



*25 YEARS OF INPUT-OUTPUT
ANALYSIS AT THE OECD:
FROM TECHNOLOGY
SPILLOVERS TO TIVA AND
BEYOND*

Andy Wyckoff, Director
Directorate for Science, Technology and Innovation, OECD

25th International Input-output Conference, 20th June 2017



Dedication: Norihisa Sakurai 1957-2015



Nori

- *pioneer of OECD IO work,*
- *IIOA vice-president*
- *good friend*



IO for Policy: 3 decades / 3 stages

Three distinct phases:

- **1990s:** Structural Change & International technology spillovers
- **2000s:** Embodied CO₂
- **2010:** Trade in Value Added (TiVA) / GVCs
- **2016+**

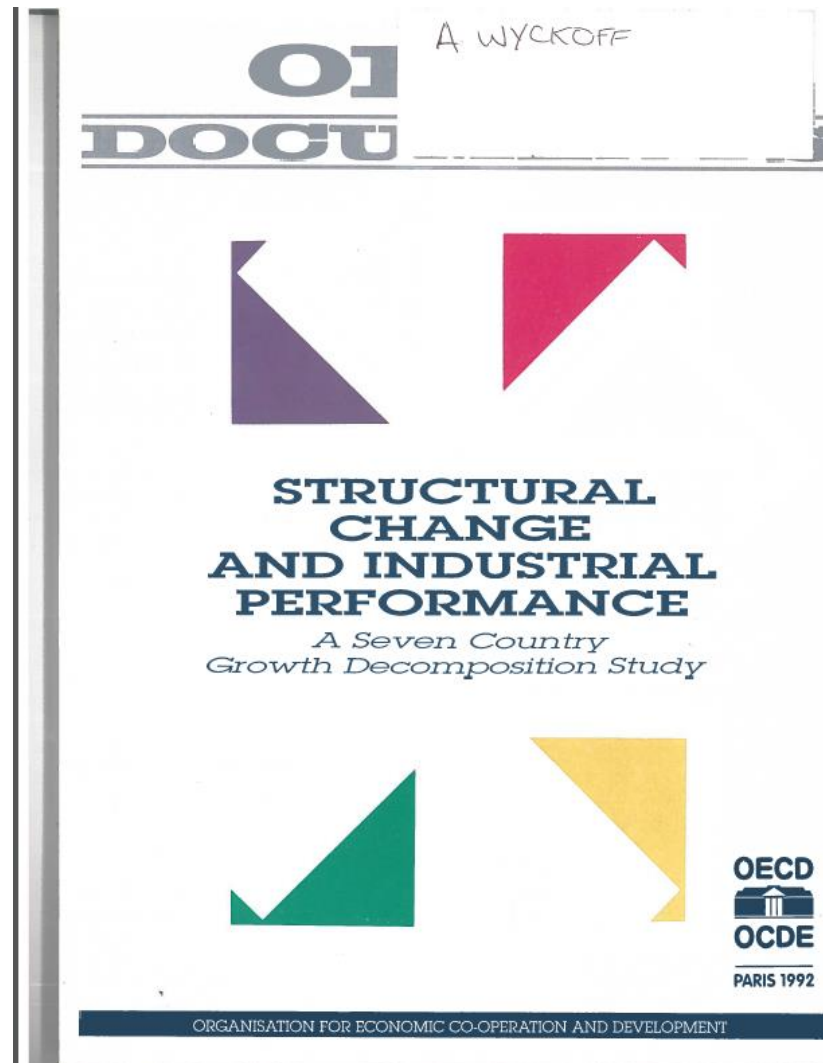


The 1990s





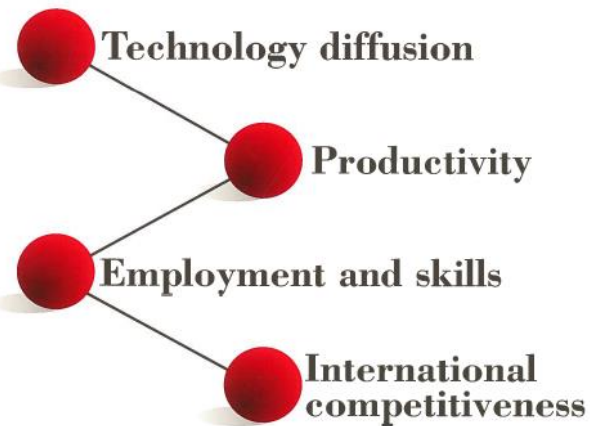
Growth Decomposition for 7 Countries





Technology & Productivity

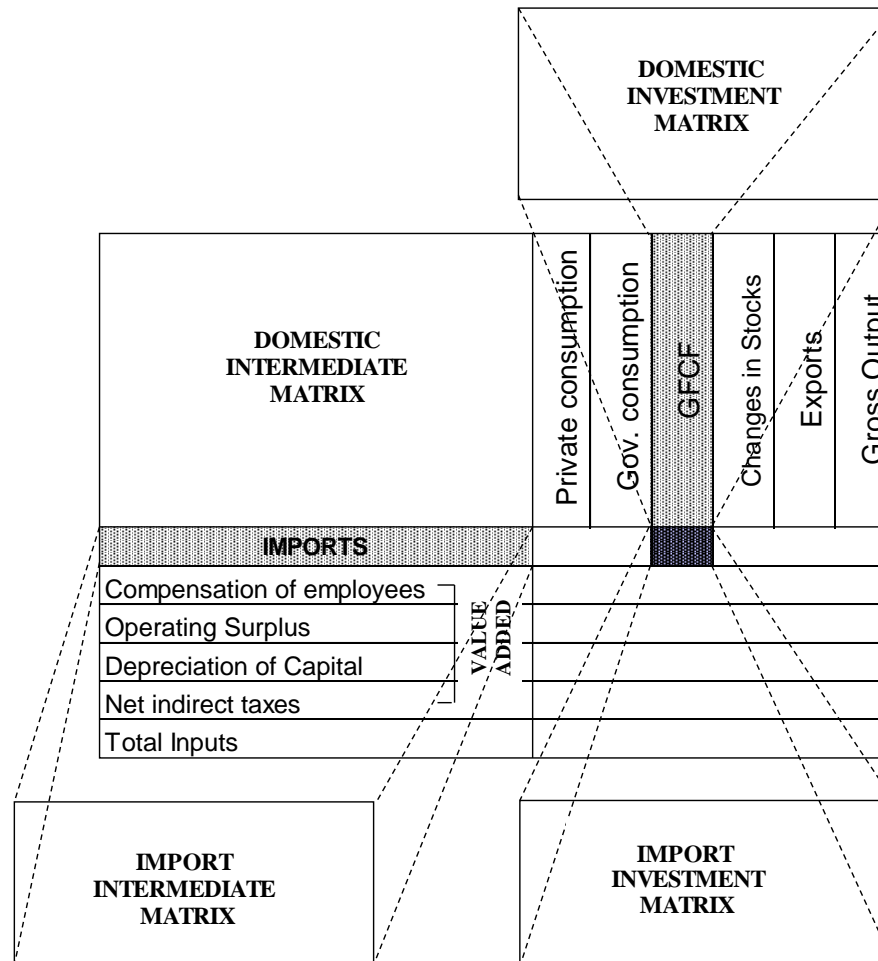
TECHNOLOGY AND INDUSTRIAL PERFORMANCE





Investment (GFCF) matrices !

Figure 1. OECD INPUT-OUTPUT SYSTEM



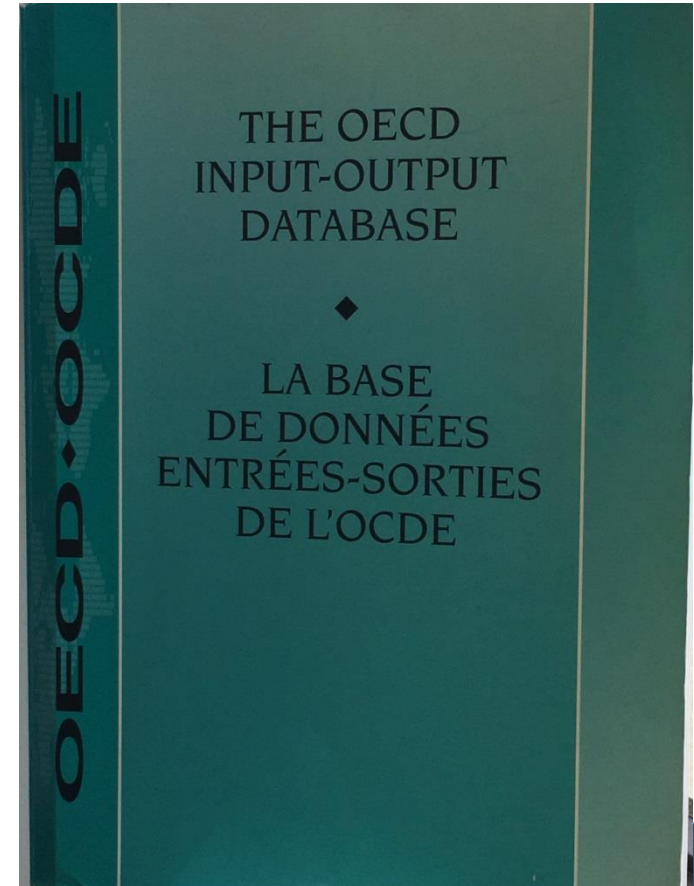
Investment goods sourced from abroad



OECD's first I-O publication - 1995

- 10 countries
- 5 benchmark years
 - from \approx 1970 to 1990
- 36 industries
 - **ISIC Rev.2 (SNA68)**
- Current and constant prices
- Investment matrices.

- **Data still available on request ...**





20 years ago on the web



OECD Input-Output (I/O) Database

The OECD Input-Output database provides internationally-comparable input-output tables in both current and constant price terms for several time points from 1970 to 1990 for ten OECD countries: Australia, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, the United Kingdom and the United States. The unique features of this database are:

- its international comparability based on the use of a common industrial classification (ISIC Revision 2, 36 sectors), which allows the distinction of high-technology, trade-oriented industries such as pharmaceutical, computers, communication equipment, automobiles and aircraft;
- the distinction of transaction flows of goods and services;
- the inclusion of consistent capital investment flow matrices.

This publication provides an invaluable empirical tool in economic analysis among sectors, covering not only manufacturing but also services. [Bilateral trade](#) and industrial R&D; ([ANBERD](#)), it provides a new employment consistently at both the sectoral and macroeconomic levels.

Click here for [details of the coverage](#).

First edition : November 1995.

Reference: (92 95 12 3) ISBN 92-64-04612-7

Price: France FF 250, Other Countries: FF 325 US\$ 67 DM 93

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The STAN-family of databases emerges

- **STAN:** Output, value added and employment by industry
- **BTD:** Bilateral trade by industry
- **ANBERD:** Business R&D expenditure by industry
- **STAN-IO:** Harmonised national Input-Output tables



2000s



<https://guyanachronicle.com/2014/12/01/govt-accepts-doha-amendment-to-kyoto-protocol-exemplifies-commitment-to-fight-climate-change>



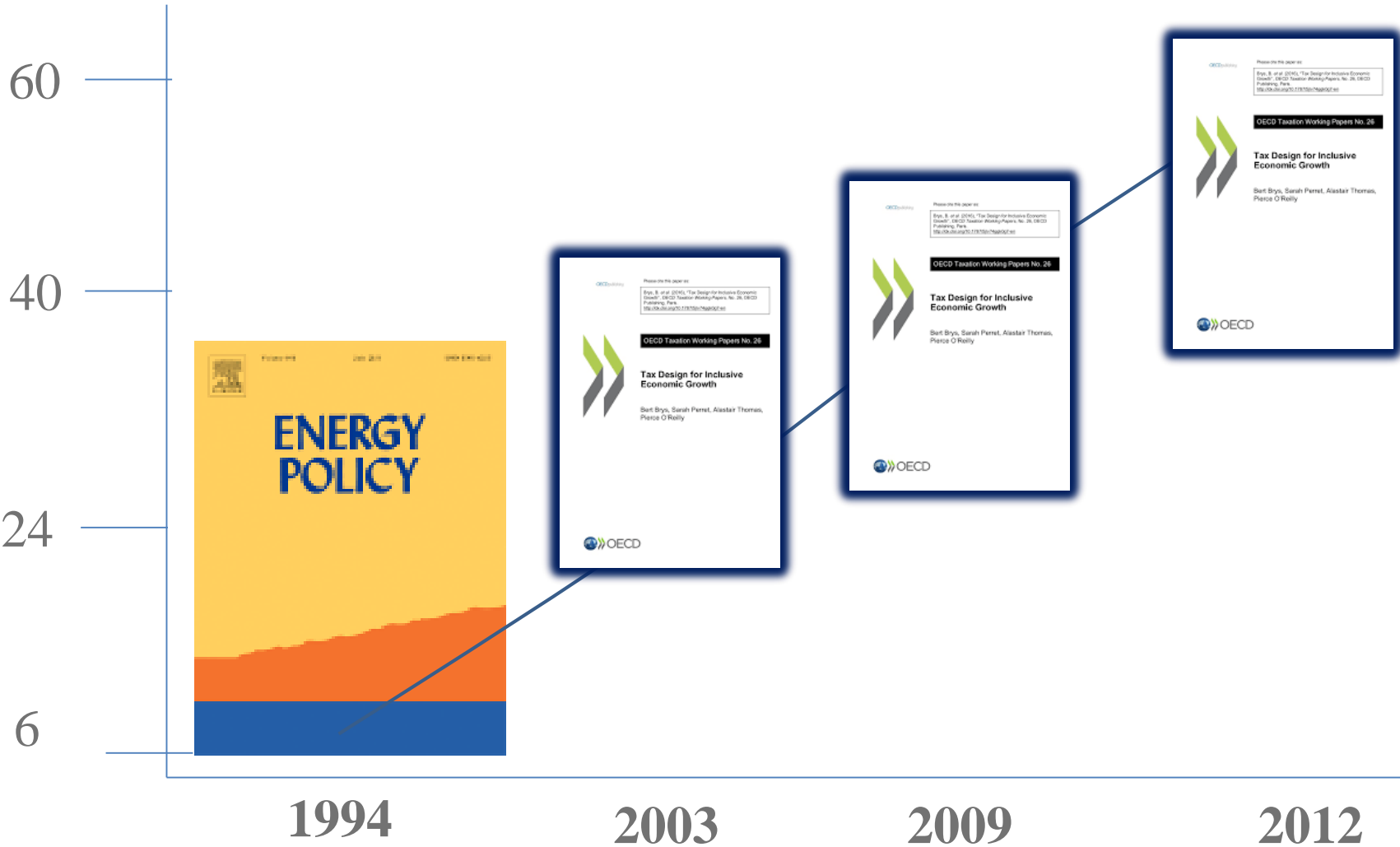
Consumption-based carbon accounting

Context

- Existing accounting system is based on place of emission - but important and persistent point of contention in identifying “polluter”
- Greenhouse gases emitted by many countries may be embodied in final goods.
- Measuring a nation’s production-based or territorial-based CO₂ emissions is not enough.

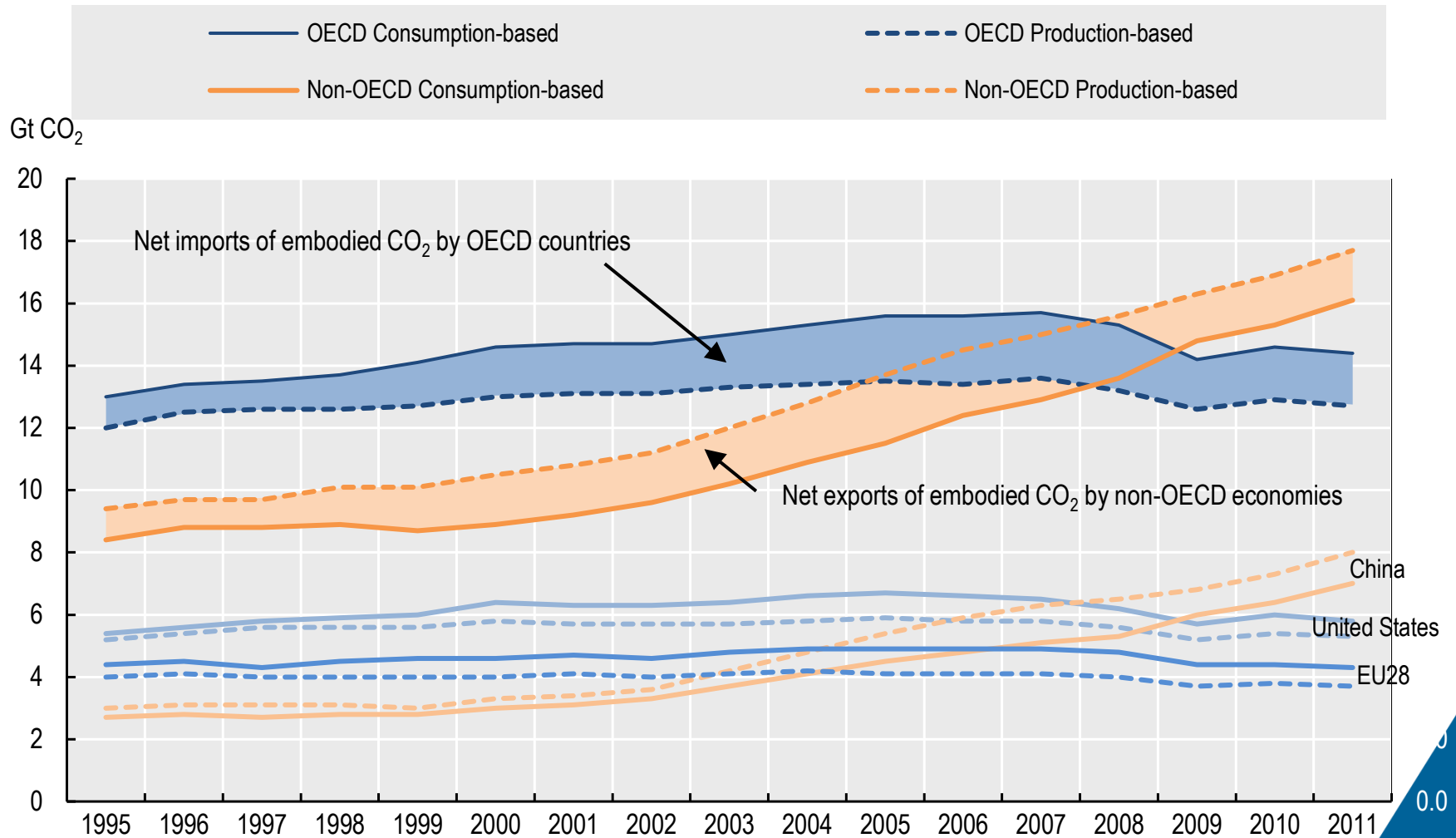


Estimating Carbon Embodied in Trade:





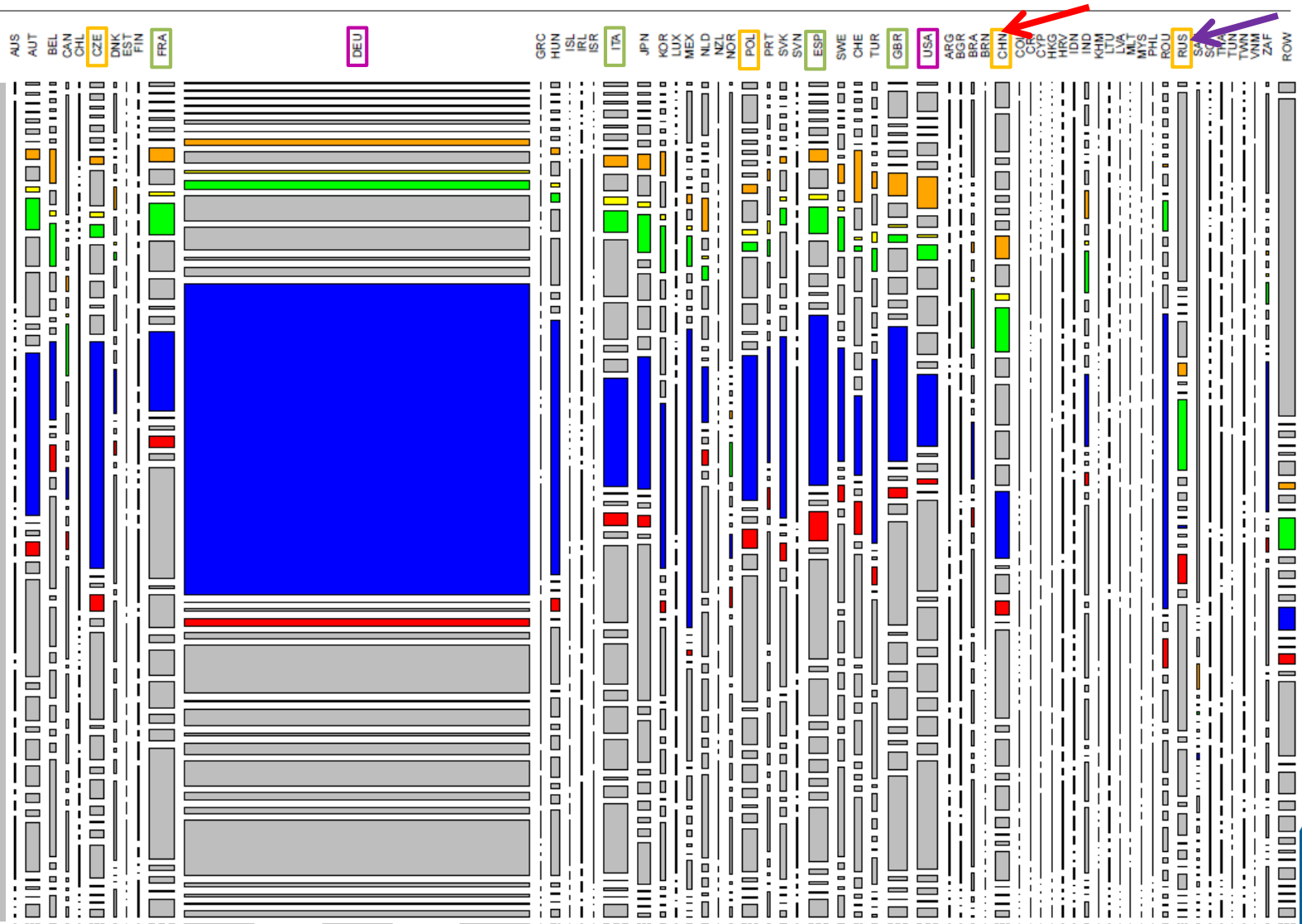
CO2 emissions: production- and consumption-based estimates 1995-2011





Germany's demand for motor vehicles

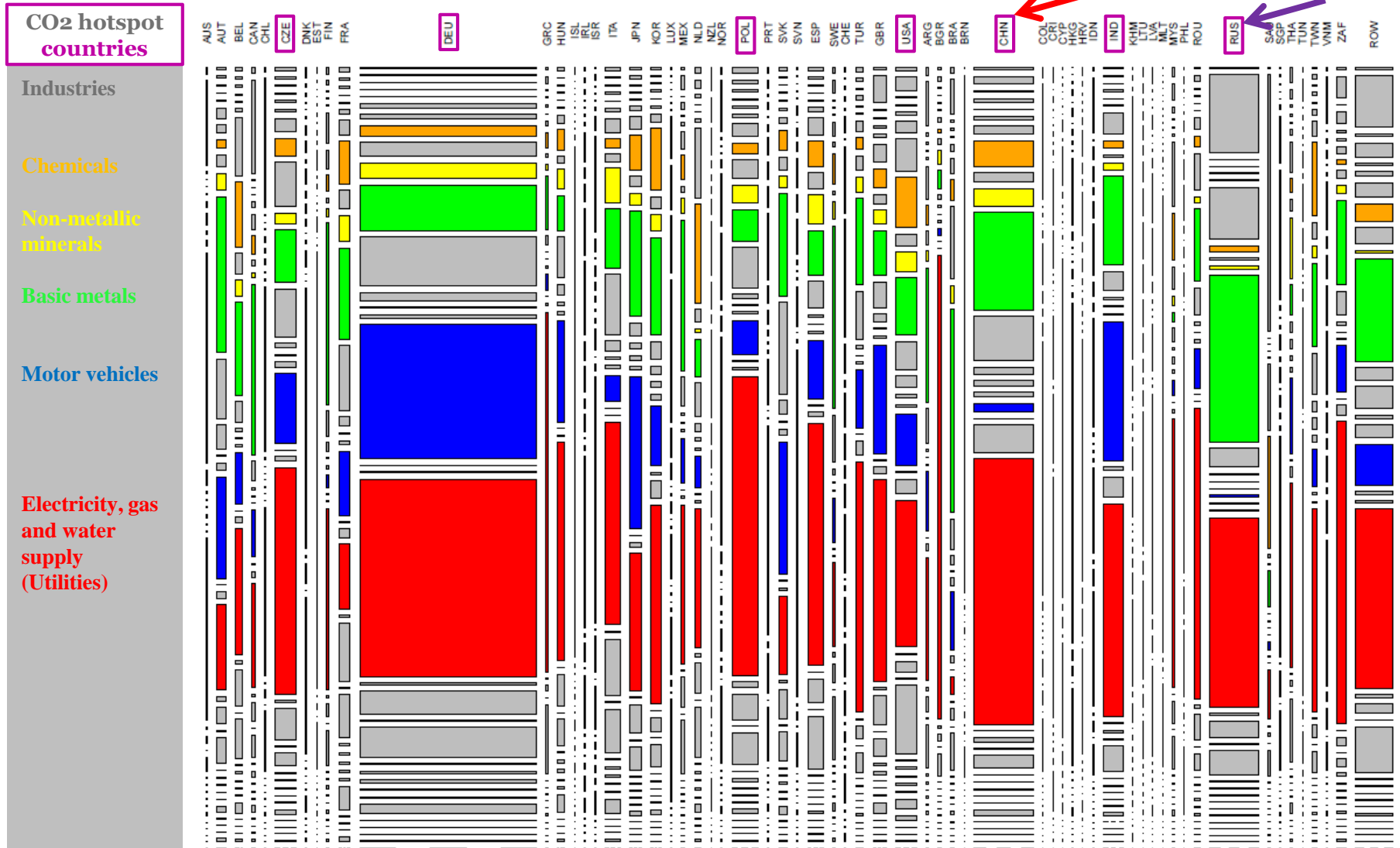
2011, Origin of value added by country and industry





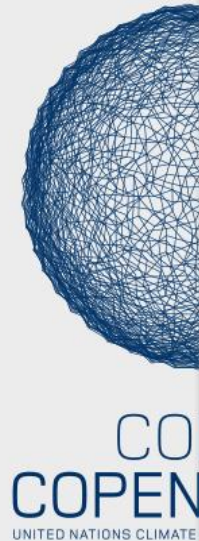
Germany's demand for motor vehicles

2011, Origin of CO2 emissions by country and industry – hotspots





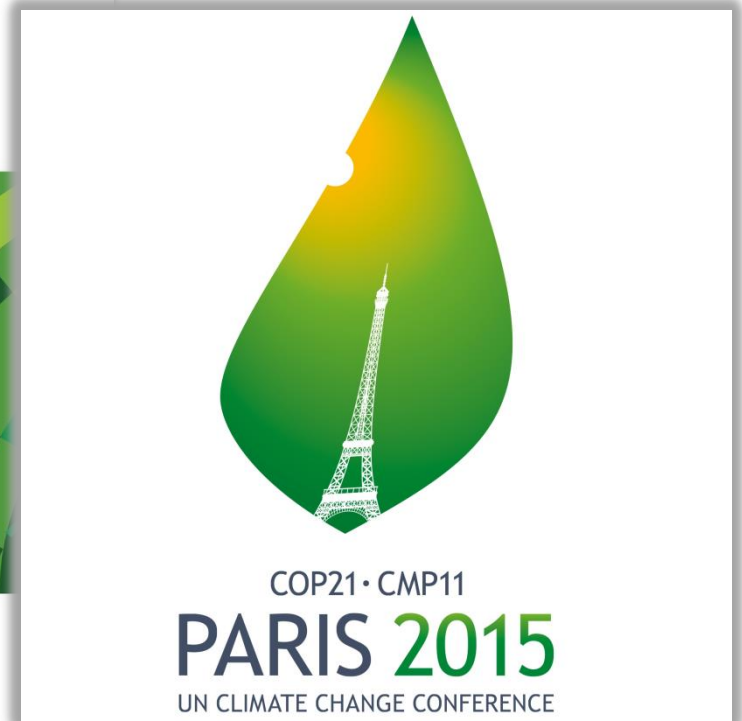
Growing recognition



2009



2014

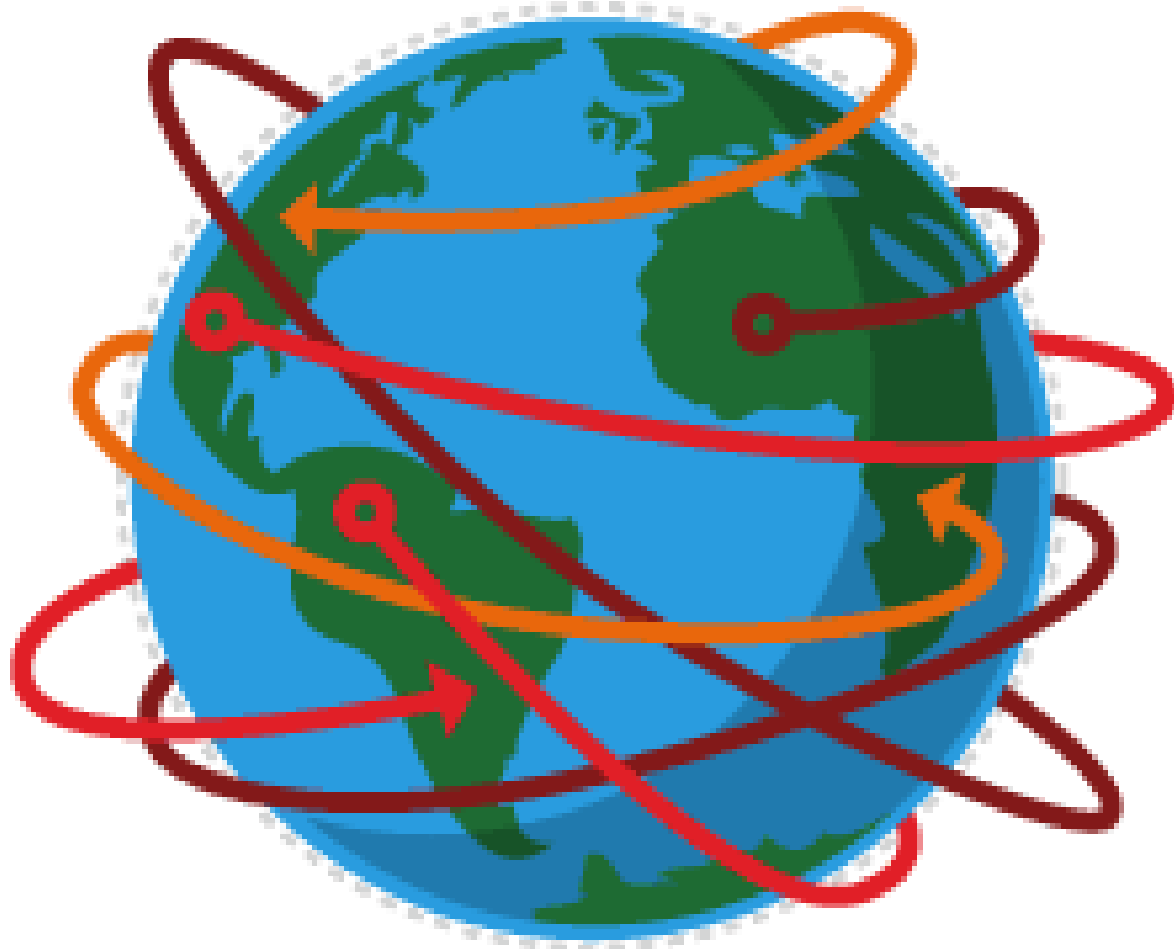


2015

https://en.wikipedia.org/wiki/2009_United_Nations_Climate_Change_Conference; <https://za.ambafrance.org/Paris-2015-COP-21-COP21-videos>



2010s

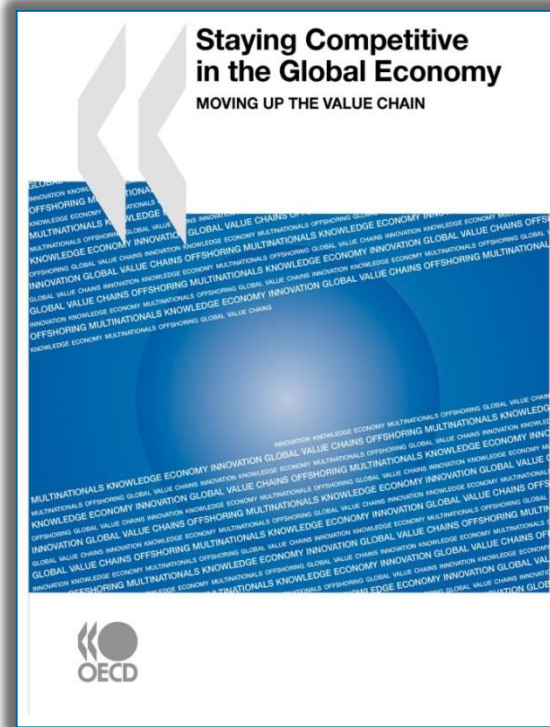




Global Value Chains: a well-established concept



2005



2007



2008



Apple's iPod Teardown: GVCs simplified

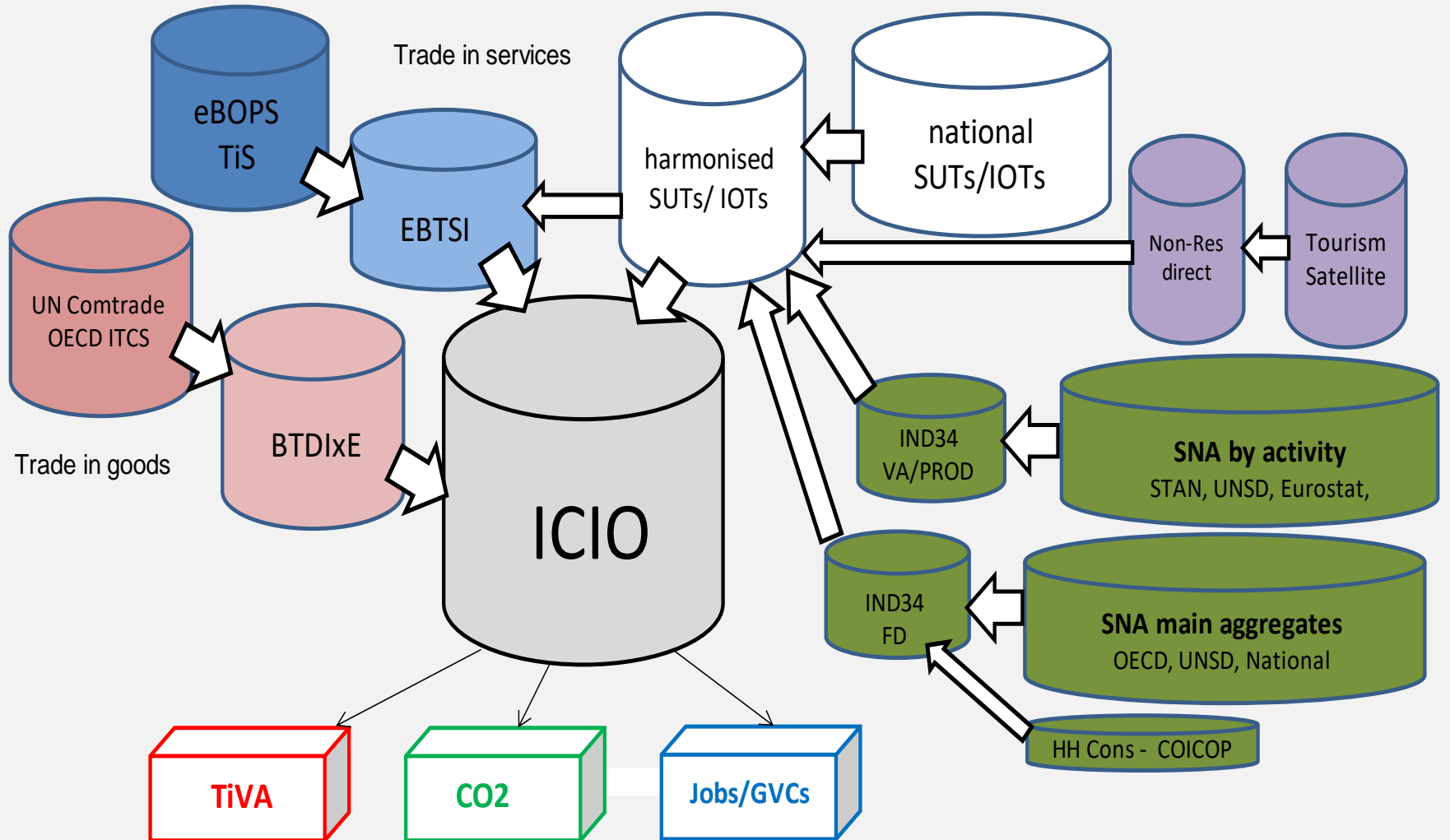


Distribution of the value added

- 299 US\$
 - 75\$ profit to US (Apple)
 - 73\$ whls/retail US (Apple)
 - 75\$ to Japan (Toshiba)
 - 60\$ 400 parts from Asia
 - 15\$ 16 parts from the US
 - 2\$ assembly by China



“We could do that...”





OECD-WTO TiVA database and GVC synthesis for Ministers



Research rewrites global trade data

OCDE et OMC affinent la vision du commerce mondial grâce à de nouvelles données

PAGE 4

FINANCIAL TIMES FT.com

L'OMC et l'OCDE rebattent les cartes du commerce mondial

Scoop
INDEPENDENT NEWS

Research reshapes debate on global trade policy

OECD und WTO messen Welthandel neu

Trade's added value

New statistics reveal glorious interdependence of countries

NASDAQ

THE IRISH TIMES

theguardian

WORLD ECONOMICS

LesEchos

DER STANDARD

la Repubblica

THE WALL STREET JOURNAL

LE DEVOIR

Statistics is not always the bedfellow of lies and damned lies. At its best, it brings epiphanies. An initiative by the OECD and the World Trade Organisation to map the value added embodied in international trade flows should be an eye-opener for policy makers.

Revolutionary Trade Database Launched by OECD and WTO

Bloomberg

OECD/WTO 'Value-Added' Trade Measure Shows Exchange Rate Issues Overstated

The Washington Post

services in creating goods. Whilst there are, at present, limitations to the widespread calculation of trade in value-added data, this OECD-WTO initiative is to be applauded for providing a more revealing look into global trade and integration, and for paving the way for further development in this area.

Handelsblatt

Ces produits qui bouleversent le commerce mondial

PORTAL GOSPODARCZY

CHINA DAILY

Expansión



REUTERS

THE ECONOMIC TIMES

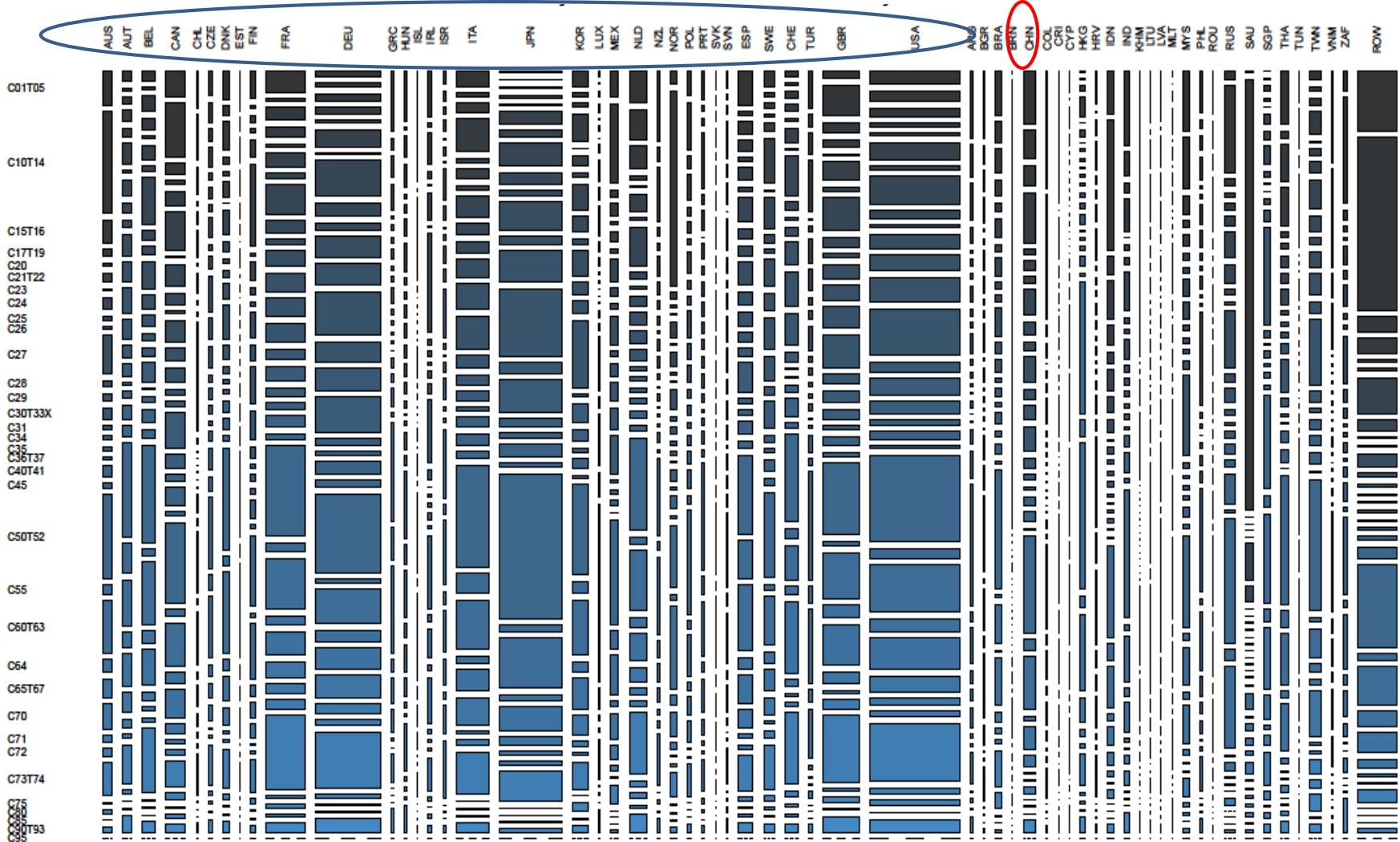


El Financiero



The genome of world trade - 1995

Value added in world exports by source country and source industry, 1995



Coefficient = DATA.ICIOeconCVB ; Demand = DATA.ICIOeconGRTR ; Calculation = couSindS
ExportCou = WOR ; ExportInd = CTOTAL ; DemandCou = WOR



The genome of world trade - 2011

Value added in world exports by source country and source industry, 2011



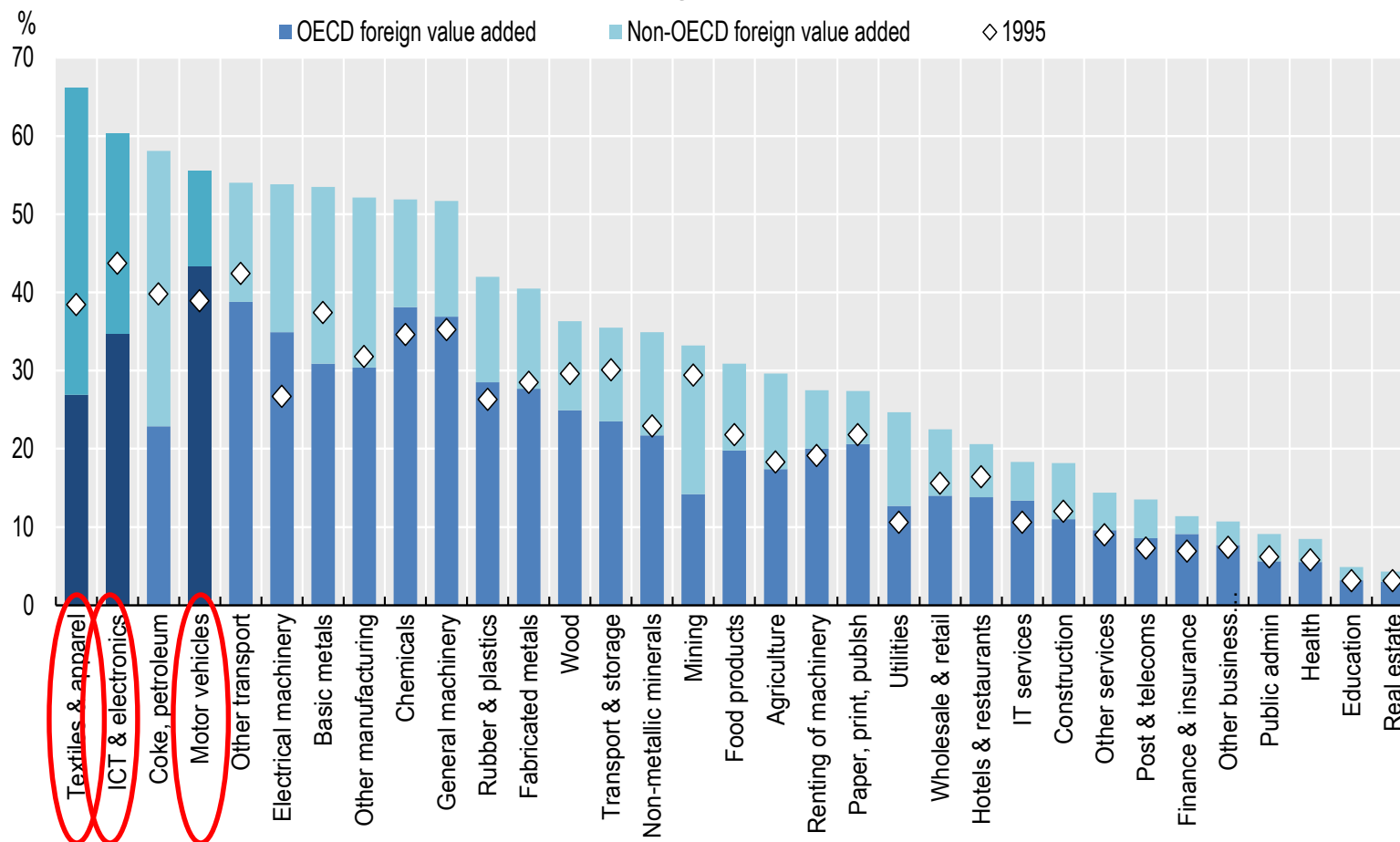
Coefficient = DATA.ICIOeconCVB ; Demand = DATA.ICIOeconGRTR ; Calculation = couSindS
ExportCou = WOR ; ExportInd = CTOTAL ; DemandCou = WOR



TiVA tells us which sectors are the most global...

Foreign value added embodied in domestic demand, by sector, OECD average, 2011

(as a percentage of total domestic demand)

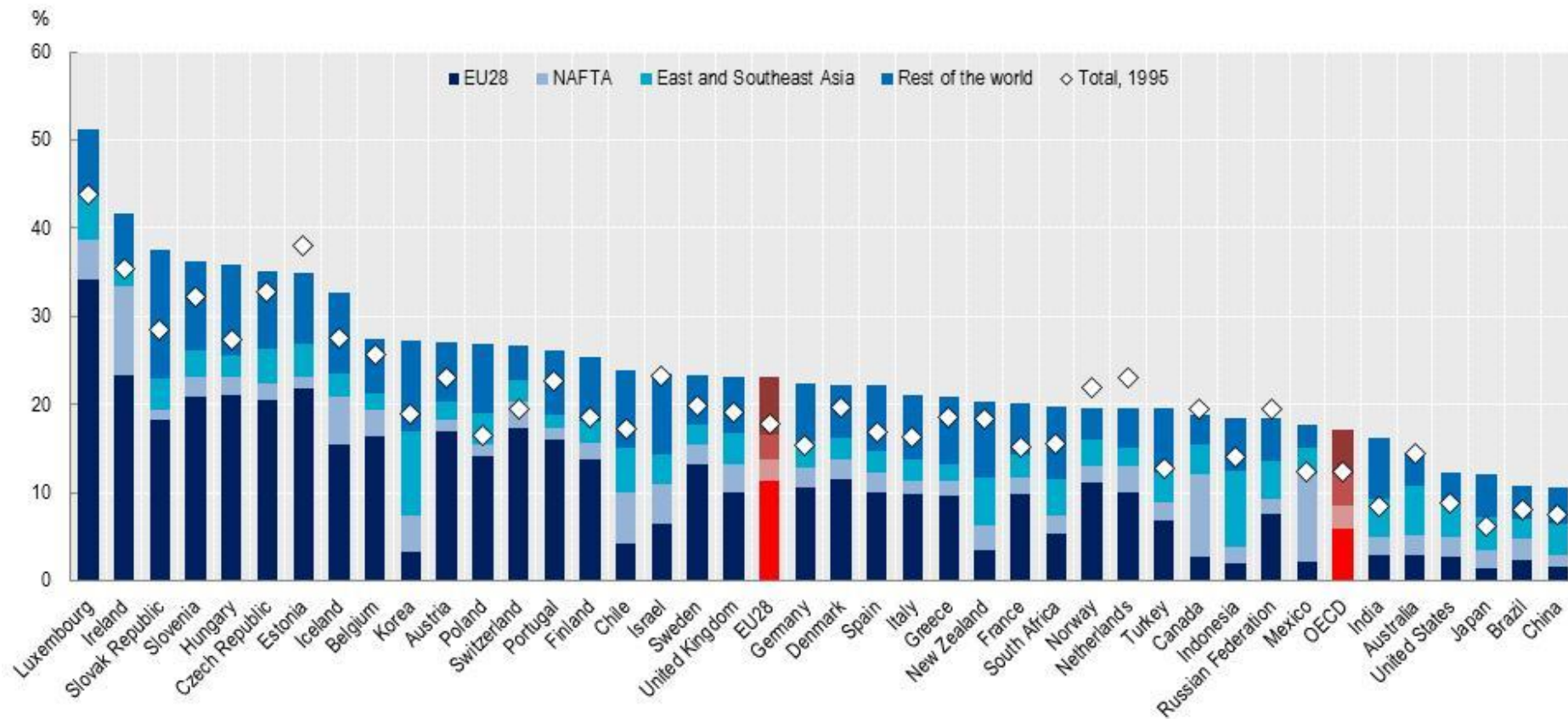


Source: Science, Technology and Industry Scoreboard 2015, forthcoming.



... the extent to which consumption relies on foreign value added ..

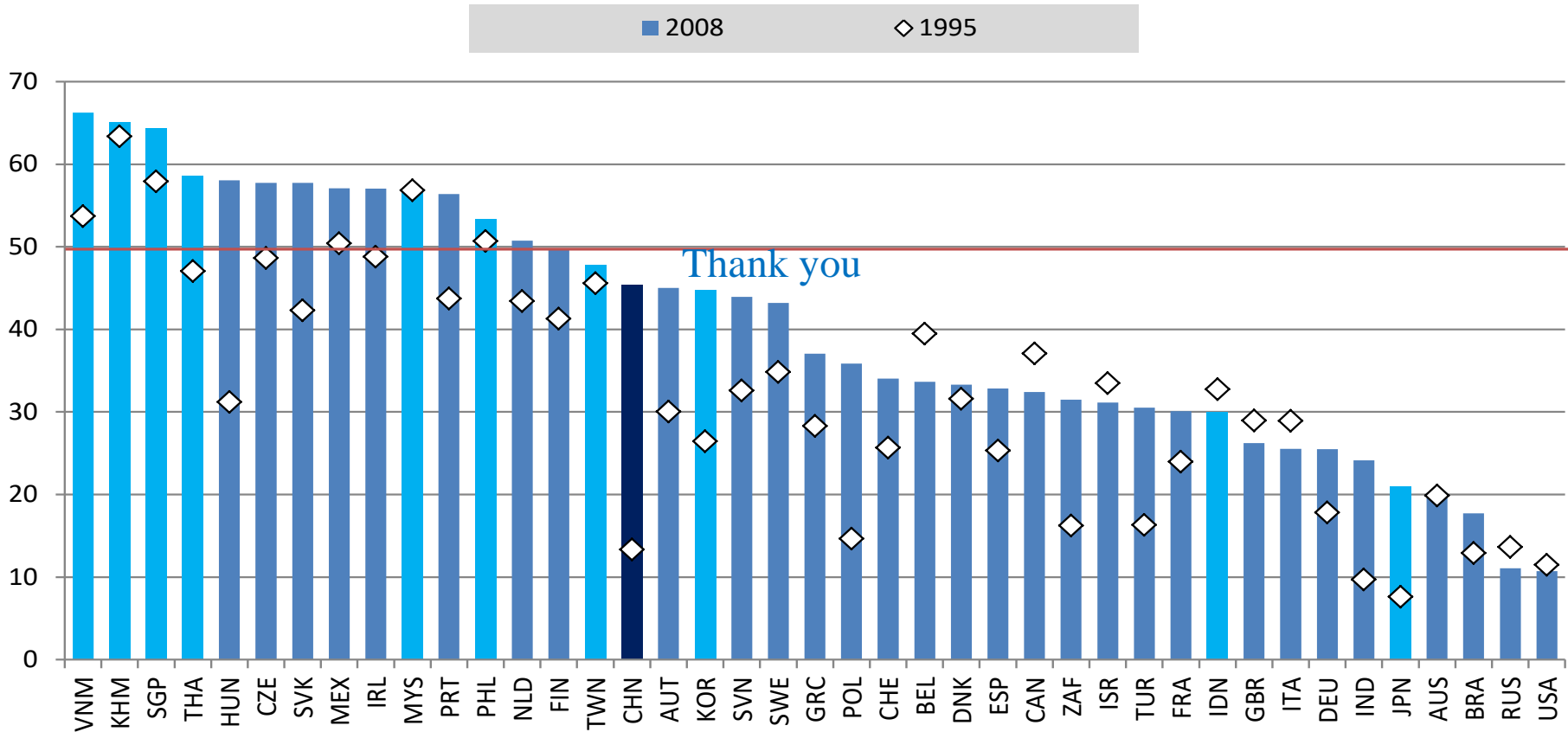
Foreign value added in domestic consumption, by source region, 2011
As a percentage of total domestic consumption





...that exports require imports...

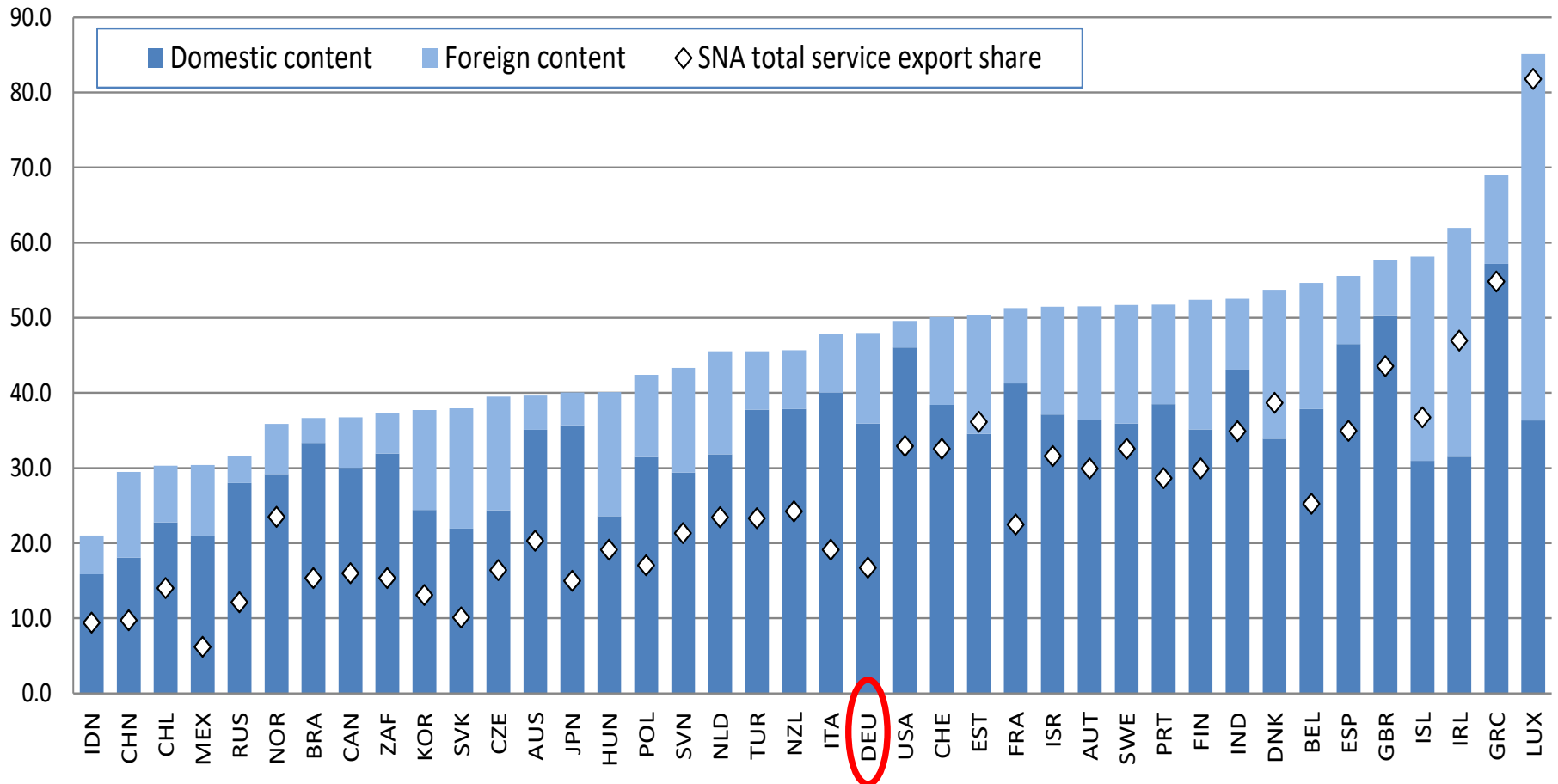
*Foreign value-added content of gross exports (%)
Electrical and optical equipment (30t33)*





...and services matter...

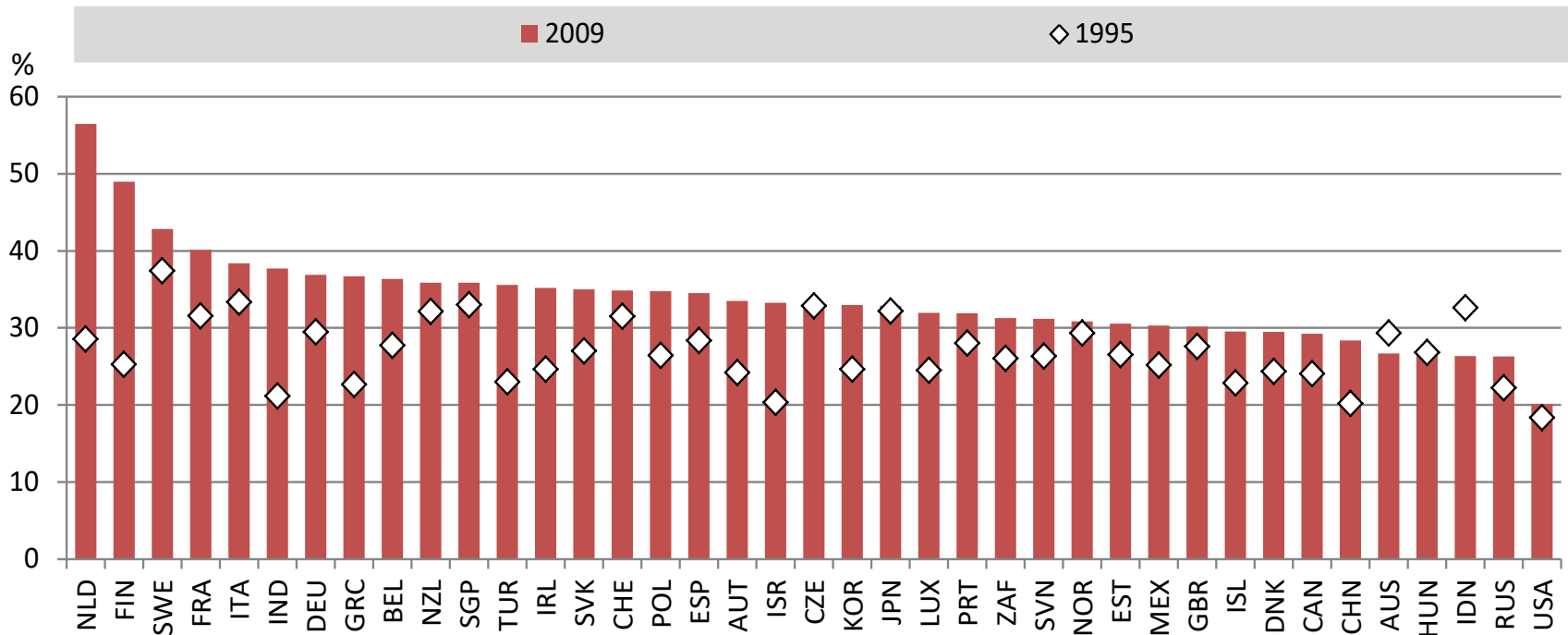
Services Value-Added: % of exports, 2009





...even for manufactured goods...

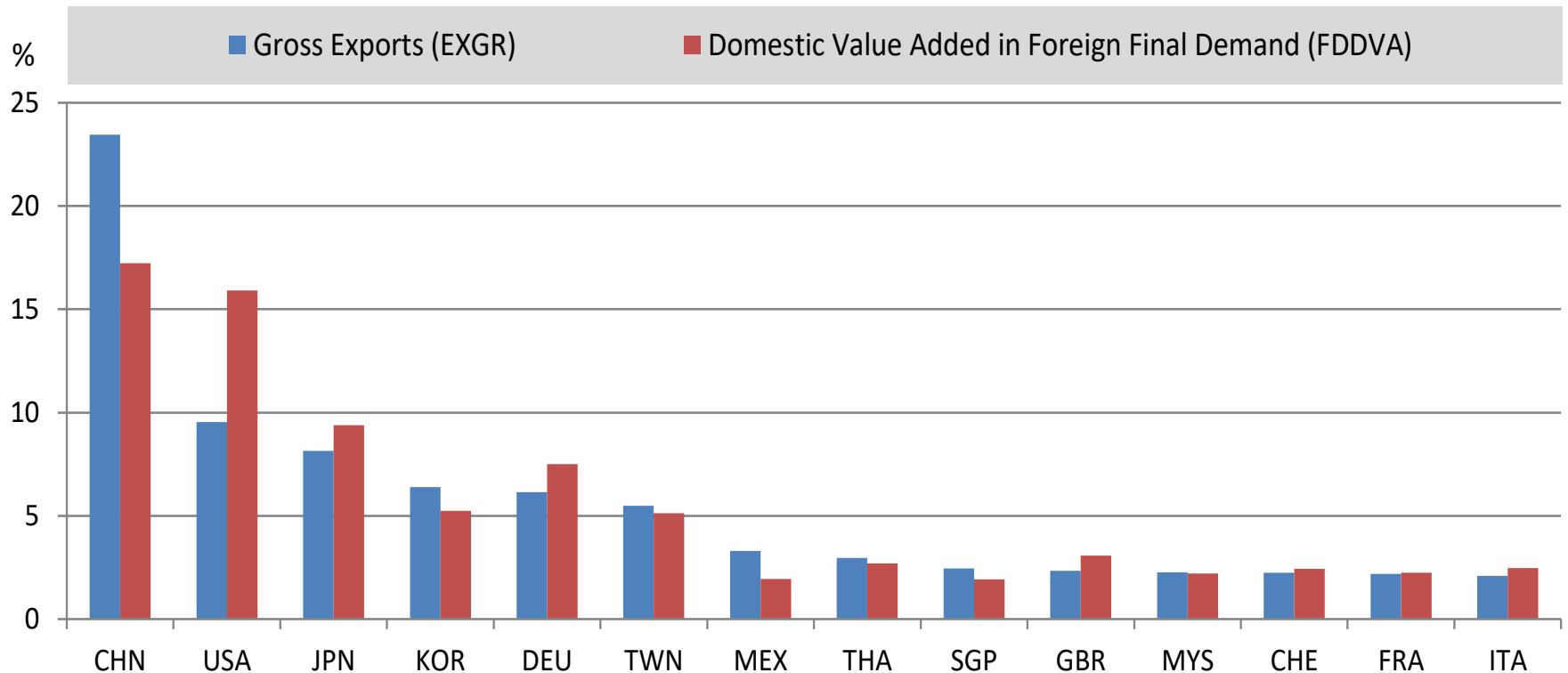
Exports of electrical and optical equipment (30t33), 2009 Service value added content, %





...and via TiVA new trade patterns emerge.

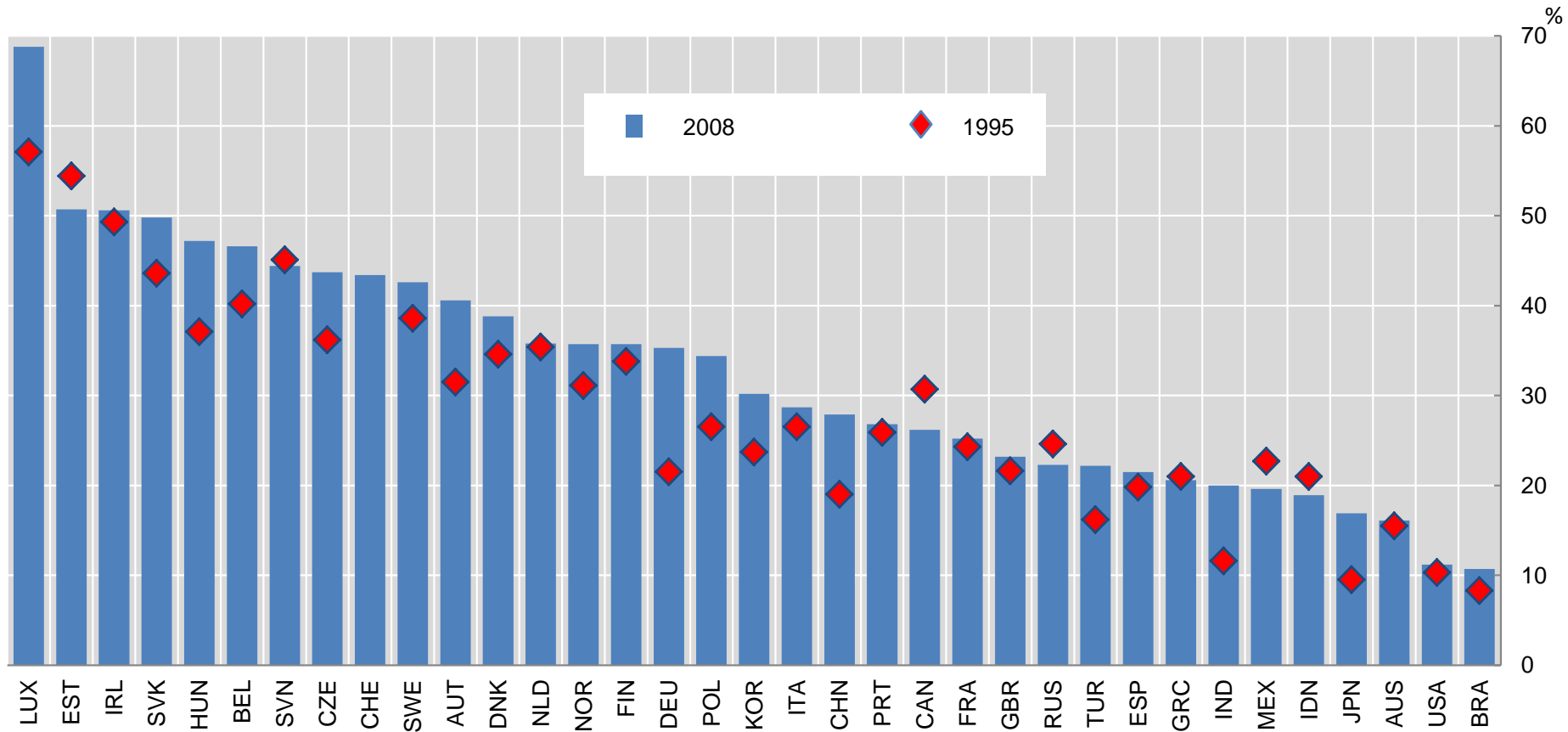
Shares of world exports in gross and value added terms, Electrical and optical equipment (30t33)





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

As a percentage of total business sector employment



Source: OECD Science, Technology and Industry Scoreboard 2013.

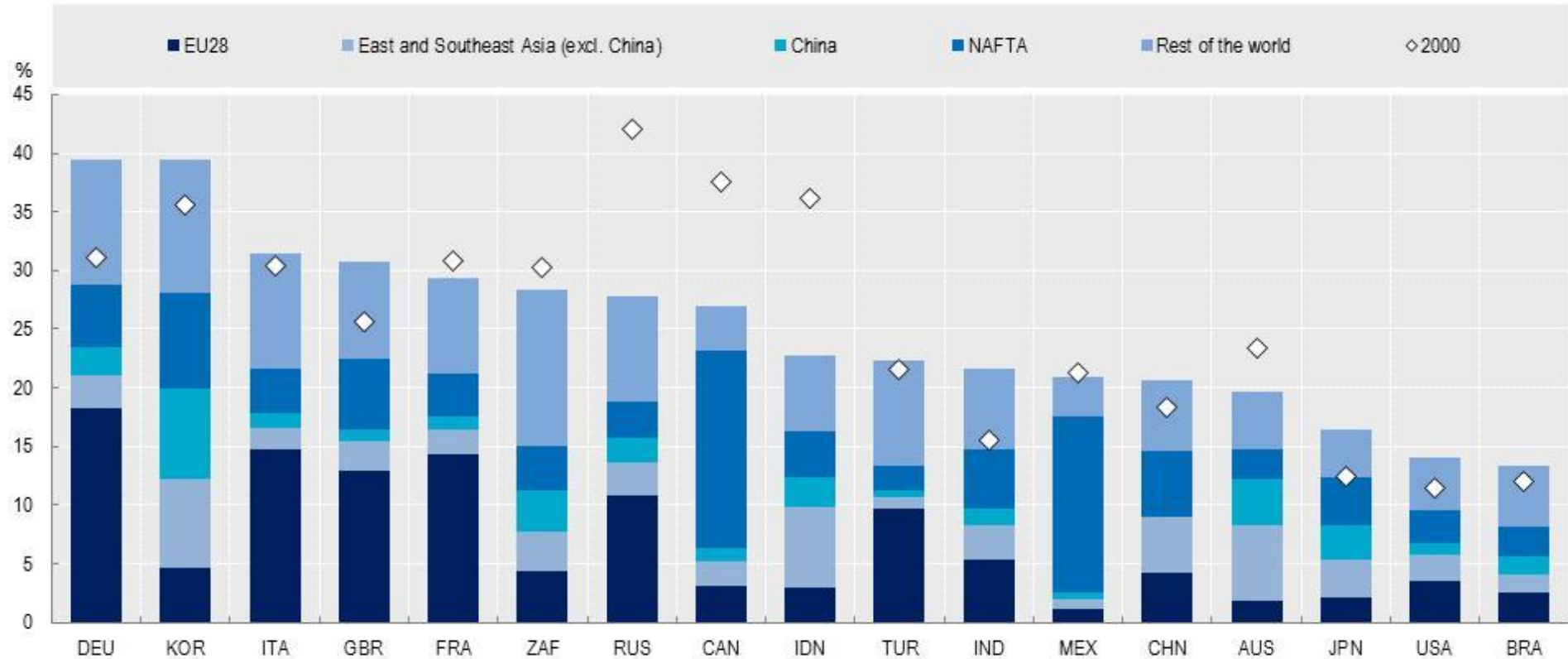
<http://dx.doi.org/10.1787/888932904469>



...by region of demand...

Jobs in the business sector sustained by foreign final demand, by region of demand, 2011

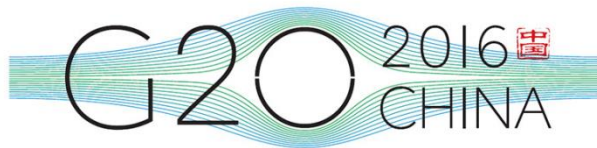
As a percentage of total business sector employment



Source: OECD Science, Technology and Industry Scoreboard 2015.



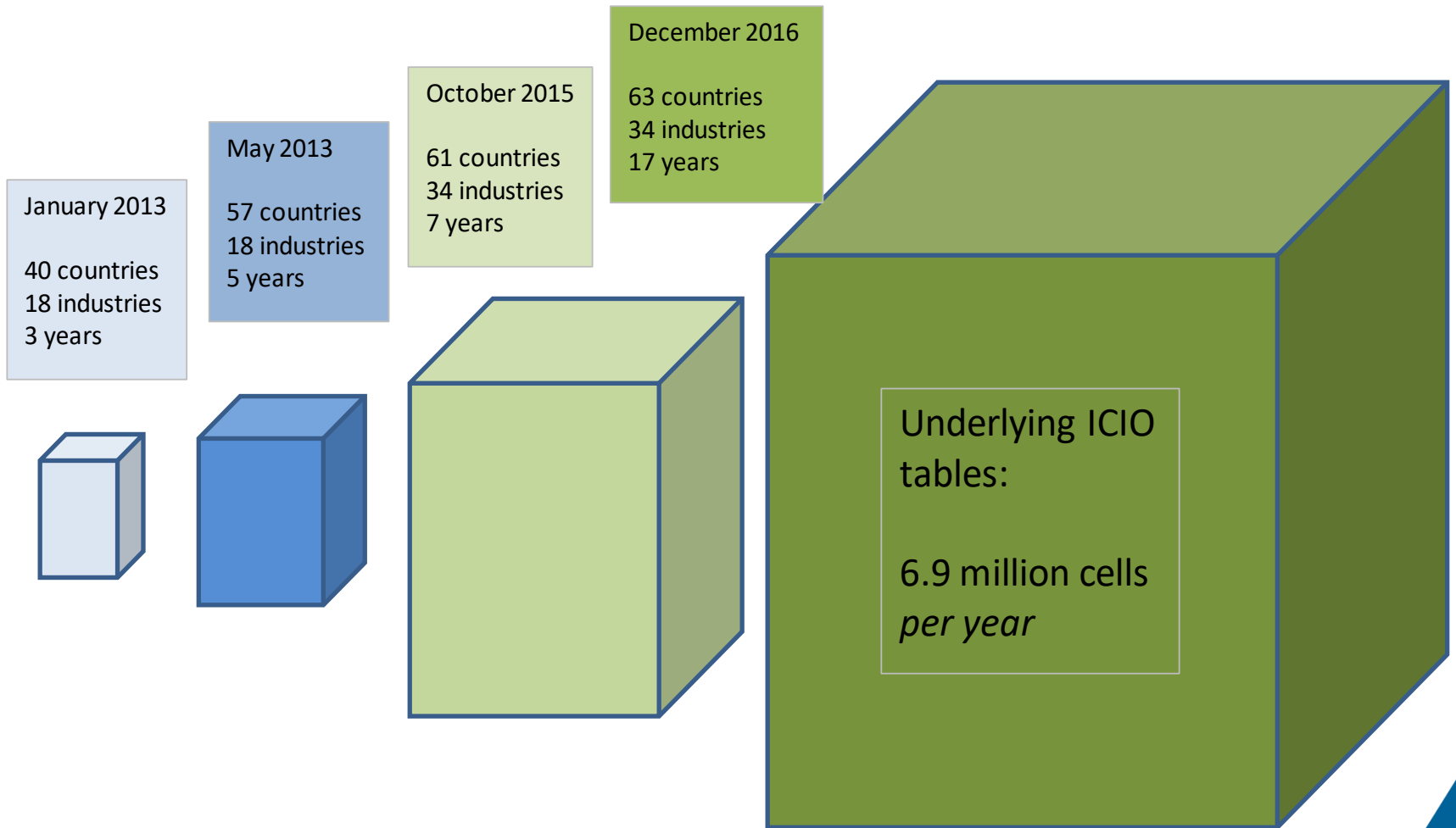
G20 Dialogue includes GVCs and TiVA



- Report on “Inclusive Global Value Chains for Small and Medium Enterprises and Low-Income Developing Countries”
- G20 Strategy for Global Trade Growth



2016+





Some particular features of ICIO

- **Accounting for firm heterogeneity in manufacturing:**

 - Split tables for China & Mexico (processors, other exporters and non-exporters)

 - Moving away from the import proportionality assumption

- **Separation of “direct purchases by non-residents” from cross-border trade:**

 - Enables Tourism policy analysis

- **Allocation of domestic trade and transport margins from manufacturing output to services:**

 - Emphasizes the service content of manufactured exports



It can be dirty work...





...but its all worth it.

- High level of interest in TiVA worldwide
- Huge renewed interest in IO as a policy tool
- Expanding IO related academic research around the world
- Many national stats offices motivated to improve their national statistical infrastructures to better account for global perspective

However, challenges meeting all demands

- Too many indicators !!! v. Not enough indicators !!!



Two distinct user communities



Power users:
“Just give me the data...”



IO practitioners: Too many indicators !!!

OECD, Inter-Country Input-Output (ICIO) Tables, 2016 edition

	Intermediate use ctry 1 x ind 1 [...] ctry 71 x ind 34	Final Demand HH NPISH GOV GFCF INVNT NON-RES DISC	Output
country 1 x industry 1 country 1 x industry 34 country n x industry 1 country n x industry 34 country 71 x industry 1 country 71 x industry 34	Z	FD	X
Value added (+ taxes - subs on intermediate products)	VA	<i>Note : FD = Total final expenditures + discrepancy (i.e. exports to unspecified partners)</i>	
Output	X		

Get them here: <http://oe.cd/icio>



Two distinct user communities



Powerful users: “What’s the bottom-line?”



The mainstreaming of IO at the OECD

- Analyses of GVCs (*OECD Committee for Industry and Entrepreneurship*)
- Numerous Trade policy papers (*OECD Trade Committee*)
- OECD Country Studies (*Economic Policy Committee*)
- OECD Skills outlook (*Education Committee*)
- Steel and GVCs (*OECD Steel Committee*)
- Shipbuilding (*OECD Shipbuilding Committee*)
- Tourism (*OECD Tourism Committee*)
- Embodied CO2 and material flows (*OECD Environment Committee*)
- Role of SMEs in GVCs (*Committee for Statistics and Statistical Policy*)
- Digital economy? (*OECD Committee for Digital Economy Policy*)
- Innovation spillovers? (*OECD Committee for Science and Technology*)



Non-IO experts: More indicators please

“Simple to understand”, with 3 dimensions: country, partner, industry

code	description	CN Fig.
EXGR_DVASH	Domestic value added share of gross exports	2
EXGR_FVASH	Foreign value added share of gross exports	1,3
EXGR_FNLDVASH	Domestic value added in exports of <i>final products</i> as a share of gross exports	
EXGR_INTDVASH		
EXGR_INTDVApSH		
EXGRpSH		
EXGR_DVApSH		
EXGR_TDVAIND		
EXGR_TFVAIND		
EXGR_SERV_DVASH		
EXGR_SERV_FVASH		
IMGRINT_REII		
IMGRpSH		
FFD_DVApSH		7
DFD_FVApSH	Value added in domestic final demand, partner shares	7
VALUX_FFDDVA	Domestic value added embodied in foreign final demand, as share of total value added	5,6
PROD_VASH	Value added as a % of production	
FD_VASH	Value added share of total final demand by source country and industry	
CONS_VASH	Value added share of total consumption by origin	12
GFCF_VASH	Value added share of gross fixed capital formation by origin	

Policy analysts in national administrations
 OECD analysts – GVC angle in many reports
 Media commentators
 Researchers new to the world of IO
 Powerpoints for senior staff
 etc.



The TiVA indicator challenge

To produce “core indicators” with 3 dimensions:
Country, Industry, “Partner”

- means reducing 8 dimensions
 - Origin of Value added *by country and industry*
 - Exporter *by country and industry*
 - Importer *by country and industry*
 - Final demand *by country and industry*

So many variations !

DIY: data cubes with 4 dimensions developed:

- Origin of value added (by country and industry) in
- gross exports, gross imports and final demand



TiVA / ICIO: Next steps – from 2017

- Always demand for more countries (Africa?!) and, more recent years
- New version being developed based on ISIC Rev.4 (NACE Rev.2) and latest SNA 2008 / BPM6 inputs
- *Nowcasting*: for more timely information, develop methods for extrapolating TiVA indicators to provide figures for more recent years (t-1 rather than t-3).
- *Better accounting for firm heterogeneity* – beyond China and Mexico Linking trade, SNA and business statistics? Fruits of extended SUTs project



The OECD working environment (v. Academia)

- Research agenda and priorities determined by:
 - *200+ OECD Committees and their Working Parties.*
- Access to leaders (via G20 / G7)
 - *G20 broadens access to non-members*
- Strong links with regional/international orgs
 - (UN, WTO, EU, APEC etc)
- Direct working relations with officials in Ministries
- Active engagement with statistical agencies



We stand on the shoulders of many.

