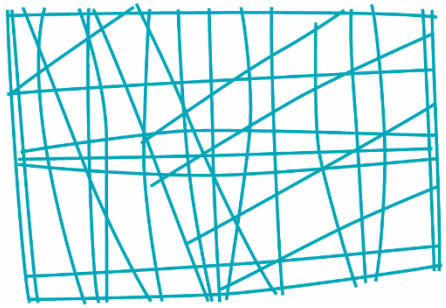


NEREUS

Núcleo de Economia Regional e Urbana
da Universidade de São Paulo

The University of São Paulo
Regional and Urban Economics Lab

Aula 7a: Modelos Globais de Insumo-Produto

Prof. Inácio F. Araújo

Uma versão preliminar desse material foi preparada por Vinícius de Almeida Vale (UFPR)

Agenda

Global Input-Output Models

Databases:

- WIOD – World Input-Output Database
- ICIO – Inter-Country Input-Output Database, OECD
- EORA – Multi-Region Input-Output (MRIO)

Global Input-Output Models

- WIOD - World Input-Output Database
- ICIO - Inter-Country Input-Output Database, OECD
- EORA - Multi-Region Input-Output (MRIO)
- ECLAC - Input-Output Table for Latin America and the Caribbean
- EXIOBASE - Multi-Regional Environmentally Extended Supply-Use
- Table (MR-SUT) and Input-Output Table (MR-IOT)
- FIGARO - EU-Inter Country Supply, Use and Input-Output Tables
- GTAP - Global Trade Analysis Project
- IDE-JETRO - International Input-Output Tables

World Input-Output Database

Data base

Release 2013:

- World Input-Output Tables and underlying data, covering **40 countries**, and a model for the rest of the world for the period **1995-2011**. Data for **35 sectors** are classified according to the International Standard Industrial Classification revision 3 (ISIC Rev. 3). The tables adhere to the 1993 version of the SNA

Release 2016:

- World Input-Output Tables and underlying data, covering **43 countries**, and a model for the rest of the world for the period **2000-2014**. Data for **56 sectors** are classified according to the International Standard Industrial Classification revision 4 (ISIC Rev. 4). The tables adhere to the 2008 version of the SNA

World Input-Output Database

Release 2013

Input-Output Tables:

- World Input-Output Tables (World IO Tables)
- Deflated WIOTs in Previous Years' Prices (World IO Tables PYP)
- Regional aggregations (Regional IOTables) of the WIOTs
- International Supply and Use Tables (International SUTs)
- National Supply and Use Tables (National SUTs)
- National SUTs (Input for SUTs)

* WIOT tables are also available in **STATA** format and **MATLAB** format

World Input-Output Database

Release 2013

Socio Economic Accounts:

- Data on employment (number of workers and educational attainment), capital stocks, gross output and value added at current and constant prices at the industry level
- WIOD SEAS

Environmental Accounts:

- Data on energy use, CO_2 emissions and emissions to air at the industry level
- Land use, Materials use and water use
- WIOD EAS

World Input-Output Database

Release 2016

Input-Output Tables:

- World Input-Output Tables (World IO Tables)
- Deflated WIOTs in Previous Years' Prices (World IO Tables PYP)
- Regional aggregations (Regional IOTables) of the WIOTs
- International Supply and Use Tables (International SUTs)
- National Supply and Use Tables (National SUTs)
- National SUTs (Input for SUTs)

* WIOT tables are also available in **STATA** format and **R** format

World Input-Output Database

Release 2016

Socio Economic Accounts:

- Data on employment, capital stocks, gross output and value added at current and constant prices at the industry level
- WIOD SEAS

Environmental Accounts (by European Commission):

- Gross energy use, emission relevant energy use and CO2 emissions by 64 sectors and by households, for 12 energy commodities
- WIOD EAS

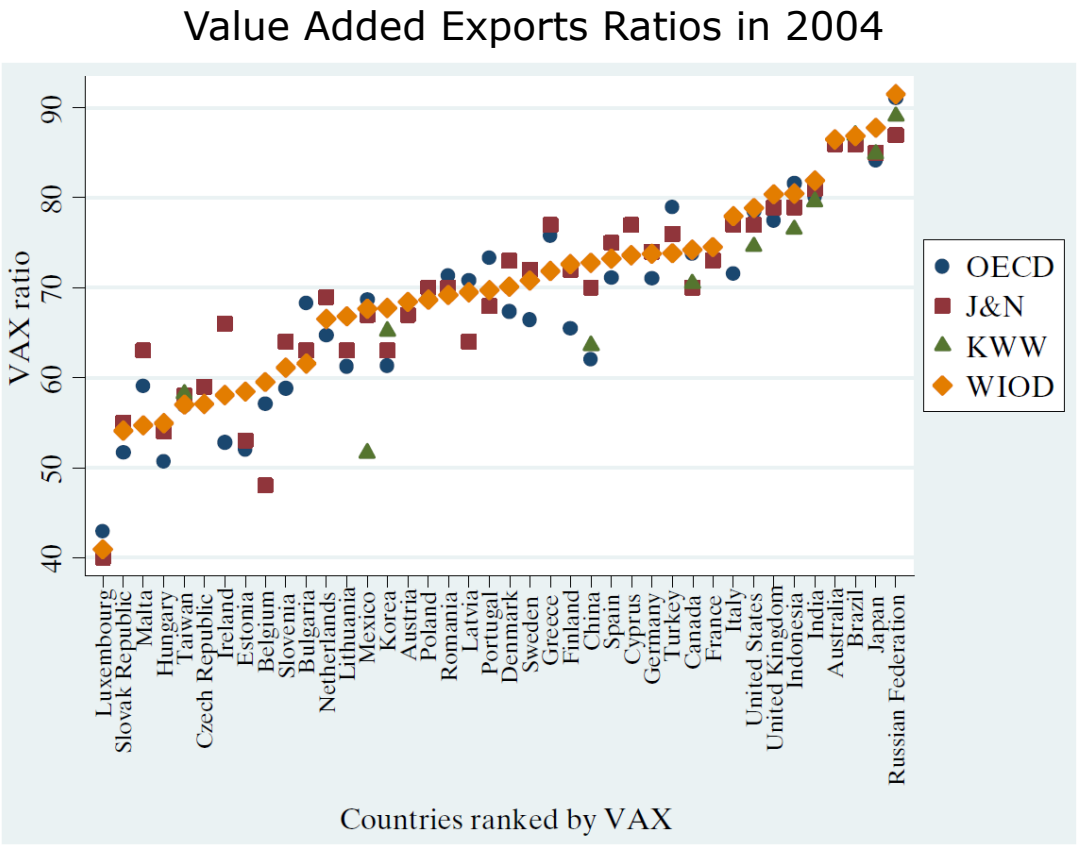
World Input-Output Database

Schematic Outline of a World Input–Output Table (WIOT)

			Use by country-industries							Final use by countries			Total use
			Country 1			…	Country M			Country 1	…	Country M	
			Industry 1	…	Industry N	…	Industry 1	…	Industry N		…		
Supply from country-industries	Country 1	Industry 1											
		…											
		Industry N											
	……												
	Country M	Industry 1											
		…											
		Industry N											
Value added by labour and capital													
Gross output													

Source: **Timmer et al. (2015)**.

World Input-Output Database

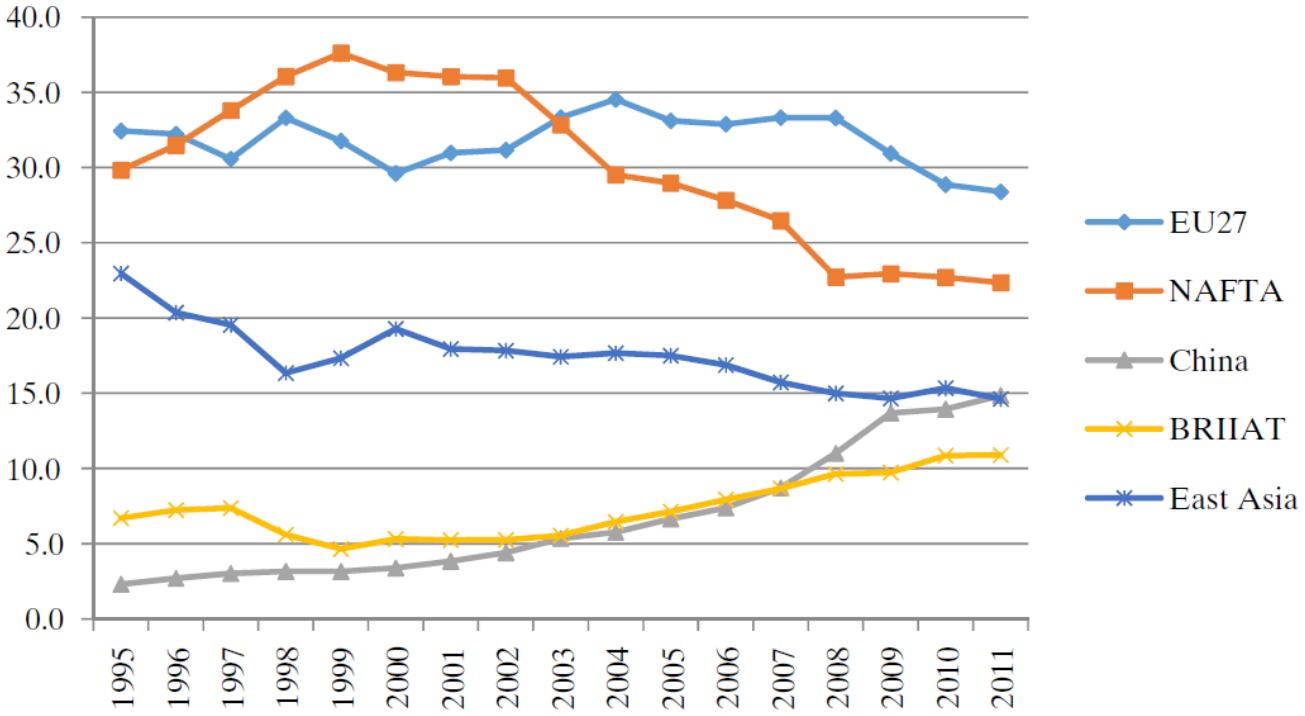


Source: **Timmer et al. (2015)**.

OECD refers to numbers taken from OECD Trade-in-value-added (TiVA) database, July 2013 version. J&N refers to numbers in Johnson and Noguera (2012a) and KWW to Koopman et al. (2014). WIOD are authors' calculations based on the World Input–Output Database, November 2013 version.

World Input-Output Database

GVC Income from Production of Automotives (as % of world)

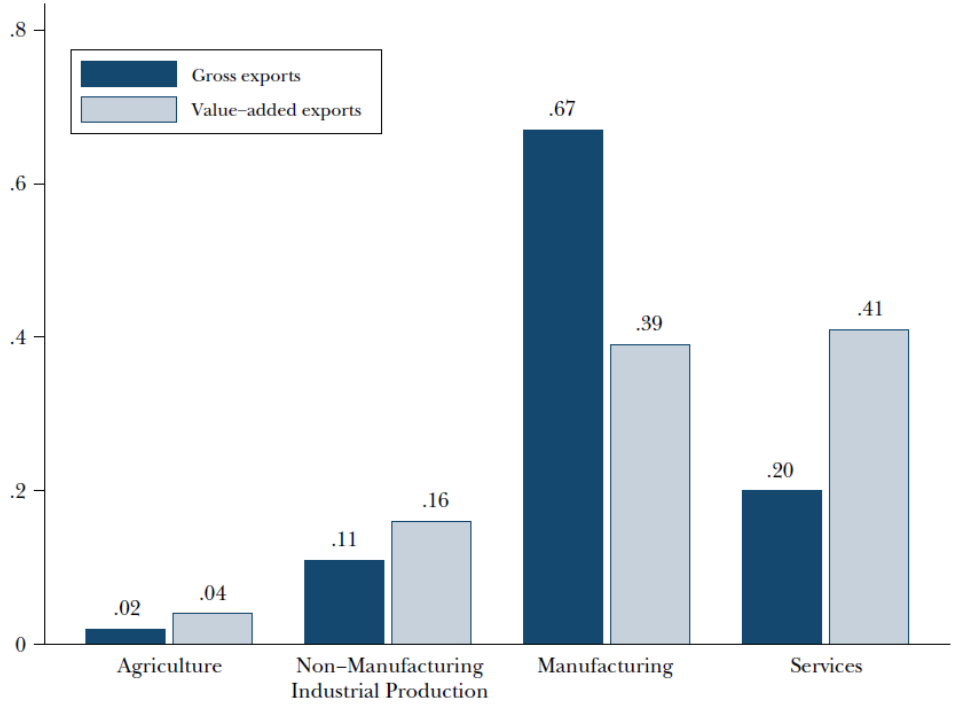


Source: **Timmer et al. (2015)**.

Global Value Chain - a final good as the set of all value-adding activities needed in its production.

World Input-Output Database

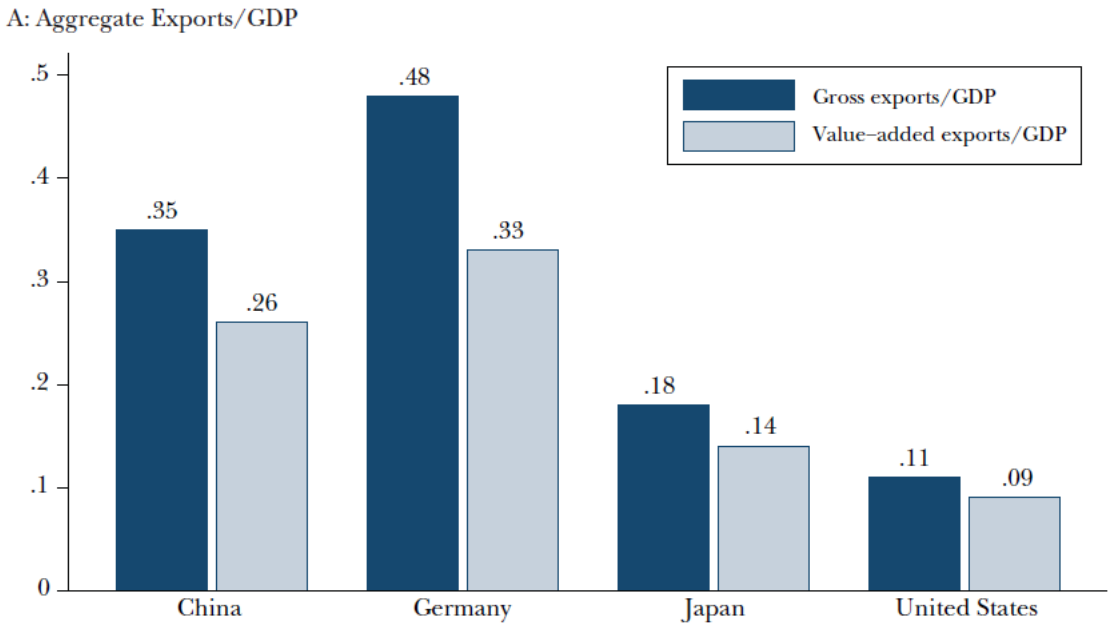
Sector Shares in Total World Value-Added and Gross Exports



Source: **Johnson (2014)**.

World Input-Output Database

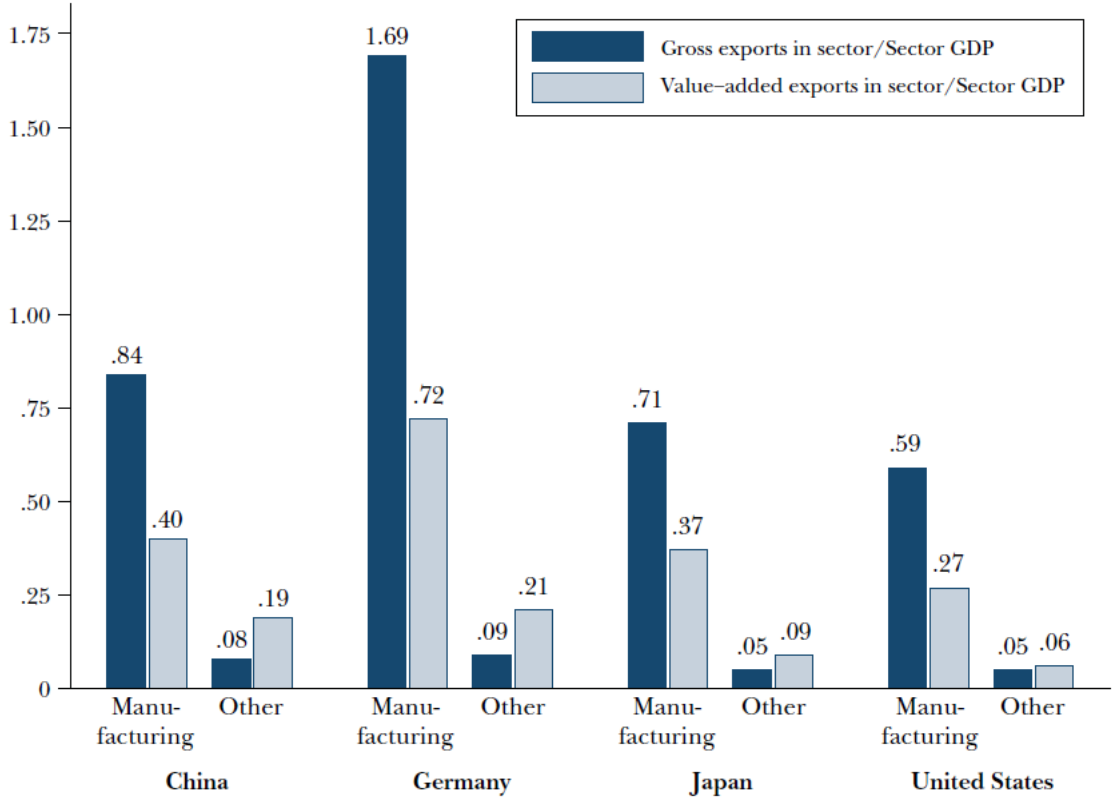
Aggregate and Sector-Level Openness for Top Four Exporting Countries



Source: **Johnson (2014)**.

World Input-Output Database

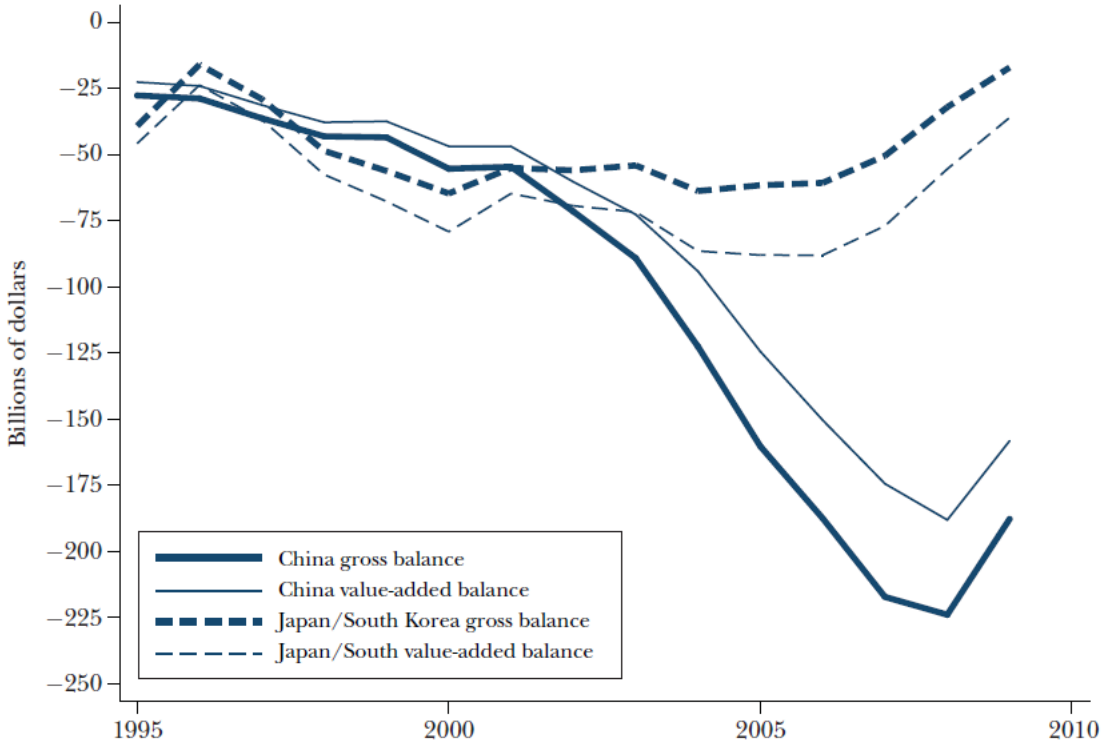
Aggregate and Sector-Level Openness for Top Four Exporting Countries



Source: **Johnson (2014)**.

World Input-Output Database

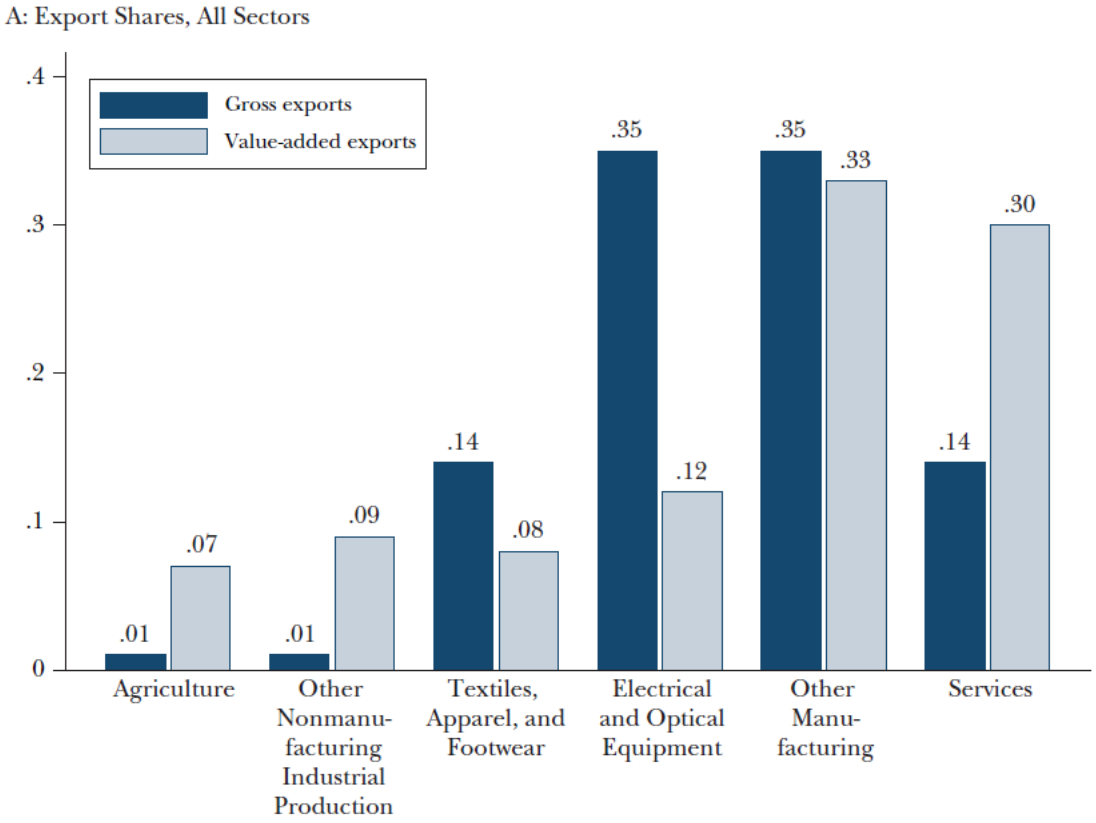
United States Trade Deficits with China, Japan, and South Korea



Source: **Johnson (2014)**.

World Input-Output Database

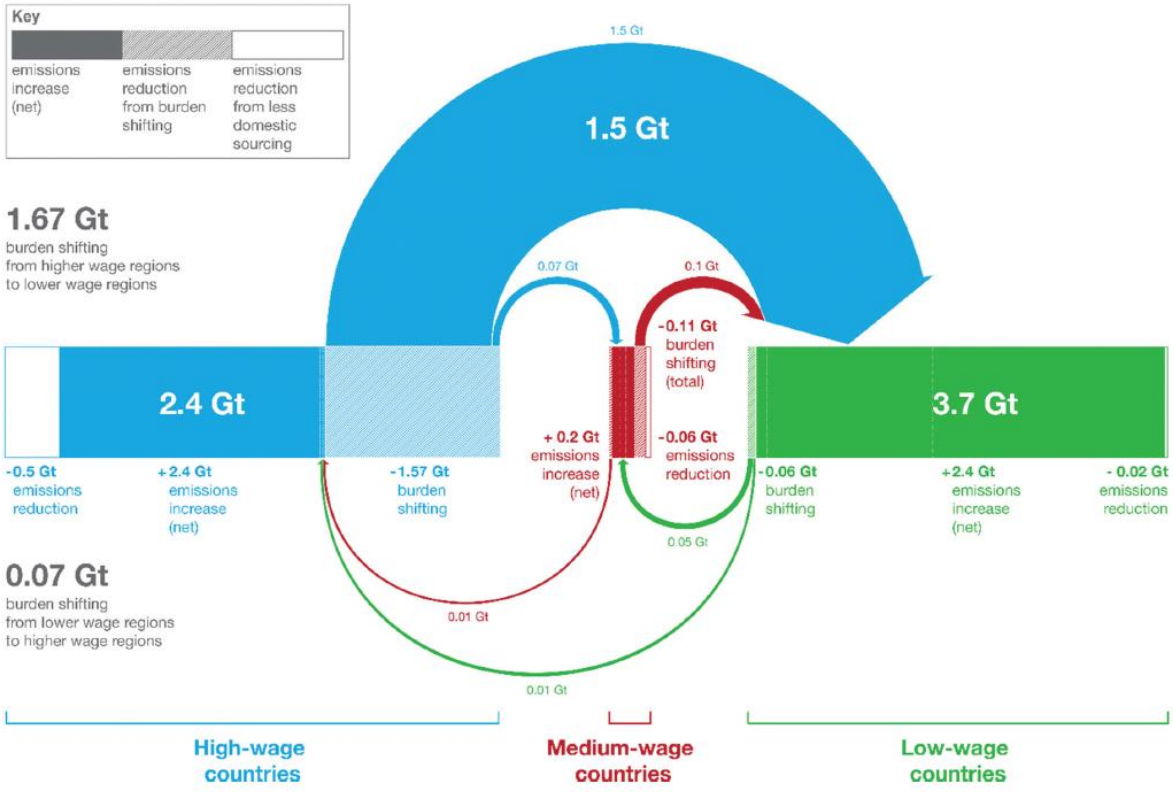
Sector-Level Export Shares for China



Source: **Johnson (2014)**.

World Input-Output Database

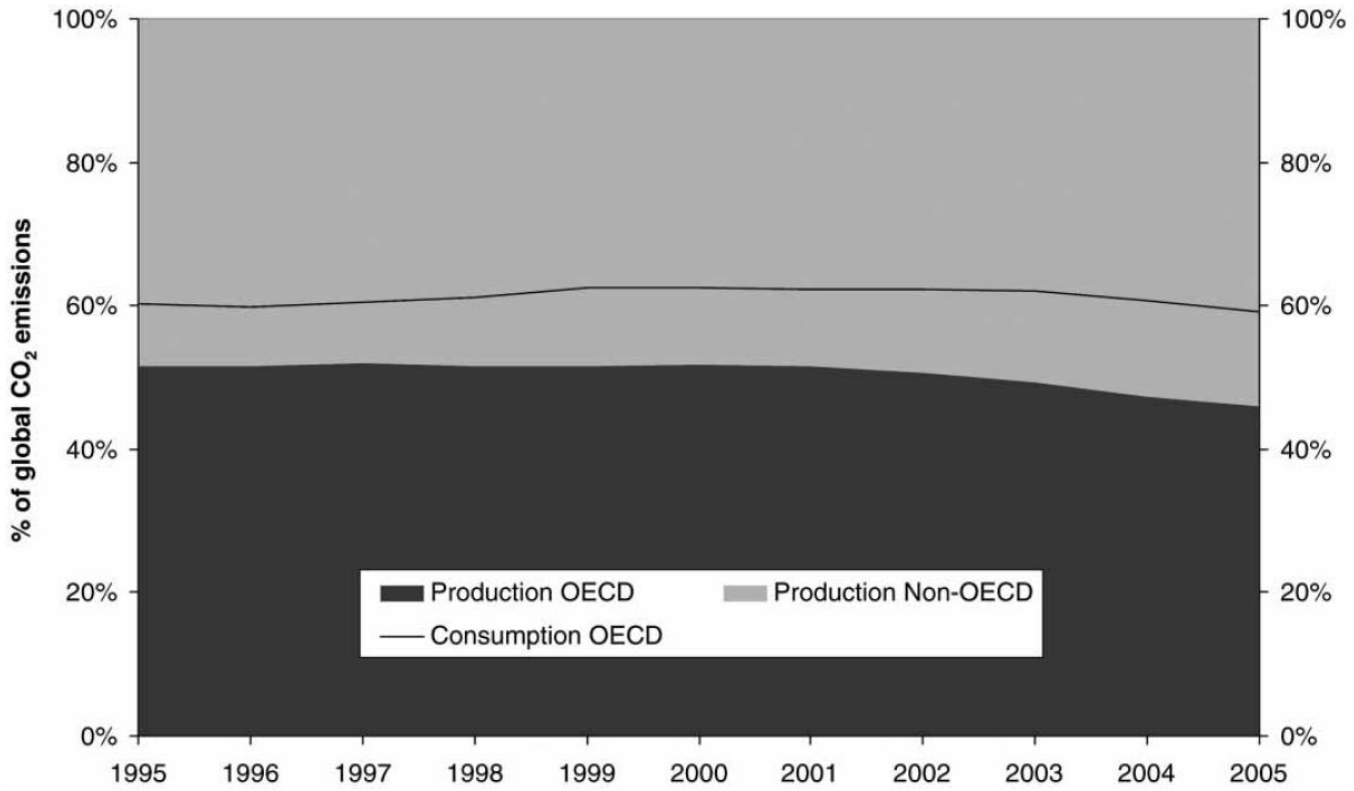
Changes in global CO2-emissions due to changes in variables in high-wage, medium-wage and low-wage countries and the sourcing effect, 1995–2007



Source: **Hoekstra et al. (2016)**.

World Input-Output Database

Carbon production and consumption: OECD and Non-OECD



Source: **Wiebe et al. (2012)**.

OECD Databases

ICIO

- Inter-Country Input-Output Tables

TiVA

- Trade in Value Added

TECO2

- CO_2 Emissions Embodied in International Trade

TiM

- Trade in Employment

Inter-Country Input-Output Tables

Data base

ICIO SNA93, ISIC REV.3:

- Data are presented for **63 countries** (i.e. 35 OECD countries and 28 non-OECD economies), the Rest of the World and split tables for China and Mexico. Period: **1995-2011**. Industrial sectors: **34**

ICIO SNA08, ISIC REV.4:

- Data are presented for **64 countries** (i.e. 36 OECD countries and 28 non-OECD economies), the Rest of the World and split tables for China and Mexico. Period: **2005-2015**. Industrial sectors: **36**

Inter-Country Input-Output Tables

Country Coverage

OECD	All OECD countries
BRIICS	Brazil, China, India, Indonesia, Russian Federation, South Africa
Other EU28	Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta, Romania
Other G20	Argentina, Saudi Arabia
Other South Eastern Asia	Brunei Darussalam, Cambodia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
Other Eastern Asia	Chinese Taipei, Hong Kong China
Other	Columbia, Costa Rica, Tunisia, Kazakhstan, RoW
Region groups	OECD, Non-OECD, APEC, ASEAN, EasternAsia,EU28, Euro Area, North America, etc

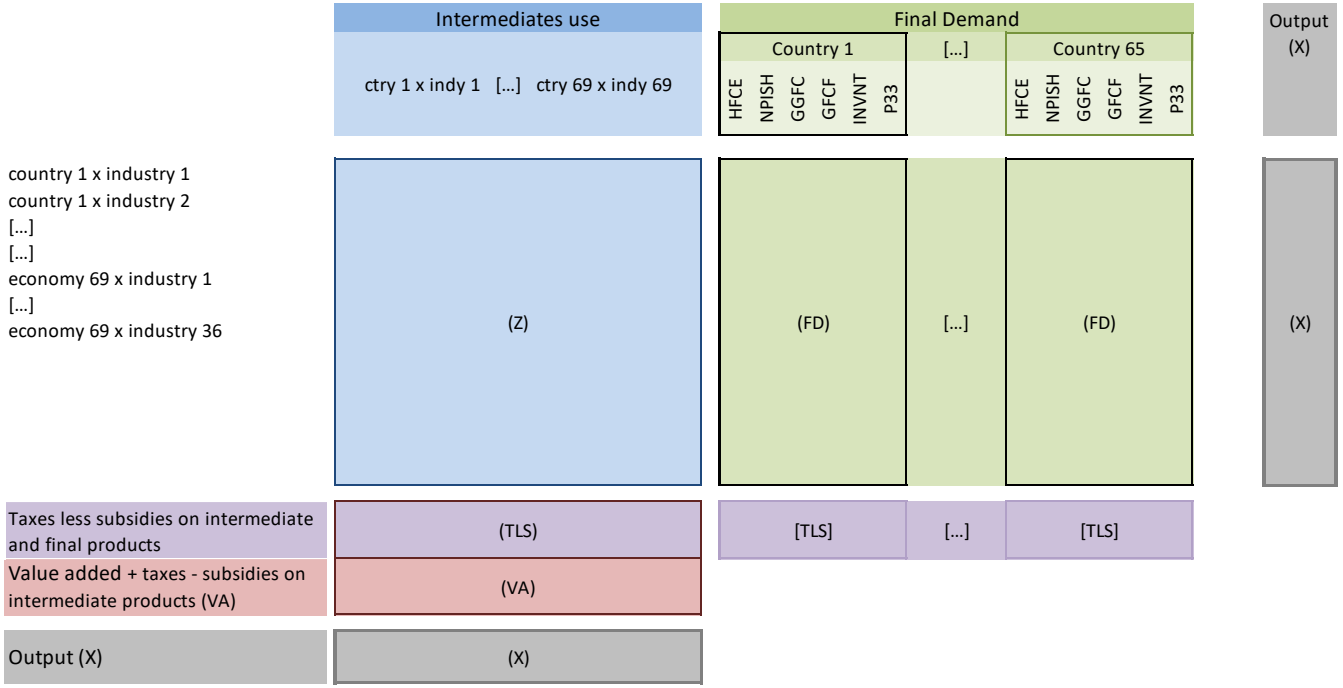
Inter-Country Input-Output Tables

	Industry Code	Heading
1	D01T03	Agriculture, hunting, forestry and fishing
2	D05T06	Mining and extraction of energy producing products
3	D07T08	Mining and quarrying of non-energy producing products
4	D09	Services to mining and quarrying
5	D10T12	Food products, beverages and tobacco
6	D13T15	Textiles, textile products, leather and footwear
7	D16	Wood and products of wood and cork
8	D17T18	Paper products and printing
9	D19	Coke and refined petroleum products
10	D20T21	Chemicals and chemical products
11	D22	Rubber and plastics products
12	D23	Other non-metallic mineral products
13	D24	Basic metals
14	D25	Fabricated metal products
15	D26	Computer, electronic and optical equipment
16	D27	Electrical machinery and apparatus, nec
17	D28	Machinery and equipment, nec
18	D29	Motor vehicles, trailers and semi-trailers
19	D30	Other transport equipment
20	D31T33	Manufacturing nec; repair of machinery and equipment
21	D35T39	Electricity, gas, water supply, sewerage, waste and remediation services
22	D41T43	Construction
23	D45T47	Wholesale and retail trade; repair of motor vehicles
24	D49T53	Transportation and storage
25	D55T56	Accomodation and food services
26	D58T60	Publishing, audiovisual and broadcasting activities
27	D61	Telecommunications
28	D62T63	IT and other information services
29	D64T66	Financial and insurance activities
30	D68	Real estate activities
31	D69T82	Other business sector services
32	D84	Public admin. and defence; compulsory social security
33	D85	Education
34	D86T88	Health and social work
35	D90T96	Other community, social and personal services
36	D97T98	Private households with employed persons

Inter-Country Input-Output Tables

OECD, Inter-Country Input-Output (ICIO) Tables, 2018 edition
current million USD

ICIO SNA08, ISIC REV.4



69 economies x 36 industries = 2484 sectors

One year per CSV file	Description	Dimension
Z	Intermediate transactions	(2484 origin sectors x 2484 destination sectors)
TLS	Taxes less subsidies on intermediate and final products	(65 economies x 2484 industries)
VA	Value added at basic prices	(1 row x 2484 industries)
X	Output at basic prices	(1 row x 2484 industries)
FD	Total final demand	(2484 origin sectors x (69 economies x 6 demand items))

Inter-Country Input-Output Tables

ICIO SNA08, ISIC REV.4, IN RDATA FORMAT

Object name for R-application	Description	Dimension
ICIO2018Z	Intermediate transactions	(11 years x 2484 rows x 2484 columns)
ICIO2018VAincTLS	Value added at basic prices **including** taxes *less* subsidies on intermediate products	(11 years x 2484 sectors)
ICIO2018VA	Value added at basic prices	(11 years x 2484 sectors)
ICIO2018X	Output at basic prices	(11 years x 2484 sectors)
ICIO2018HFCE	Household Final Consumption Expenditure	(11 years x 2484 sectors x 69 countries)
ICIO2018NPISH	Non-Profit Institutions Serving Households	(11 years x 2484 sectors x 69 countries)
ICIO2018GGFC	General Government Final Consumption	(11 years x 2484 sectors x 69 countries)
ICIO2018GFCF	Gross Fixed Capital Formation	(11 years x 2484 sectors x 69 countries)
ICIO2018INVNT	Changes in Inventories and Valuables	(11 years x 2484 sectors x 69 countries)
ICIO2018NONRES	Direct purchases by non-residents	(11 years x 2484 sectors x 69 countries)
ICIO2016FD	Total Final Demand including *discrepancies* (i.e. exports to unspecified partners)	(11 years x 2484 sectors x 69 countries)
ICIO2018VB	Value added multipliers matrix	(11 years x 2484 rows x 2484 columns)

Note: 2484 = 36 industry sectors x 69 countries (64 countries + RoW + split tables for Mexico and China).

Trade in Value Added

TiVA indicators are designed to better inform policy makers by providing new insights into the commercial relations between nations

The indicators are expressed in USD millions at current prices, in case of values, or in percent, in case of shares

Total of 50+ indicators:

- Structural indicators
- Indicators linking VA and gross exports
- Indicators linking VA and final demand
- Detailed indicators for gross exports, gross imports and final demand

Trade in Value Added

Data presented in the TiVA database provide insights into:

- Domestic and foreign value added content of gross exports by exporting industry
- Services content of gross exports by exporting industry, by type of service and value added origin
- Participation in global value chains (GVCs) via intermediate imports embodied in exports (backward linkages) and domestic value added in partners' exports and final demand (forward linkages)
- Global orientation' of industrial activity, i.e. share of industry valued added that meets foreign final demand
- Country and industry origins of value added in final demand, including the origin of value added in final consumption (by households and government) and in GFCF (investment by businesses)
- Bilateral trade relationships based on flows of value added embodied in domestic final demand
- Inter-regional and intra-regional relationships
- Domestic value added content of imports

Trade in eMployment

Employment and Global Value Chains (GVCs)

The **Trade in eMployment** (TiM) Database presents indicators of employment by industry, consistent with output and value added in the TiVA database, for all OECD, European Union and G20 countries

In addition, indicators based on compensation of employees are provided for all TiVA target countries

All 36 TiVA industries are covered for the time-period 2005-2015

Carbon dioxide emissions embodied in international trade

The **Trade in Embodied CO_2** ($TECO_2$) database presents a set of indicators to reveal patterns of CO_2 demand compared to CO_2 production (via resident industry or household emissions).

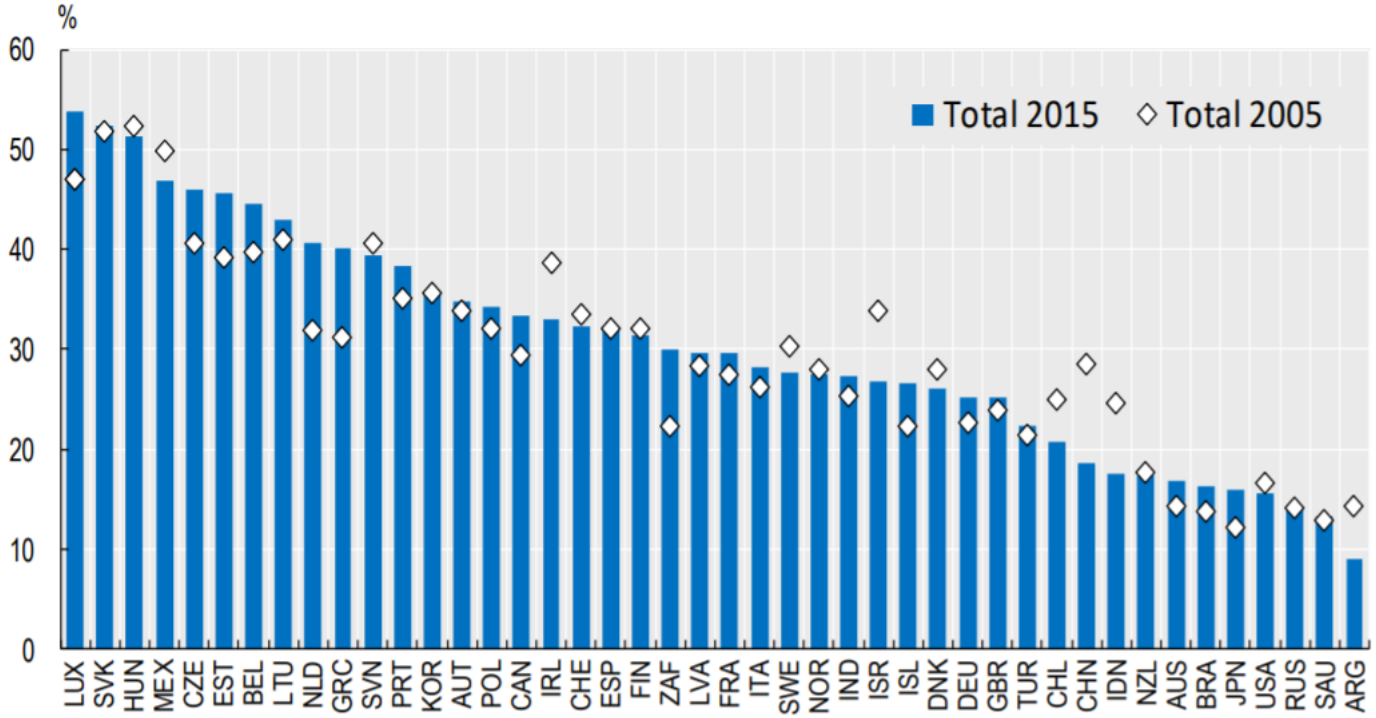
The aim is to provide policy makers with new insights into the environmental impacts of global production systems.

Indicators presented in $TECO_2$ database include:

- CO_2 emissions based on production (i.e. emitted by countries)
- CO_2 emissions embodied in domestic final demand (i.e. consumed by countries)
- Net exports of CO_2 emissions
- Per capita emissions; production and demand-based
- Country origin of emissions in final demand

Inter-Country Input-Output Tables

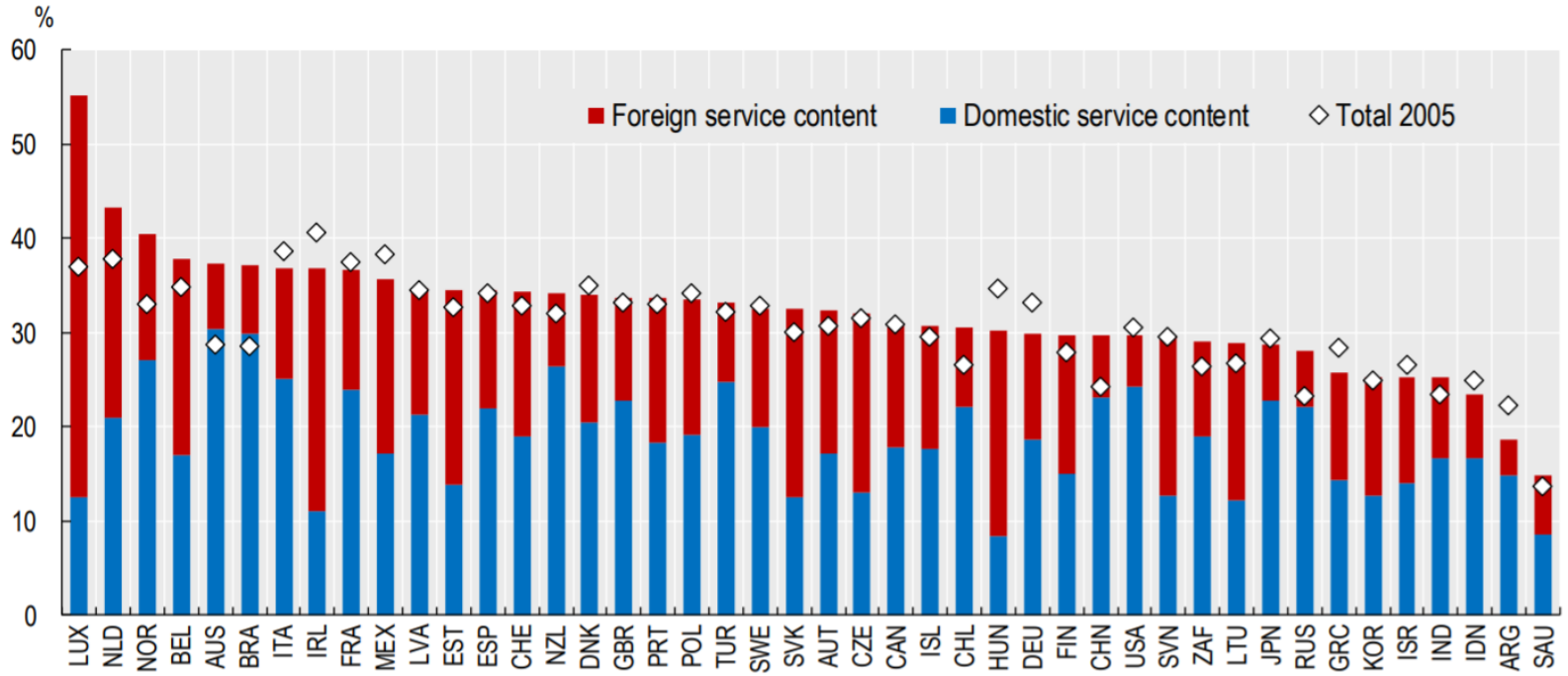
Foreign value-added share of manufactured exports



Source: **OECD (2018)**.

Inter-Country Input-Output Tables

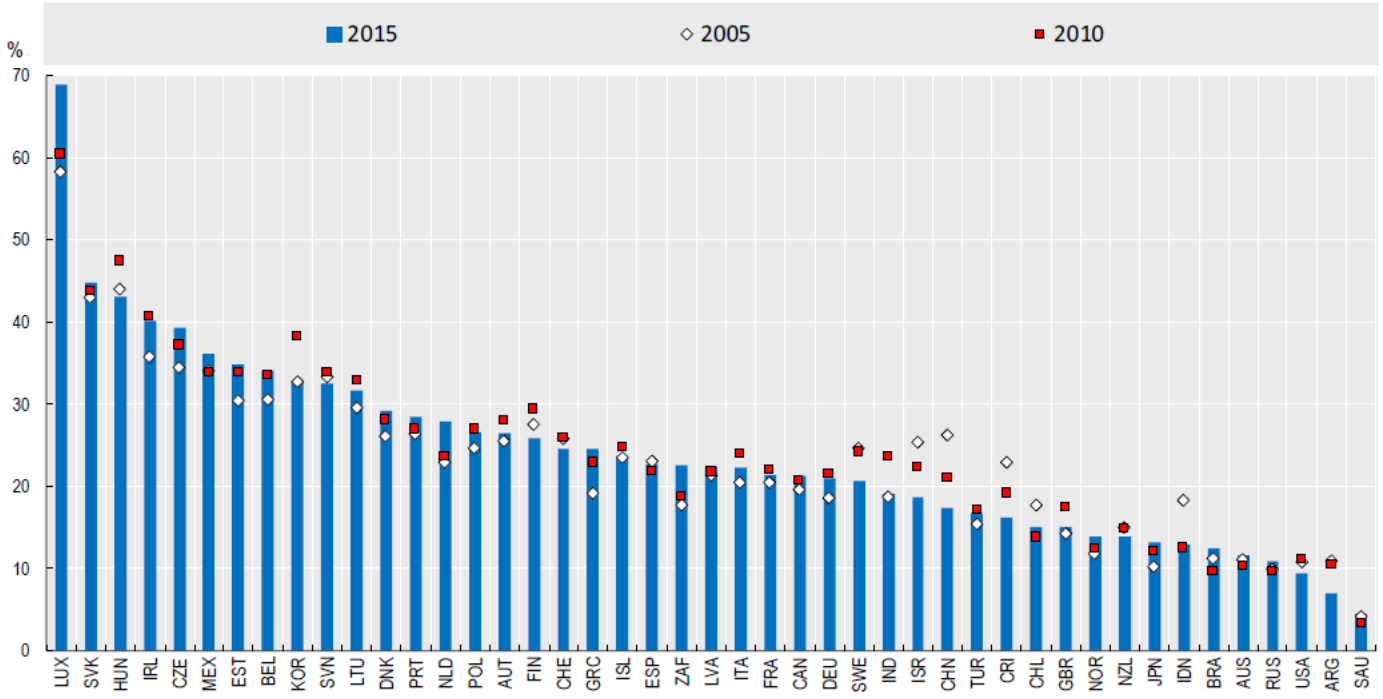
Services value-added embodied in manufacturing exports, 2015



Source: **OECD (2018)**.

Inter-Country Input-Output Tables

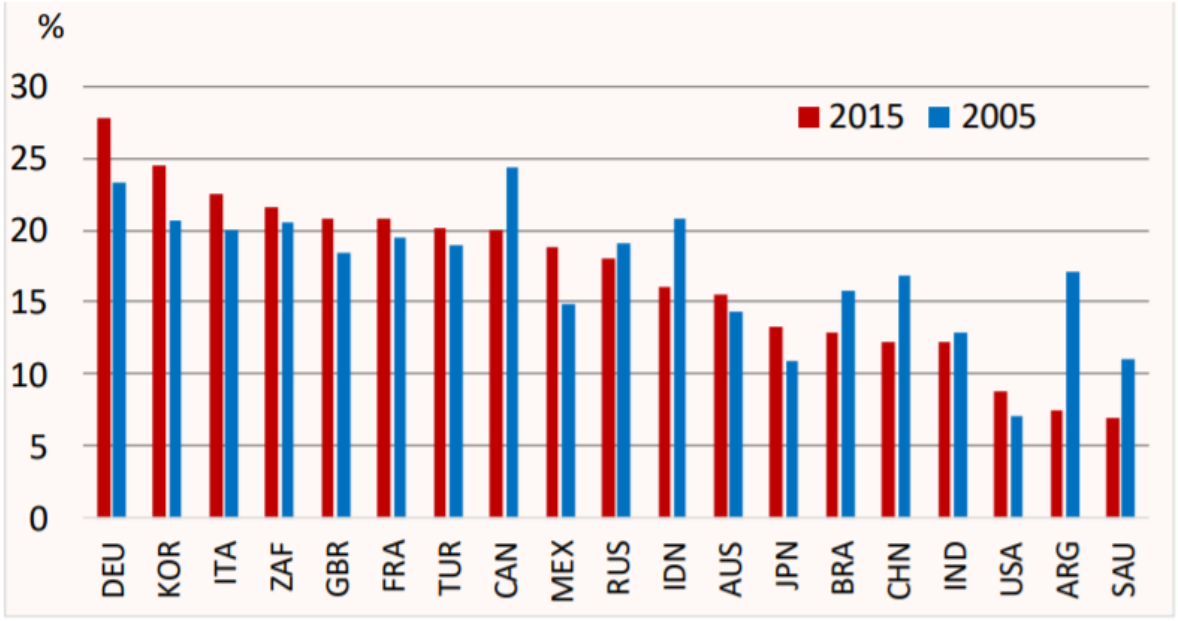
Foreign value added share of total gross exports, as a percentage of total gross



Source: **Guilhoto et al. (2019)**.

Inter-Country Input-Output Tables

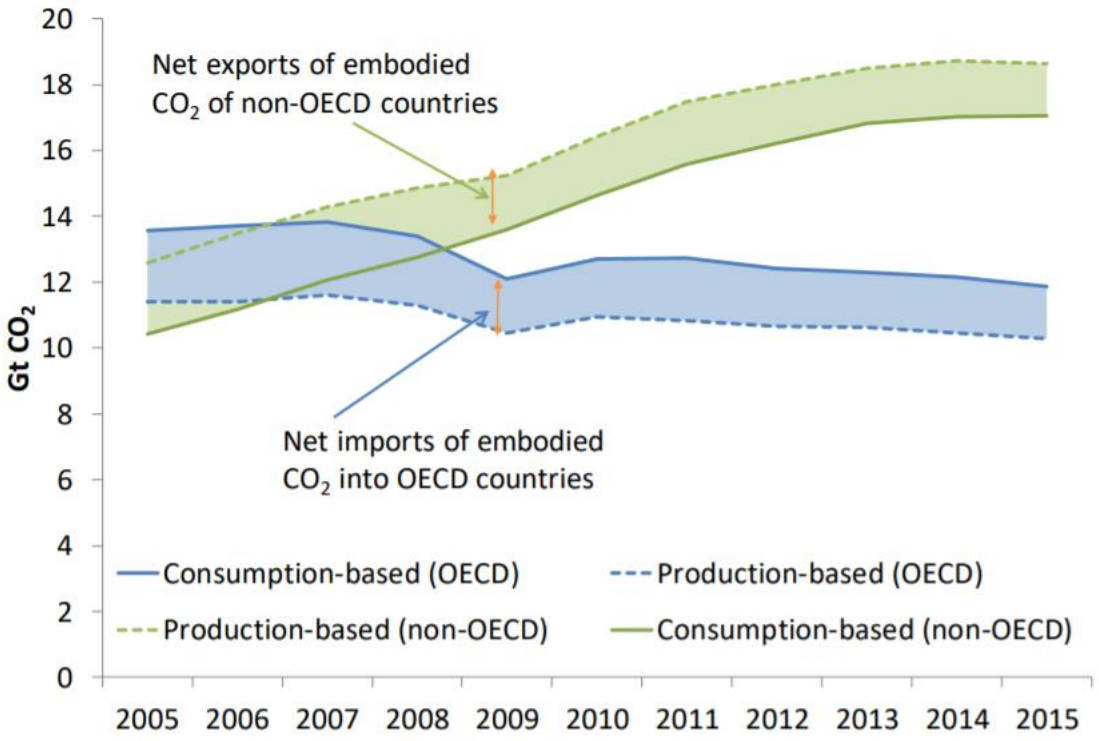
Employment sustained by foreign final demand
As a percentage of total employment



Source: **OECD (2018)**.

Inter-Country Input-Output Tables

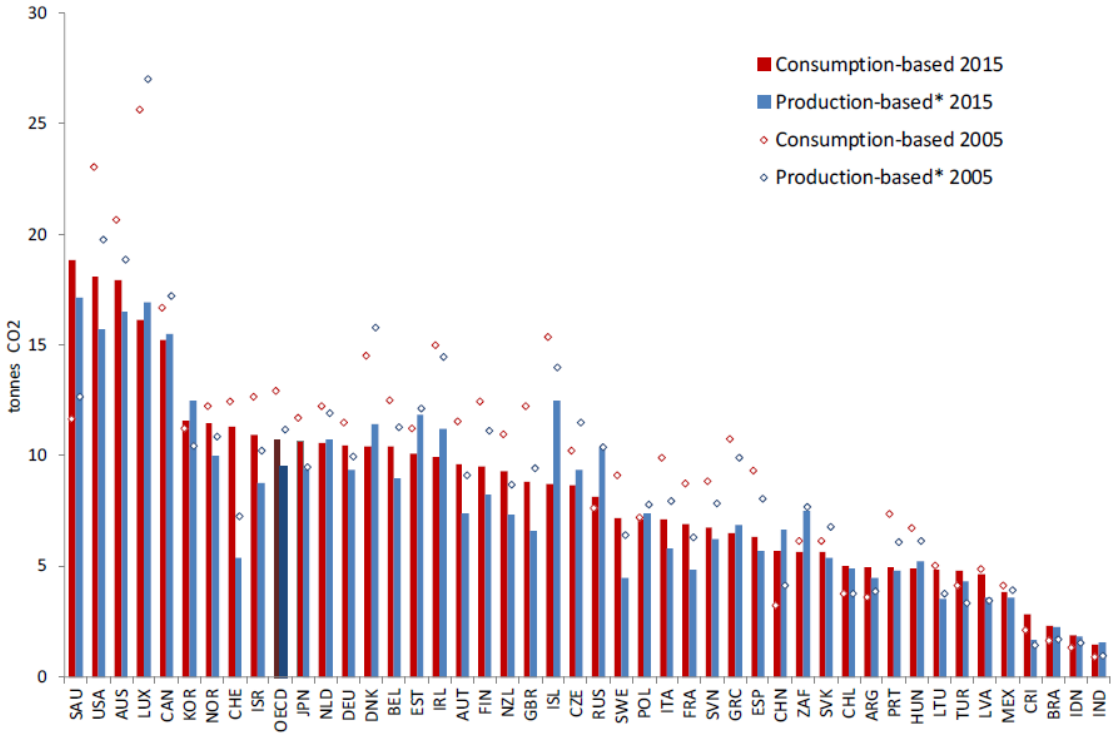
Production- and consumption-based
CO2 emissions



Source: **OECD (2018)**.

Inter-Country Input-Output Tables

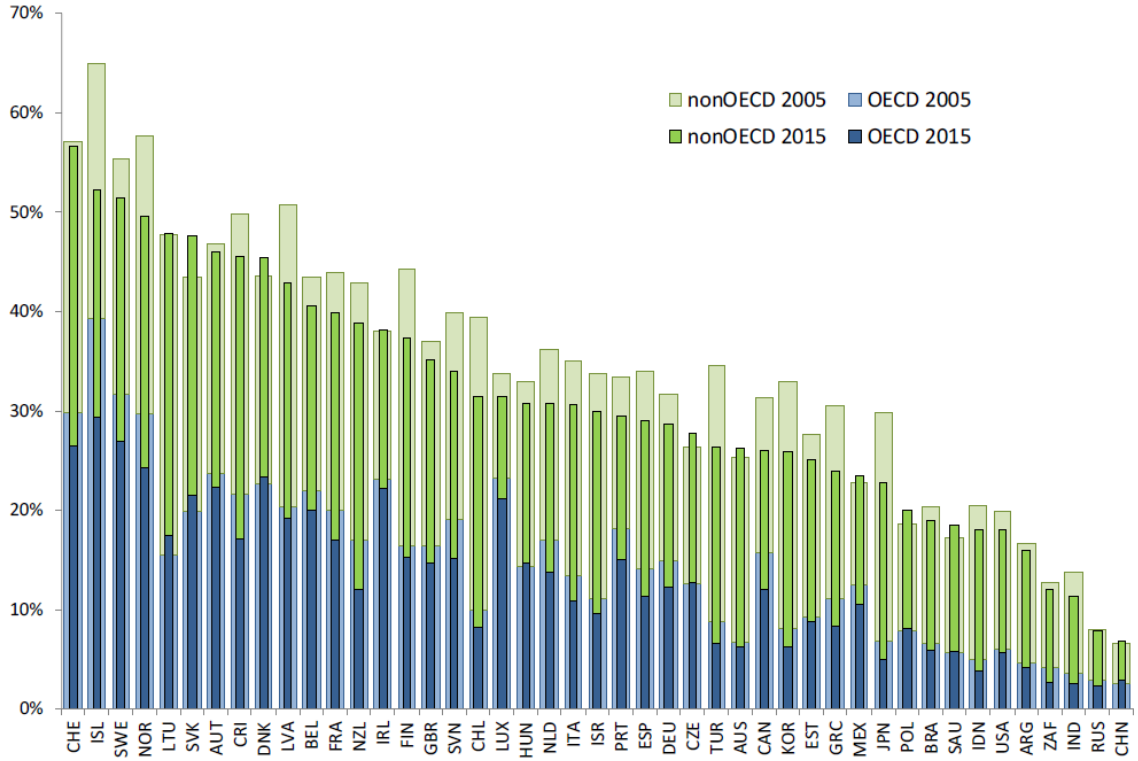
Per capita CO2 emissions from fuel combustion, consumption-based and production based (tonnes CO2)



Source: **Guilhoto et al. (2019)**.

Inter-Country Input-Output Tables

Share of CO2 emitted abroad in total CO2 embodied in domestic final demand



Source: **Guilhoto et al. (2019)**.

EORA – Multi-Region Input-Output (MRIO)

Eora MRIO
funded by the Australian Research Council

The Eora Global Supply Chain Database (EORA)

The Eora global supply chain database consists of a **multi-region input-output table** (MRIO) model that provides a time series of high-resolution IO tables with matching **environmental** and **social satellite accounts** for **190 countries**

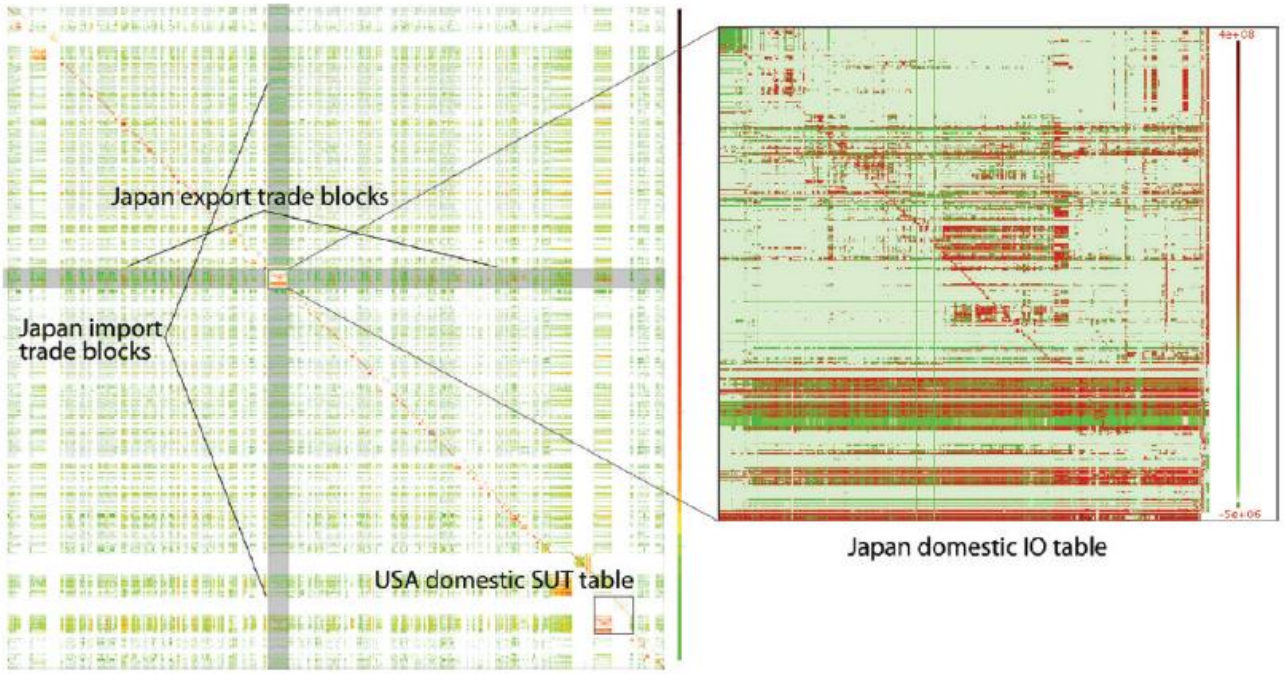
EORA – Multi-Region Input-Output (MRIO)

The Eora MRIO features:

- A balanced global MRIO table documenting the inter-sectoral transfers amongst 15,909 sectors across 190 countries
- A complete time series for 1990-2015
- 2720 line item environmental indicators covering GHG emissions, labour inputs, air pollution, energy use, water requirements, land occupation, N and P emissions, primary inputs to agriculture (including 172 crops) from FAOSTAT, and Human Appropriation of Net Primary Productivity
- A high-resolution version (full Eora) preserving national IO table detail, and a simplified verison (Eora26) with 26-sector harmonized classification
- Raw data drawn from a wide range of national and international data sources
- Reliability statistics for all results

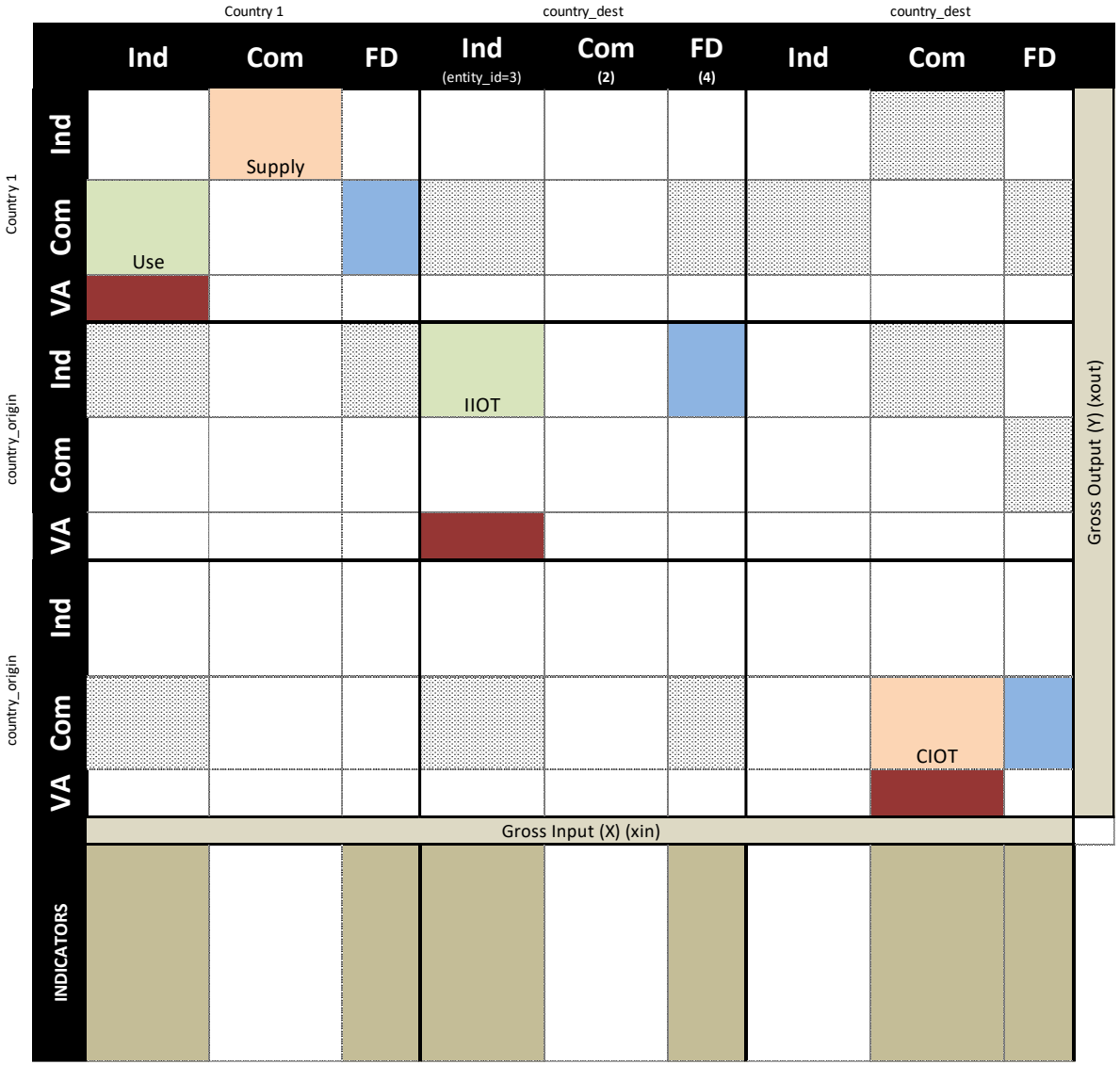
EORA – Multi-Region Input-Output (MRIO)

Eora MRIO



Source: **Lenzen et al. (2012)**.

EORA – Multi-Region Input-Output (MRIO)



EORA – Multi-Region Input-Output (MRIO)

Entities:

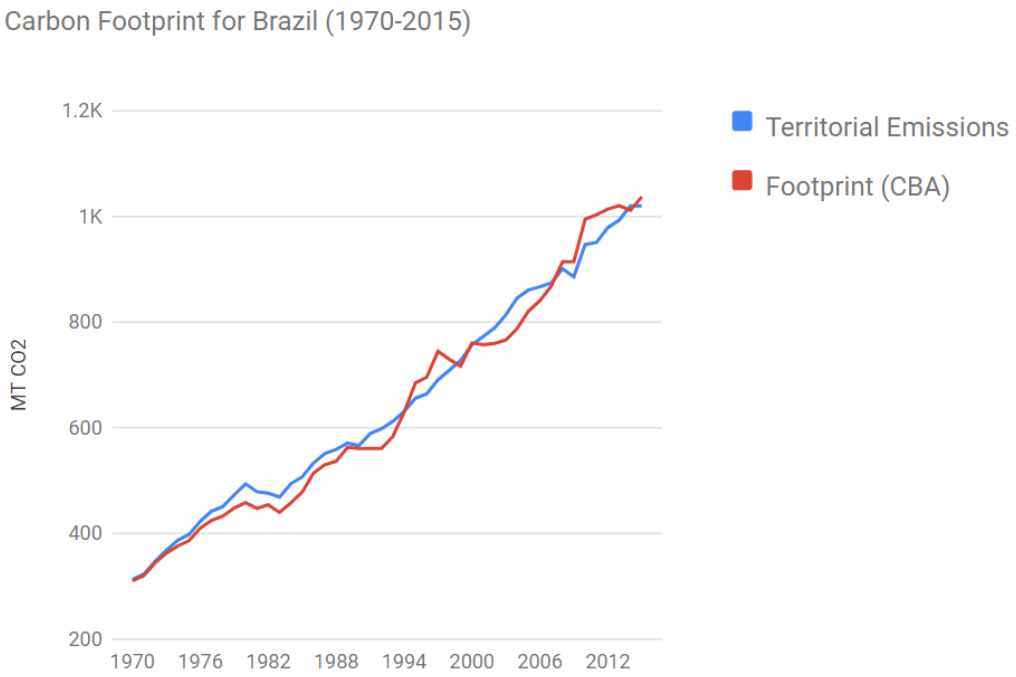
Ind	Industries
Com	Commodities
FD	Final demand
VA	Value added (also called primary inputs)
Indicators	Satellite indicator accounts, documenting nonmonetary inputs to production

In Eora countries use a mix of different types of IO tables. They are:
- Industry-by-Industry IO tables (IIOT)
- Commodity-by-Commodity IO table (CIOT)
- Supply-Use Table (SUT), with an Commodity->Industry Use table and an Industry->Commodity Supply (also called "Make") table

The figure to the left shows how these IO tables are combined in the Eora MRIO layout.
Colored and shaded blocks contain values/transactions; white blocks are empty.

EORA – Multi-Region Input-Output (MRIO)

Eora Carbon Footprint of Nations



Consumption-based accounting (CBA) of emissions (also called carbon footprints) accounts for emissions associated with imported and exported goods. CBA reports the total emissions associated with final demand in each country.

EORA – Multi-Region Input-Output (MRIO)

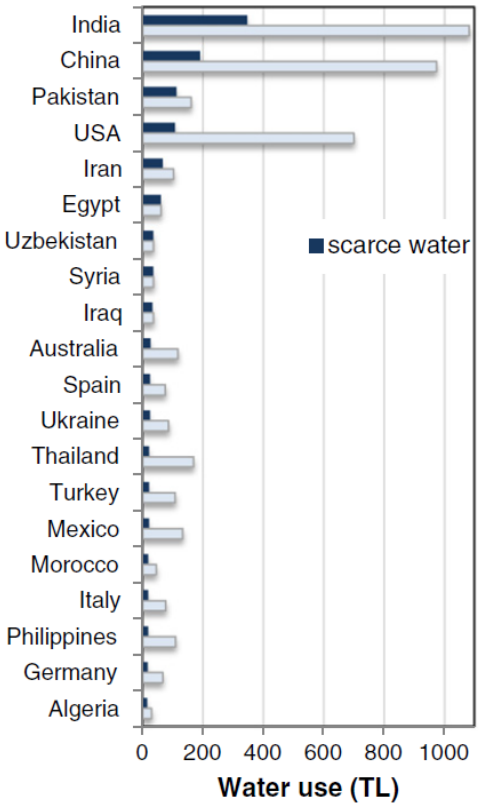
UNCTAD-Eora Global Value Chain Database

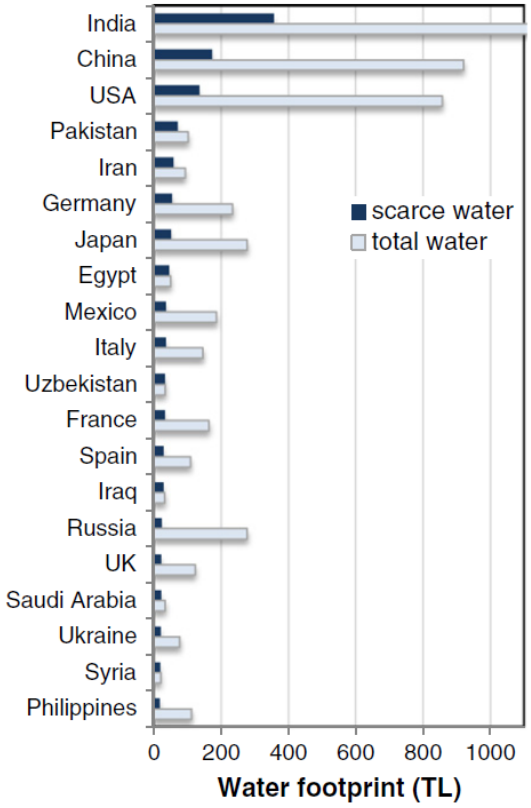
The UNCTAD-Eora Global Value Chain (GVC) database offers **global coverage** (189 countries and a "Rest of World" region) and a **timeseries from 1990 to 2019** of the **key GVC indicators**:

- Foreign value added (FVA)
- Domestic value added (DVA)
- Indirect value added (DVX)

Results from 1990 to 2017 are generated from EORA Multi-Region Input-Output tables (MRIOs). Results for 2016-2017 are provisional "beta" results and will be revsied in early 2019. Results for 2018-2019 are nowcasted based on the IMF World Economic Outlook

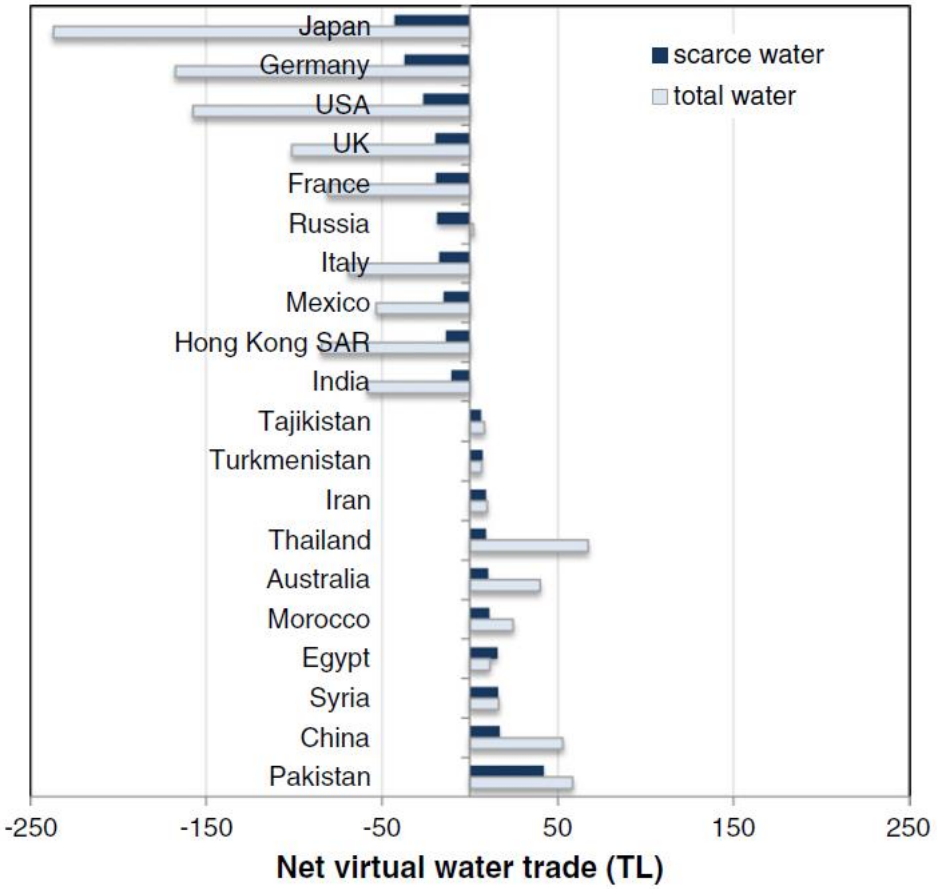
EORA – Multi-Region Input-Output (MRIO)





Source: **Lenzen et al. (2013)**.

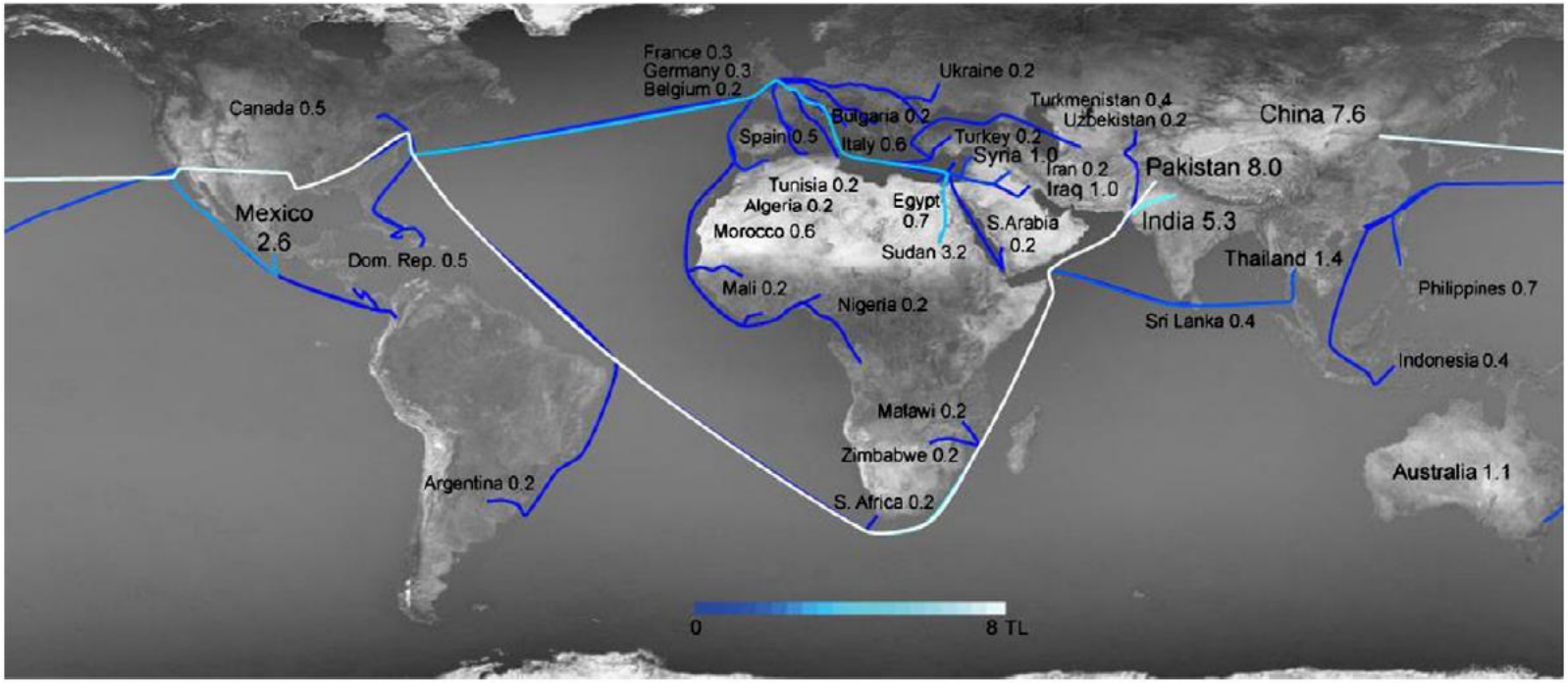
EORA – Multi-Region Input-Output (MRIO)



Source: **Lenzen et al. (2013)**.

EORA – Multi-Region Input-Output (MRIO)

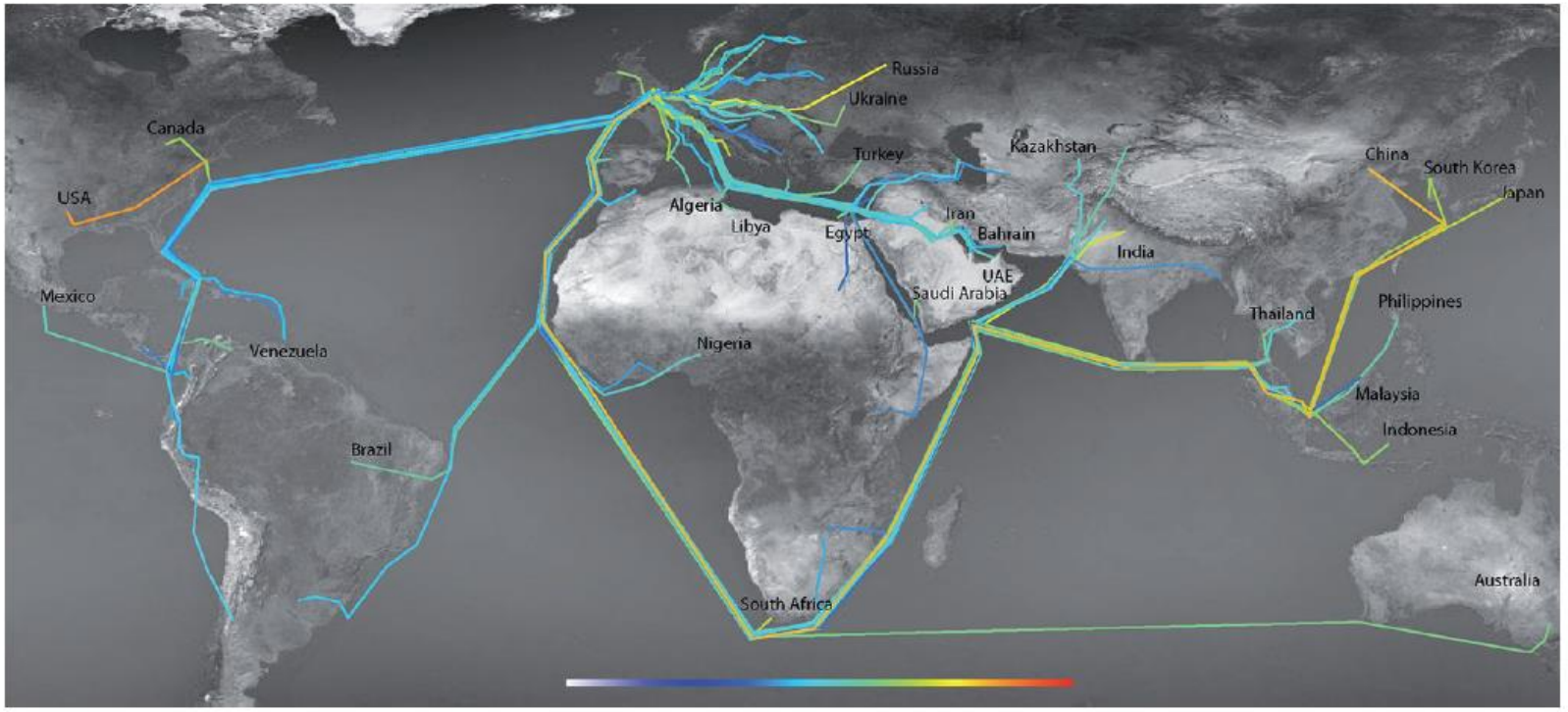
Top sources of virtual water imports into the USA



Source: **Lenzen et al. (2013)**.

EORA – Multi-Region Input-Output (MRIO)

Global flow map of embodied energy consumed in the UK



Source: **Lenzen et al. (2012)**.

Evaluating the Differences in Global Input-Output Databases

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