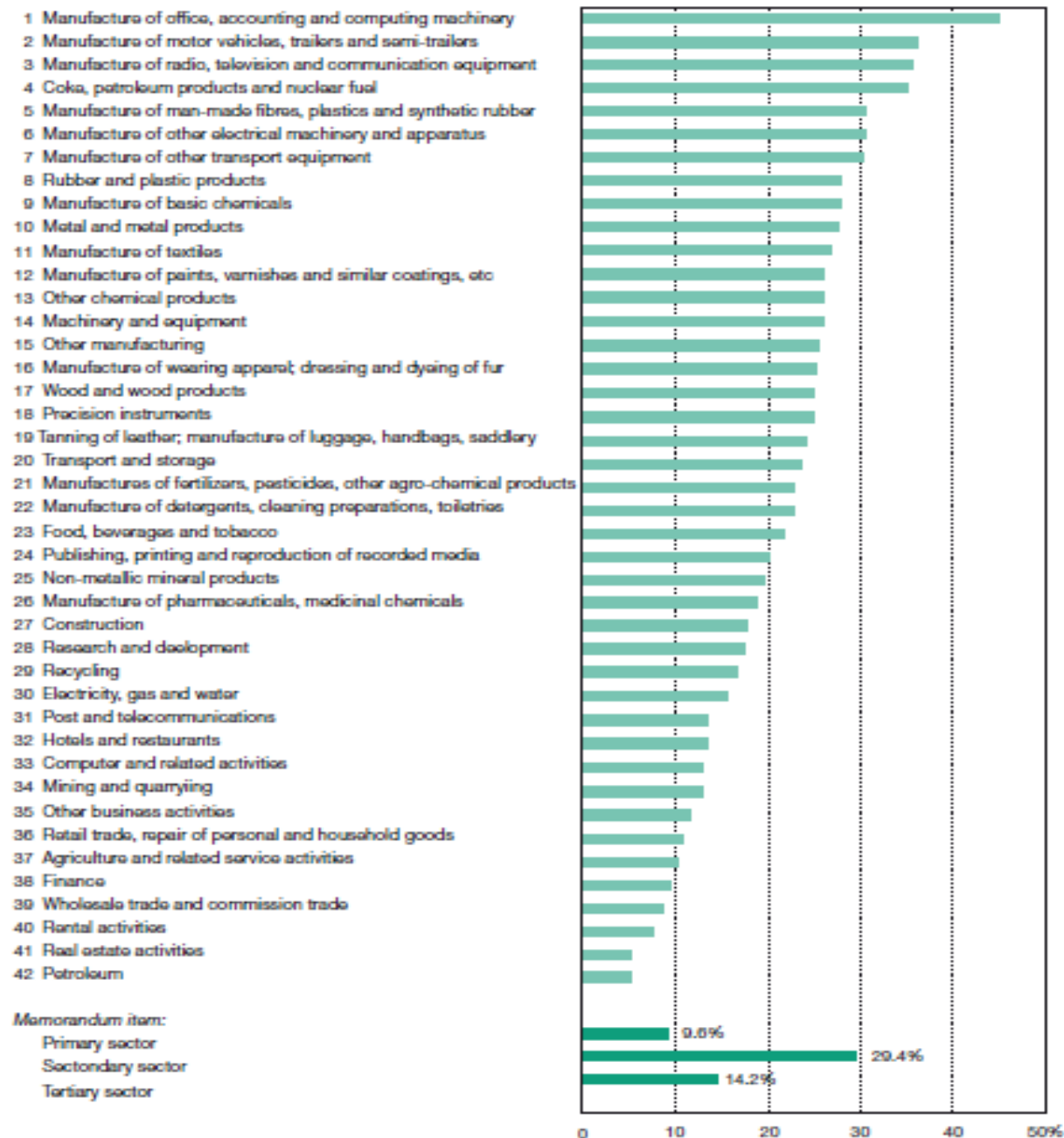
Figure IV.8. GVC participation, 2010, and GVC participation growth rates, 2005–2010



Source: UNCTAD-Eora GVC Database.

Note: GVC participation indicates the share of a country's exports that is part of a multi-stage trade process; it is the foreign value added used in a country's exports (upstream perspective) plus the value added supplied to other countries' exports (downstream perspective), divided by total exports. GVC participation growth here is the annual growth of the sum of the upstream and downstream component values (CAGR).

Figure IV.4. Share of foreign value added in exports, selected industries, 2010



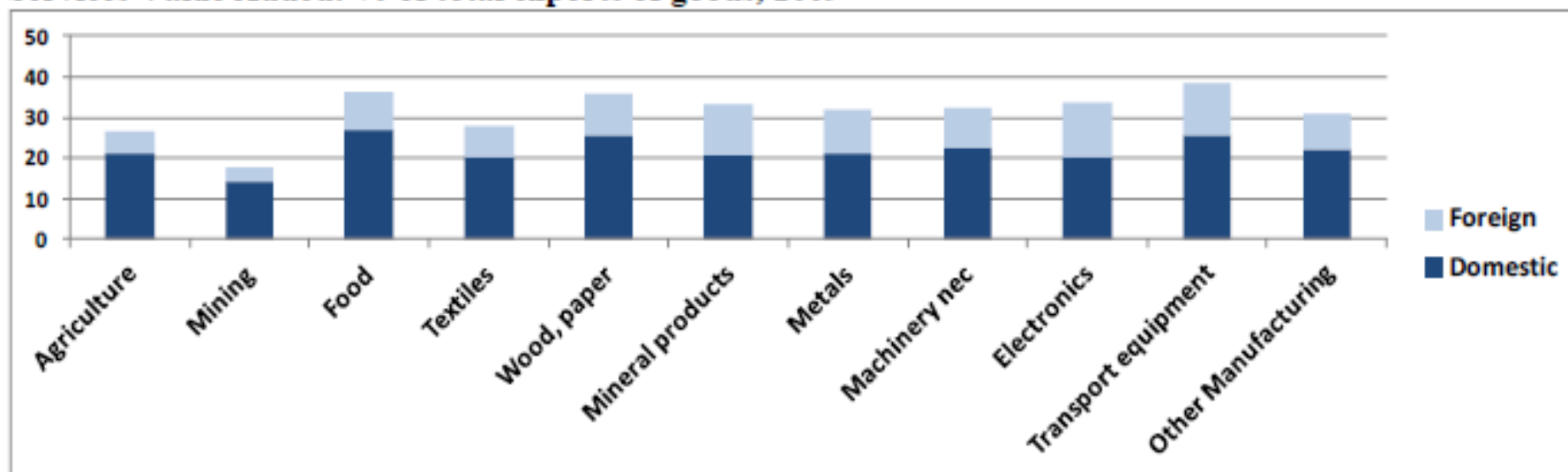
Source: UNCTAD-Eora GVC Database.

Note: Illustrative list of industries selected based on significance in GVCs, at various levels of industry classification.

Measuring TiVA – Building Capacity

Figure 7.7

Services Value Added: % of total exports of goods, 2009



Source: UNECE (2014)

Measuring TiVA – Building Capacity

Table 2

Factor Shares in Global Value Chains of All Manufactures

| Value added | 1995 | 2008 | 2008 minus 1995 |
|-----------------------------|----------------|----------------|-----------------|
| Total (billion US\$) | \$6,586 | \$8,684 | \$2,098 |
| By: | | | |
| capital (%) | 40.9% | 47.4% | 6.5% |
| high-skilled labor (%) | 13.8% | 15.4% | 1.5% |
| medium-skilled labor (%) | 28.7% | 24.4% | –4.2% |
| low-skilled labor (%) | 16.6% | 12.8% | –3.8% |

Source: Authors' calculations based on World Input-Output Database, November 2013 Release.

Notes: The table presents shares of production factors in total value added based on all global value chains of manufactures. Shares add up to 100 percent. Value added is at basic prices (hence excluding net taxes, trade, and transport margins on output). It is converted to US dollars with official exchange rates and deflated to 1995 prices with the US Consumer Price Index. Figures shown may not add due to rounding.

Measuring TiVA – Building Capacity

- International input-output (IIO) tables trace the sources of value added embodied in goods and services produced throughout the world.
- They are initially derived by integrating
 - individual countries' national account statistics (supply-use or input-output tables) with
 - bilateral trade data,
 - guided by information or assumptions about the sourcing of international intermediate inputs by using industries. (Lin, Powers, Ubee (2013))

Measuring TiVA – Building Capacity

An Accounting Framework for Global Value Chains

| | | | Final products of a global value chain, identified by country and industry of completion | | | | | | | Value added |
|--|-----------|------------|---|-----|---------------|-----|---------------|-----|---------------|----------------|
| | | | Country 1 | | | ... | Country M | | | |
| | | | Industry 1 | ... | Industry N | ... | Industry 1 | ... | Industry N | |
| Value added from country- industries participating in global value chains | Country 1 | Industry 1 | | | | | | | | |
| | | ... | | | | | | | | |
| | | Industry N | | | | | | | | |
| | ... | ... | | | | | | | | |
| | Country M | Industry 1 | | | | | | | | |
| | | ... | | | | | | | | |
| | | Industry N | | | | | | | | |
| Total final output value | | | | | | | | | | World GDP |

Note: Cell values represent the value added generated in the country-industry given in the row, within the global value chain corresponding to the country-industry of completion given by the column.

Source: Timmer et al. (2014)

Measuring TiVA – Building Capacity

- Without information on the use of imported intermediate inputs by sector, 'proportionality' is assumed:
 - That is, the (country) origin share of a given import consumed by a given industry in a given country is the same for all industries in that country. (OECD, 2013)
 - Alternative, first-level enhancement—for a given import, measure origin share for intermediate use, final use, and investment use, then assume proportionality within each category.

Measuring TiVA – Building Capacity

- Access to firm-specific data will enable development of more accurate industry- and use-specific share coefficients.
- Means for obtaining such data include:
 - Micro Data Linking—linking national business registers with trade data
 - Surveys of enterprise organization and geographic allocation of business functions

Measuring TiVA – Moves to Action

- WTO and OECD agree to collaborate on encouraging TiVA measurement (Feb 2010)
- AEA issues [Report on the State of Available Data for the Study of International Trade and FDI](#) (Aug 2010)
- WTO launches [Made in the World Initiative](#) (Early Spring 2011)
- UN Statistics Division, Eurostat, WTO, UNCTAD host [Global Forum on Trade Statistics](#) (Geneva, Feb 2011)

Measuring TiVA – IIO Models

- [Asian International Input-Output Tables](#)—IDE-JETRO (2006)
- Purdue [Global Trade Analysis Project](#) data + [UN Comtrade](#) data
 - [USITC](#) (2011), [Daudin et al.](#) (2011), [Johnson and Noguera](#) (2012), [Koopman et al.](#) (2014)
- [World Input-Output Database](#)—University of Groningen et al. (2012-2013)
- [Eora MRIO Database](#)—University of Sydney (2012)
- [OECD-WTO TiVA Database](#) (2013)
- [UNCTAD-Eora GVC Database](#) (2013)

Measuring TiVA – IIO Models

TABLE 1 Global IIO databases

| Database | Data sources | Countries/regions | Sectors | Years |
|------------------------------------|--|--------------------------------|---------|------------------------------|
| World Input-Output Database (WIOD) | National supply-use tables | 40 | 35 | 1995-2009 |
| OECD-WTO TiVA database | National input-output tables | 58 plus China processing trade | 37 | 1995, 2000, 2005, 2008, 2009 |
| UNCTAD-Eora GVC Database | National and regional supply-use and I-O tables plus estimates from UN sources | 187 | 25 | 1990-2010 |
| GTAP | I-O tables submitted by GTAP members | | | |
| | • Daudin et al. (2011) | 66 or 113 | 55 | 1997, 2001, 2004 |
| | • Johnson and Noguera (2012) | 94 | 57 | 2004 |
| | • Koopman, Wang, and Wei (2013) | 26 | 41 | 2004 |

Source: Jones, Powers, and Ubee (2013)

Notes: WIOD added 2010-2011 in Nov 2013. [Eora MRIO](#), not listed here, is maintained independent of UNCTAD, includes 35 environmental indicators, and recently added 2011.

Measuring TiVA – IIO Models

OECD-WTO TiVA Database plan:

- Make TiVA estimates production a permanent feature of the international statistics system.
- Improve the coverage of countries, industries, indicators and years covered.
- Continue current work to improve data quality, including on:
 - Bilateral trade in services
 - Heterogeneity of exporting and importing firms within IO tables. ([OECD-WTO TiVA FAQs](#))

Measuring TiVA – Enterprise Characteristics

- Micro Data Linking
 - [Longitudinal Firm Trade Transactions Database \(LFTTD\)](#), 1992-2011, U.S. Census Bureau
 - Trade by Enterprise Characteristics (TEC)—[OECD](#) and [Eurostat](#)
 - [ESSnet on Measuring GVCs](#) (slides 28-50)
 - Cross-national registry development
 - [EuroGroups Register](#)—information TNC operations in Europe
 - [European System of Business Registers](#)—linked registers across European Statistical System

Measuring TiVA – Enterprise Characteristics

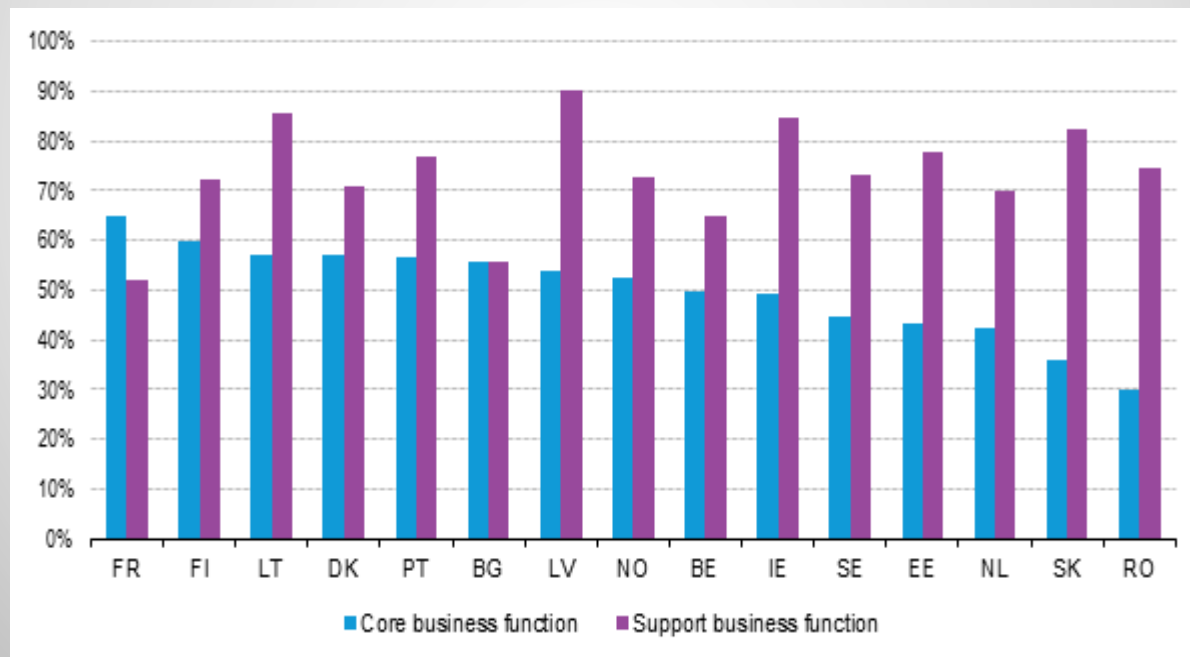
- Surveys of International Organization of Business Functions
 - Consensus on business functions typology:
 - Core business function—production of final goods or services intended for the market/for third parties.
 - Support business functions that facilitate production of goods or services.
 - Distribution and logistics
 - Marketing, sales and after sales services
 - ICT services
 - Administrative and management functions
 - Engineering and related technical services
 - Research & Development

Measuring TiVA – Enterprise Characteristics

- Surveys of International Organization of Business Functions
 - [Eurostat International Sourcing Survey](#) (2006, 2012)
 - [The 2010 National Organizations Survey:](#)
 - Examining the Relationships Between Job Quality and the Domestic and International Sourcing of Business Functions by United States Organizations (Brown, Sturgeon, Cole (2013))

Measuring TiVA – Enterprise Characteristics

Enterprise sourcing internationally by type of sourced business function, 2009-2011 (Eurostat)



Measuring TiVA – Enterprise Characteristics

Table 4. Distribution of Sourcing Costs for U.S. Organizations by Business Function (full sample)

| Business Function | Domestic In House | Domestic External | International Affiliate | International External | International Sourcing | N |
|------------------------------------|-------------------|-------------------|-------------------------|------------------------|------------------------|-----|
| Primary Business Function | 93.3% | 3.0% | 2.9% | 0.8% | 3.7% | 317 |
| Research and Development | 91.8% | 3.4% | 3.9% | 0.9% | 4.8% | 190 |
| Sales and Marketing | 91.5% | 4.2% | 4.0% | 0.3% | 4.3% | 222 |
| Transportation Services | 82.6% | 12.6% | 3.2% | 1.7% | 4.8% | 210 |
| Customer & After-sales Service | 92.9% | 2.3% | 4.2% | 0.6% | 4.8% | 220 |
| Management, Admin, and Back-office | 94.9% | 1.8% | 3.0% | 0.4% | 3.4% | 292 |
| Information Technology Systems | 83.2% | 12.4% | 3.1% | 1.4% | 4.5% | 253 |
| Facilities Maintenance | 81.6% | 14.5% | 3.4% | 0.5% | 3.9% | 243 |

The international sourcing column indicates organizations that engage in internal (from affiliates), external (from external suppliers) international sourcing, or both.

Source: Brown, Sturgeon, Cole (2013)

Measuring TiVA – International Measurement Frameworks

- UN Statistical Commission Friends of the Chair (FoC) Group on International Trade and Economic Globalization
- Eurostat Initiative: GVCs and Economic Globalisation
- UN Economic Commission for Europe—Conference of European Statisticians, Task Force on Global Production

Measuring TiVA – International Measurement Frameworks

UNSC FoC Group on International Trade and Economic Globalization

- On basis of [UNSD International trade statistics report](#) (Dec 2012), UNSC created FoC Group to prepare a concept paper on new trade measurement framework (Mar 2013)
- FoC Group held [expert meeting](#) (Nov 2013) and prepared [initial report](#) with schematic framework based on IO, bilateral trade, and firm characteristics data (Dec 2013)
- UNSC accepts initial report and seeks final version in one year (Mar 2014)

Measuring TiVA – International Measurement Frameworks

Composition of the Friends of the Chair group

Moderator: Canada

Member countries and agencies:

Europe: Denmark, Ireland, Italy and the Netherlands

America: Colombia, Costa Rica, Mexico and the United States of America

Africa: Cabo Verde, Morocco, South Africa and Uganda

Asia: China, India, Iran (Islamic Republic of), the Republic of Korea, Thailand, and Viet Nam

Agencies: Eurostat, IMF, OECD, the United Nations Conference on Trade and Development, the World Trade Organization, the Economic Commission for Europe and the Statistics Division

Measuring TiVA – International Measurement Frameworks

Eurostat Initiative: GVCs and Economic Globalization

- [Seminar](#) (Dublin, Apr 2013)
- [GVCs and Economic Globalization – Towards a New Measurement Framework](#) (Sturgeon, Nov 2013)
 - Recommends creation of an integrated international data platform (IIDP) that would include:
 - Full datasets on trade and FDI
 - Full, accurate, and up-to-date enterprise ownership information, internationally linked enterprise IDs
 - Administrative data sets adapted for statistical use
 - Survey information on international sourcing
 - The internationalization of R&D and innovation

Measuring TiVA – International Measurement Frameworks

UNECE-CES, [Task Force on Global Production](#) (TFGP)

- TFGP created on basis of UNECE-CES report on [The Impact of Globalisation on National Accounts](#) (Dec 2011).
 - To address issues in measuring global production, including factoryless good producers, IP ownership, trade in services.
 - Members: Canada, Finland, Ireland, Israel, Italy, Mexico, Netherlands, Norway, Sweden, United States, Eurostat, IMF, OECD, UNECE, UNSD and WTO. Chaired by Ireland.
- TFGP prepared draft [Guide to measuring global production](#), with detailed priorities for improving data inputs for TiVA analysis (Feb 2014).
- UNECE-CES Group of Experts on National Accounts [reviewed findings](#) (May 2014).

Efforts to Measure TiVA and Map GVCs

- Emergence of GVC research & analysis (2000-present)
- Efforts to measure TiVA (2009-present)
 - Calls to action
 - Building measurement and analytic capacity
 - Macro: International Input-Output Modeling
 - Micro: Enterprise Characteristics
 - Developing international frameworks
- **Implications for ISA members**

Implications for ISA Members

- The number and sophistication of multinational efforts to measure TiVA have grown greatly since 2011.
- Important decisions re TiVA measurement capacities and frameworks will be made in the near future.
- The opportunities for industry research presented by these efforts are substantial.
- It is in the ISA members' interest to track progress and find means to provide input.

Efforts to Measure Trade in Value-Added and Map Global Value Chains: A Guide

Andrew Reamer, Research Professor
George Washington Institute of Public Policy
George Washington University

areamer@gwu.edu

(202) 994-7866