TiVA Background – Global Production today

- A world of increasing international fragmentation of production
- Explosion of trade in intermediates as firms specialise in stages (tasks) of production
- “Gross” trade flows increasingly embody components, and therefore value added, created elsewhere

Fragmentation of production: an old example – the iPod

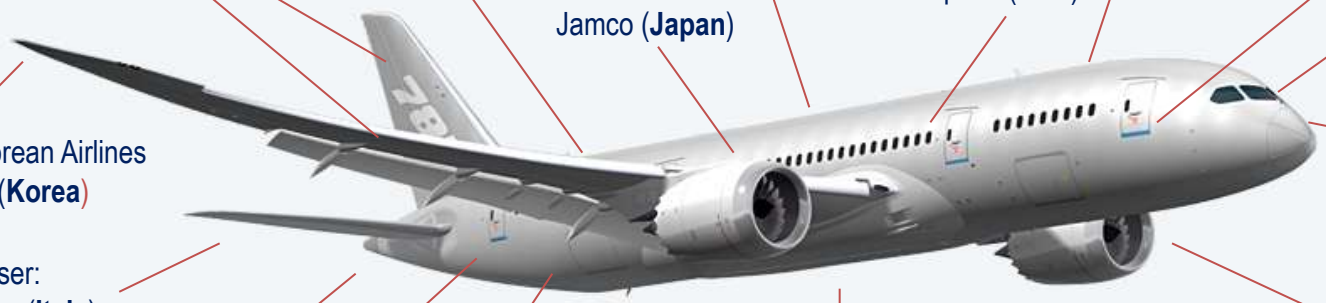
Apple iPod = 299$ of *reported* Chinese 'exports' to US

The Distribution of the value added

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

Source: Personal Computing Industry Center, University of California Irvine

Other example: the Boeing 787 Dreamliner …



Wing box: Mitsubishi Heavy Industries (**Japan**)
Wing ice protection: GKN Aerospace (**UK**)

Centre fuselage: Alenia Aeronautica (**Italy**)

Forward fuselage:
Kawasaki Heavy Industries (**Japan**)
Spirit Aerosystems (USA)

Rear fuselage:
Boeing South Carolina (USA)

Vertical Stabiliser: Boeing
Commercial Airplanes (USA)

Doors & windows:
Zodiac Aerospace (USA)
PPG Aerospace (USA)

Escape slides: Air Cruisers (USA)

Lavatories:
Jamco (**Japan**)

Flight deck seats:
Ipeco (**UK**)

Raked wing tips: Korean Airlines
Aerospace division (**Korea**)

Flight deck controls:
Esterline (USA),
Moog (USA)

Horizontal Stabiliser:
Alenia Aeronautica (**Italy**)

Engines: GE Engines (USA),
Rolls Royce (**UK**)

Aux. power unit: Hamilton
Sundstrand (USA)

Centre wing box:
Fuji Heavy Industries (**Japan**)

Engine nacelles: Goodrich (USA)

Passenger doors:
Latécoère Aéroservices (**France**)

Tools/Software: Dassault Systemes (**France**)
Navigation: Honeywell (USA)
Pilot control system: Rockwell Colins (USA)
Wiring: Safran (**France**)

Cargo doors: Saab (**Sweden**)

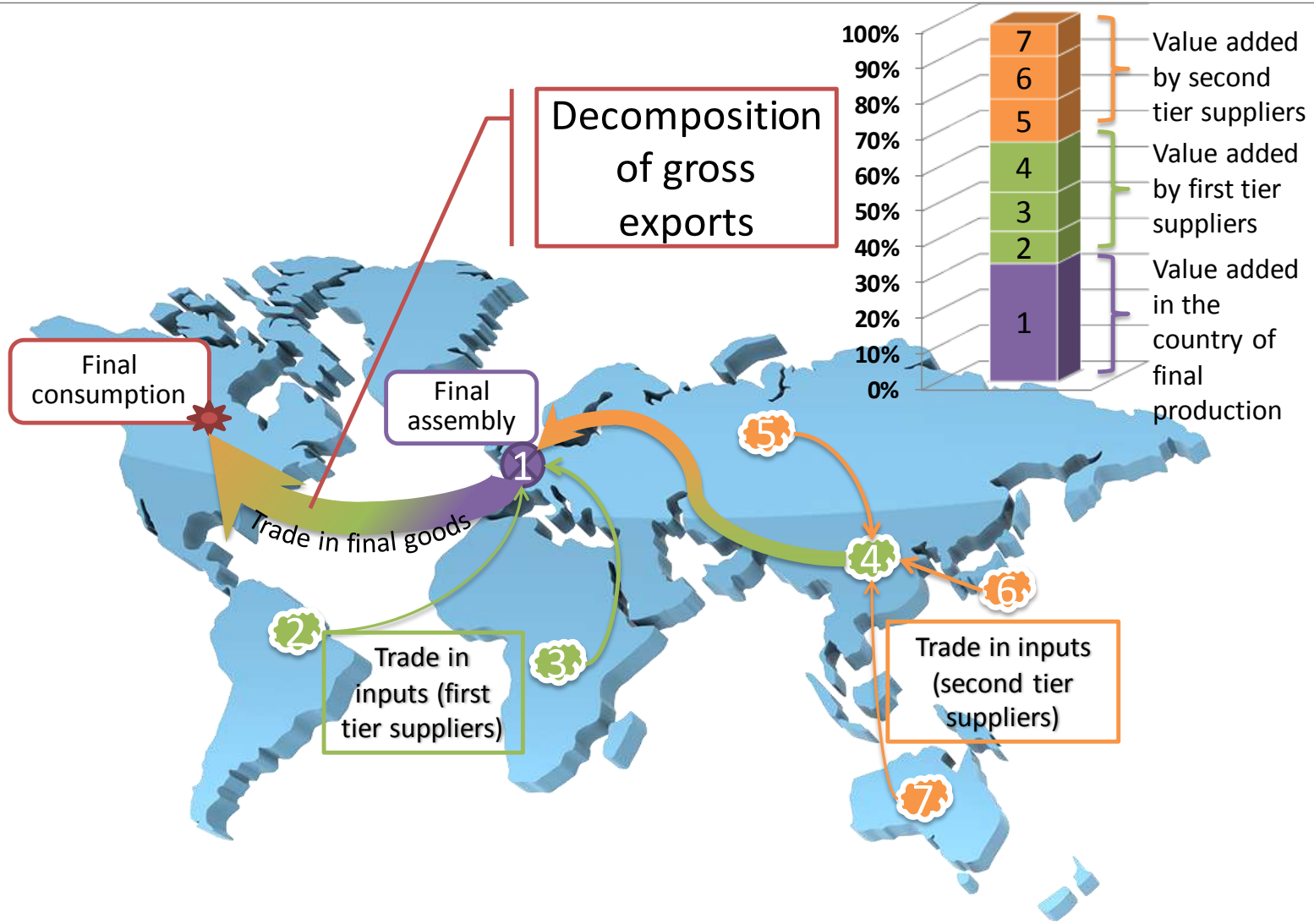
Landing gear: Messier-Dowti (**France**)
Electric brakes: Messier-Bugatti (**France**)
Tires: Bridgestone Tires (**Japan**)

Prepreg composites:
Toray (**Japan**)

Final assembly: Boeing
Commercial Airplanes (USA)

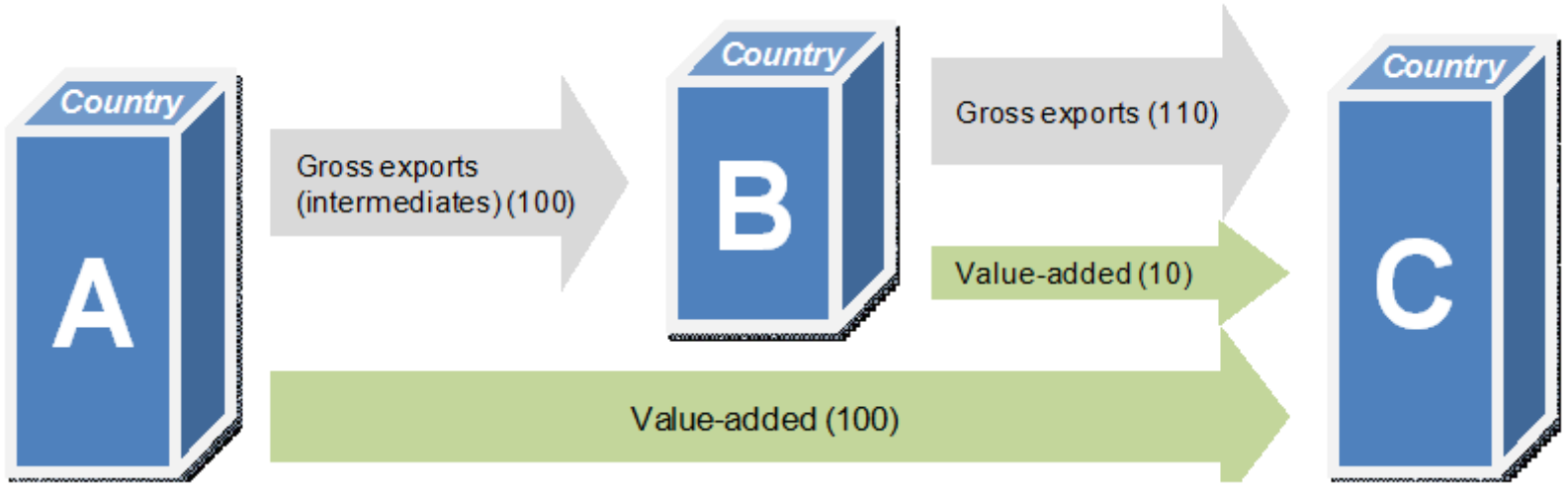
Source: www.newairplane.com

A simple Global Value Chain



What is the measurement issue?

Reported Gross trade statistics 'count' flows in intermediates many times as production processes spread across over several countries…



Thus, there is implicit multiple counting of intermediate goods and services in "traditional" gross trade statistics that tends to hide actual patterns of trade and which may create 'misleading perceptions' and imperfect policies...

Why Trade in Value Added (TiVA) ?

Increasing recognition that current 'gross' measures of trade may create 'misleading perceptions' and imperfect policies:

- **Export driven growth strategies** may target the wrong sectors.
  Gross trade statistics :
  - typically reveal a low contribution made by the service sector (< 25%)
  - cannot reveal whose final consumers drive supply
- **Protectionism can be counter-productive:**
  - Imports can improve competitiveness
  - Imports increasingly embody value originally generated in the importing country itself.
- **Systemic risks** - impact of macro-economic shocks on supply-chains
- understanding the **impact of international trade on jobs** and the **integration of emerging economies in GVCs**

Many calls for new statistics that better respond to these issues.

Trade in Value Added (TiVA) project

- OECD-WTO initiative.
- Aim: develop a statistical infrastructure and pertinent indicators to measure international trade in value added terms and provide a more realistic picture of how international trade really works
- Contribute to various strands of Trade and Industrial Policy
- Close cooperation with other main players: e.g. **IDE-JETRO**, USITC, WIOD group. These and others in TiVA “Scientific Committee”
- First release of TiVA indicators 16th January 2013:
  - Major Launch: OECD SG Angel Gurria, WTO DG Pascal Lamy, EU Trade Commissioner and New Zealand Trade Minister.
  - 40 countries, 18 industries, 2005, 2008, 2009
  - 17 country notes, supporting documentation, website and a video

Research rewrites global trade data

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

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

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.

NASDAQ

THE IRISH TIMES

Les Echos

DER STANDARD

theguardian

la Repubblica

WORLD ECONOMICS

THE WALL STREET JOURNAL

LE DEVOIR

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.

CHINA DAILY

Handelsblatt

Ces produits qui bouleversent le commerce mondial

PORTAL GOSPODARCZY

Expansión

El Financiero

REUTERS

THE ECONOMIC TIMES

FOX BUSINESS

2nd release of TiVA indicators – May 2013

Coverage

34 OECD countries, 23 non-members and rest of the world

18 industries, 1995, 2000, 2005, 2008, 2009

Indicators – for country, by industry and partner:

1. Foreign VA embodied in gross exports
2. Domestic VA embodied in foreign final demand
3. Origins of VA in domestic final demand
4. Service content of exports
5. Bilateral trade flows in gross and VA terms + related balances

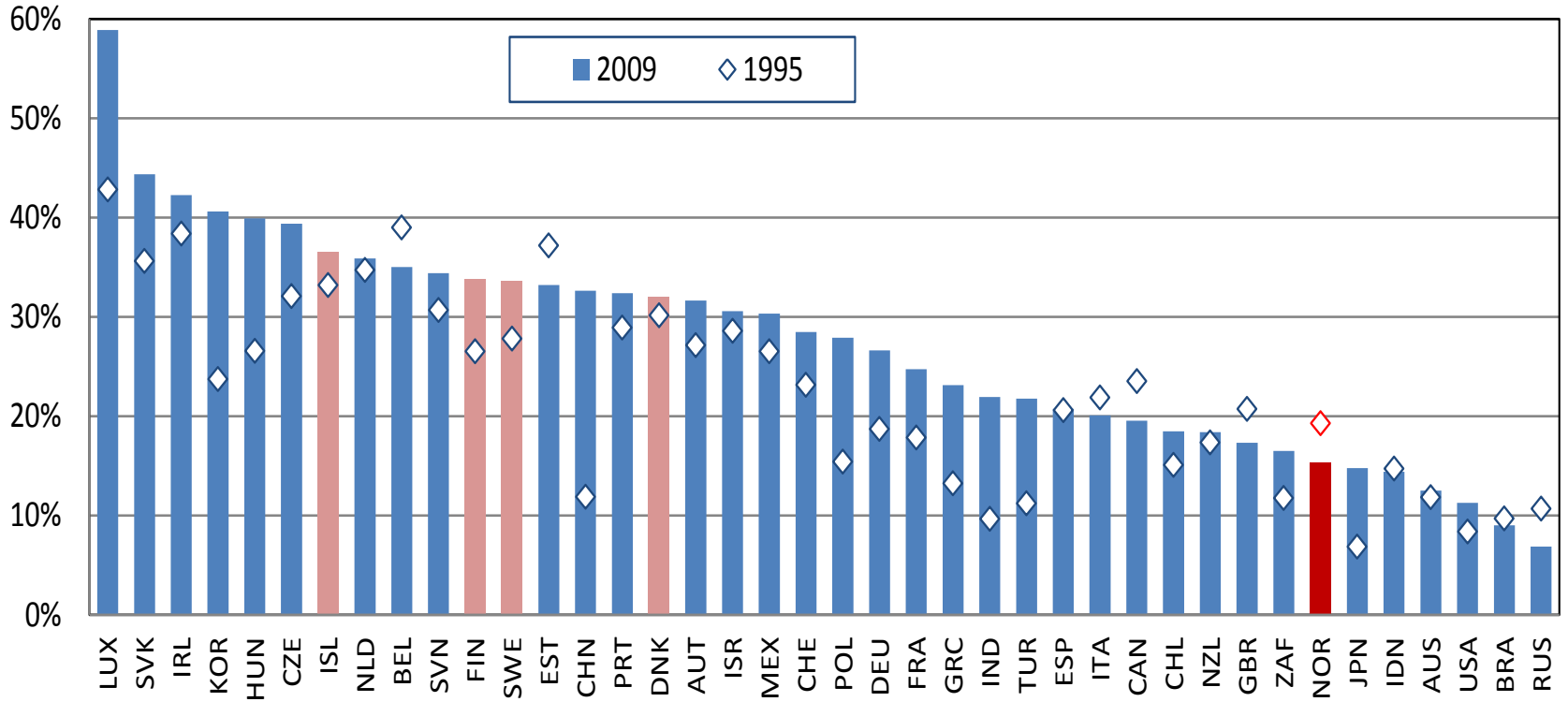
+ 40 country notes

http://www.oecd.org/trade/valueadded

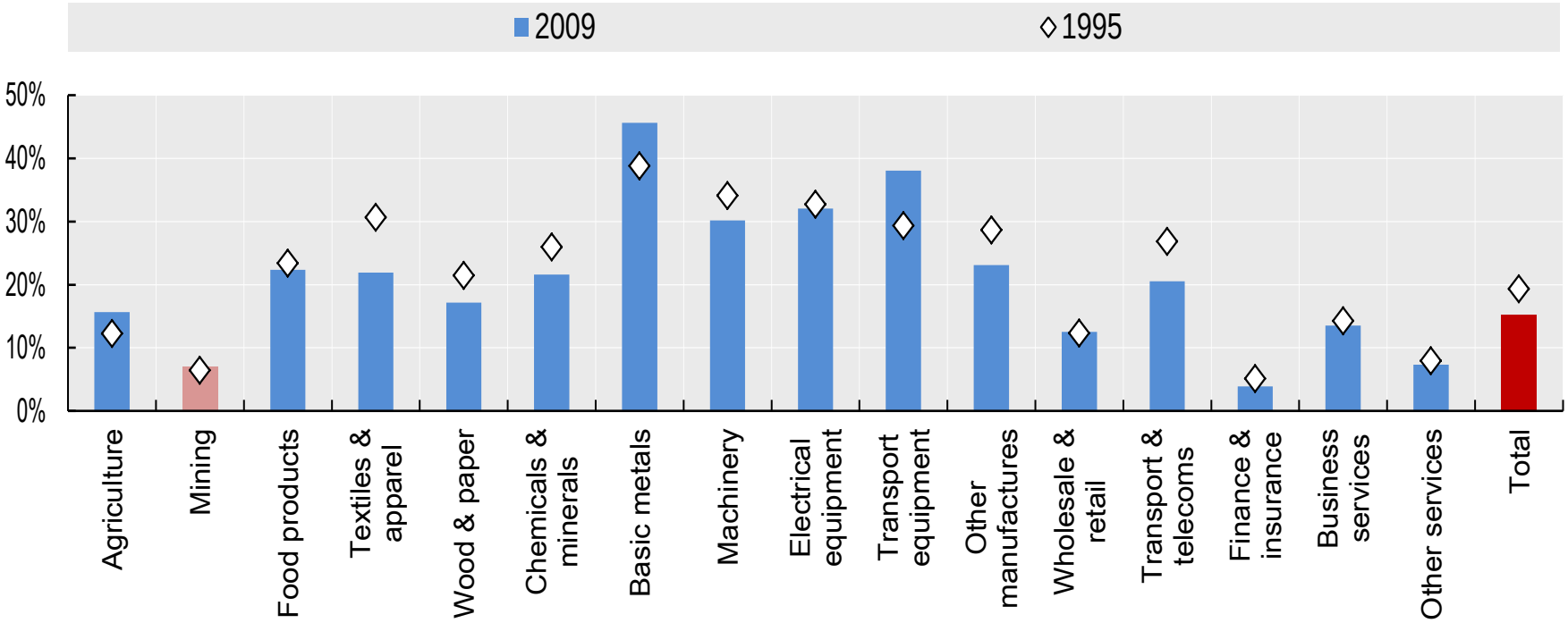
Exports require imports

Foreign value-added content of gross exports (%)

Low–Good, High-Bad? High-Good, Low-Bad? Neither

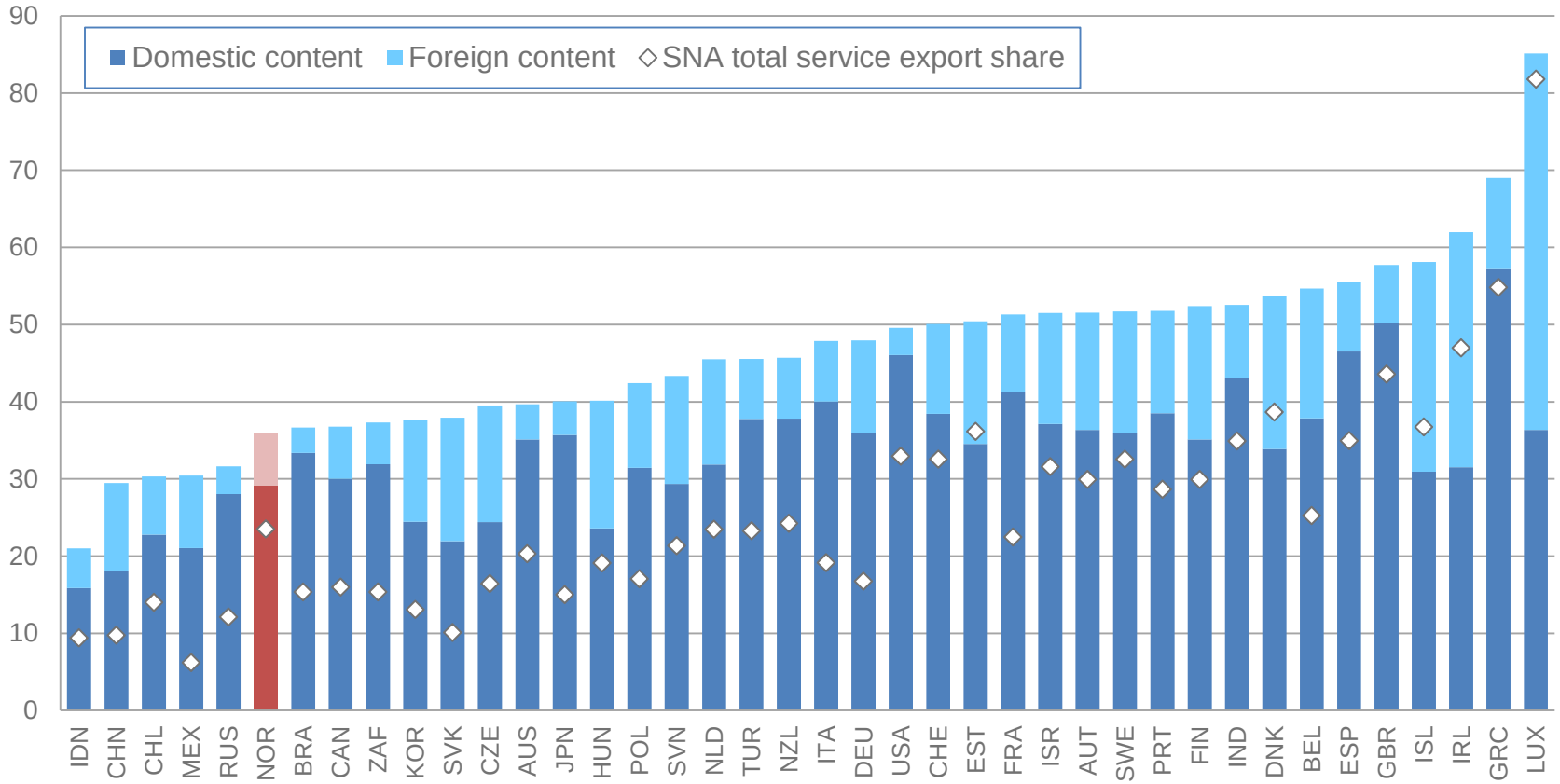


Norway: foreign value-added content of gross exports by industry (%)

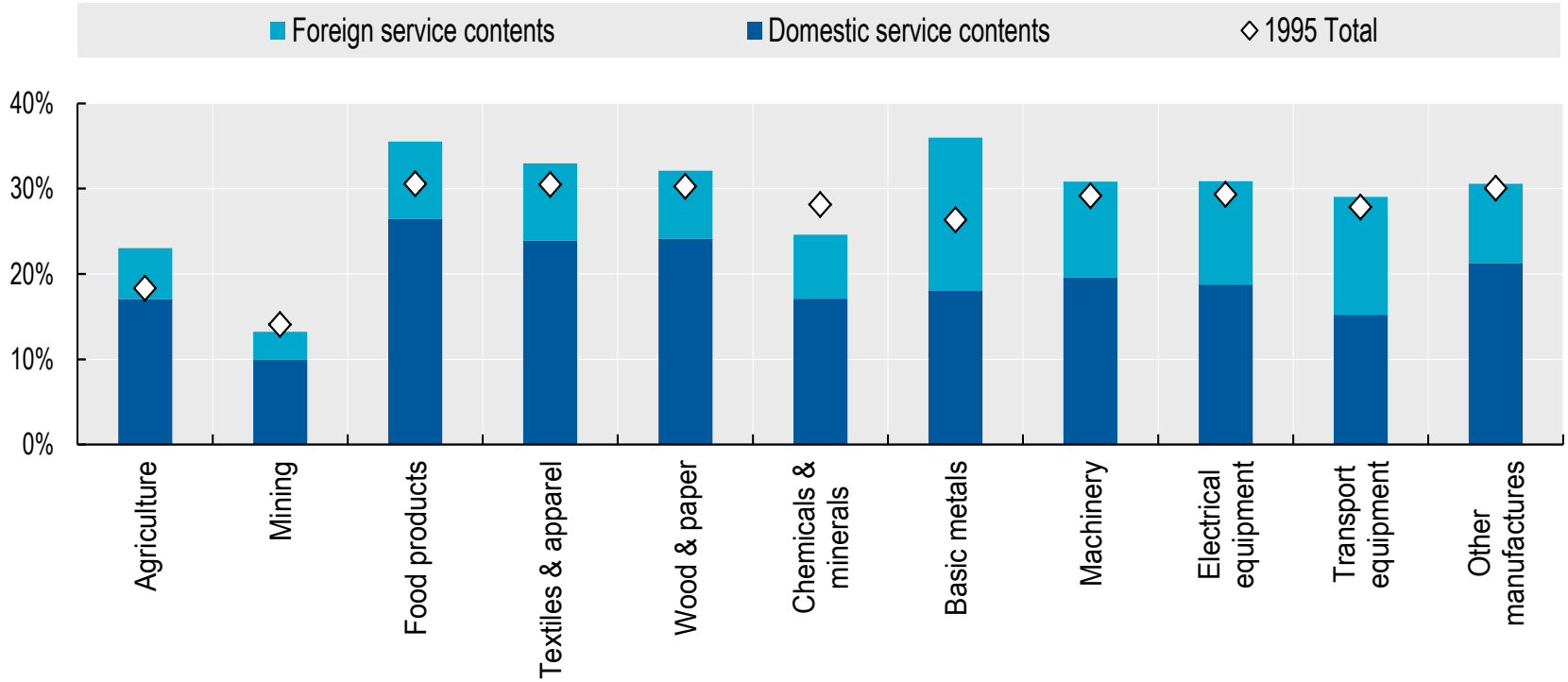


Services matter

Services Value-Added: % of exports, 2009

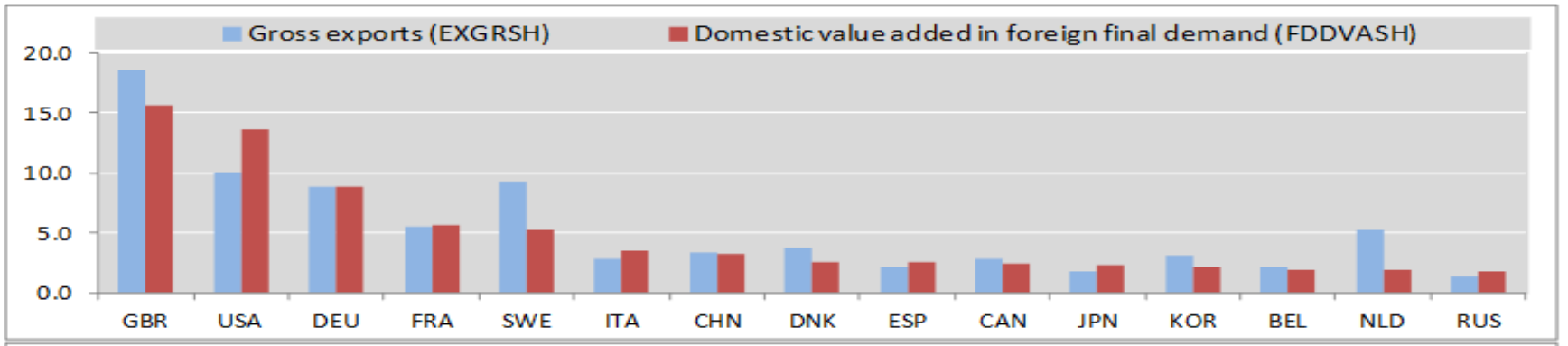


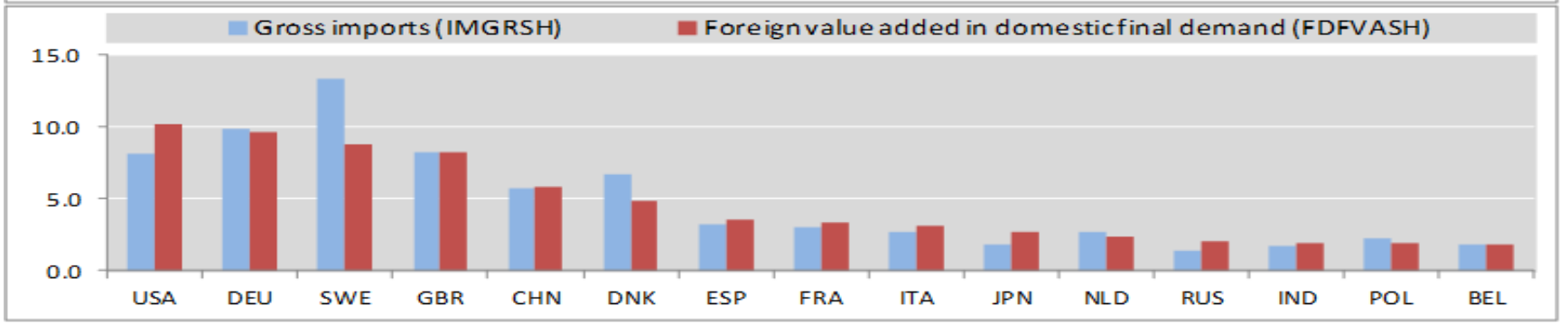
… and have a high VA content in goods

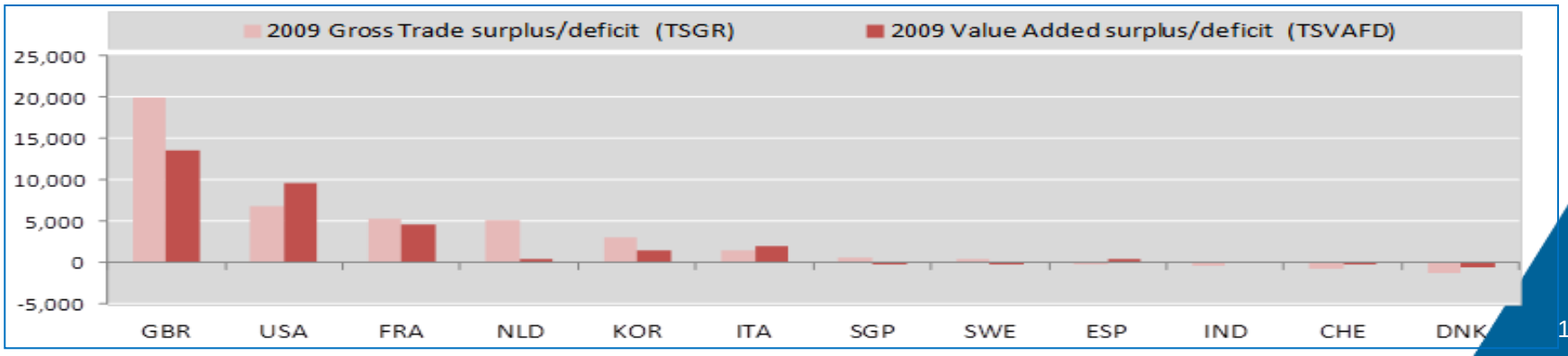


New trade patterns emerge

Norway: partner shares of exports/imports gross v. value added, 2009







How ? Where do TiVA indicators come from?

Inter-Country Input-Output (ICIO) system allows analysis of

- International trade flows of intermediate goods and services
- Harmonised bilateral trade positions
- Sectoral GDP and output at a global level
- Origins of value added in domestic final demand

Main reason for construction of ICIO at OECD is the development of trade in value added (TiVA) indicators but, the infrastructure also used for:

- Measurement of embodied CO2 (and other GHGs) in international trade i.e. consumption rather than production based measures
- Development of indicators of technology and knowledge spillovers

Inter-country Input-Output (ICIO) system

- the heart of the TiVA project
- A simplified ICIO system, 2 countries, 1 sector

ICIO	Intermediate demand		Personal expenditure by residents		Direct purchases abroad		Other final expenditure		Re-exports and re-imports adjustments	
	Cou A	Cou B								
Country A	Z_{AA}	Z_{AB}	HC_{AA}	HC_{AB}	-	HCN_{AB}	FE_{AA}	FE_{AB}	RIM_A	REX_A
Country B	Z_{BA}	Z_{BB}	HC_{BA}	HC_{BB}	HCN_{BA}	-	FE_{BA}	FE_{BB}	RIM_B	REX_B
Taxes less subsidies on products	NTZ_A	NTZ_B	$NTHC_{A*}$	$NTHC_{B*}$	$NTHC_{B*}$	$NTHC_{A*}$	$NTFE_A$	$NTFE_B$		
Value-added	V_A	V_B								
Output at basic price	X_A	X_B								

Z_{AB}	Intermediate transaction of products from Country A to Country B
HC_{AB}	Personal expenditure of Country A's products by Country B's residents in Country B
HCN_{AB}	Direct purhcases by Country B's residents in Country A
FE_{AB}	Other final expenditure of Country A's products by Country B's residents in Country B

Total exports of Country A = $Z_{AB} + HC_{AB}+HCN_{AB}+FE_{AB}+RIM_A+REX_A$

Total imports of Country A = $Z_{BA} + HC_{BA}+HCN_{BA}+FE_{BA}+RIM_B+REX_B$

OECD Input-Output Databases

- National I-O Database
  - STAN I-O 1995ed
  - STAN I-O 2003ed
  - STAN I-O 2006ed (present format)
- Inter-country interindustry model
  - Carbon footprint analysis (Green growth indicators, 2010 -)
  - Fragmentation analysis (ERIA, 2011)
  - Region integrated I-O for IDE-BRICs project (2011)
  - Trade in VA (2013 -)

ICIO coverage

Current Coverage (2012-2013 version)

- 57 countries: All OECD, BRIICS, Other EU, Other G20, other Southeast and Eastern Asia, “Rest of the World”.
- 37 industries: Including 18 manufactures and 15 services (based on ISIC Rev. 3)
- 5 years: 1995, 2000, 2005, 2008, 2009

ICIO data sources

Primary data sources

- Supply-use and Input-Output tables (National sources/ Eurostat / ADB)
- Bilateral trade statistics for goods and services (OECD / UN)
- National Accounts (UN / OECD)
- Balance of Payments (National source / IMF)

Derivative analytical data products at OECD

- Harmonised symmetric Input-Output tables (OECD I-O)
- Bilateral Trade Database by Industry and by End-use (BTDIxE)
- Sectoral Value-Added (STAN)
- National Accounts aligned with BoP and adjusted for re-exports

Components of Inter-country I-O

- Update estimates for missing tables for reference years
- Reconciliation of I-O and BTD figures with National Accounts
- Estimated Bilateral Trade in Services by Industry (EBTSI)

Why wasn't this been done before ?

- **Heavy data requirements** – need good quality statistics from all countries considered
- **Heavy computational requirements** – estimating missing values, balancing global trade, calculating indicators etc.
- I-O related research out-of-fashion for some years ; many sceptics; issues of timeliness - lags in national production of Supply-Use tables (2-4 years) and I-O tables (4-6 years)
- Limited institutional support

However

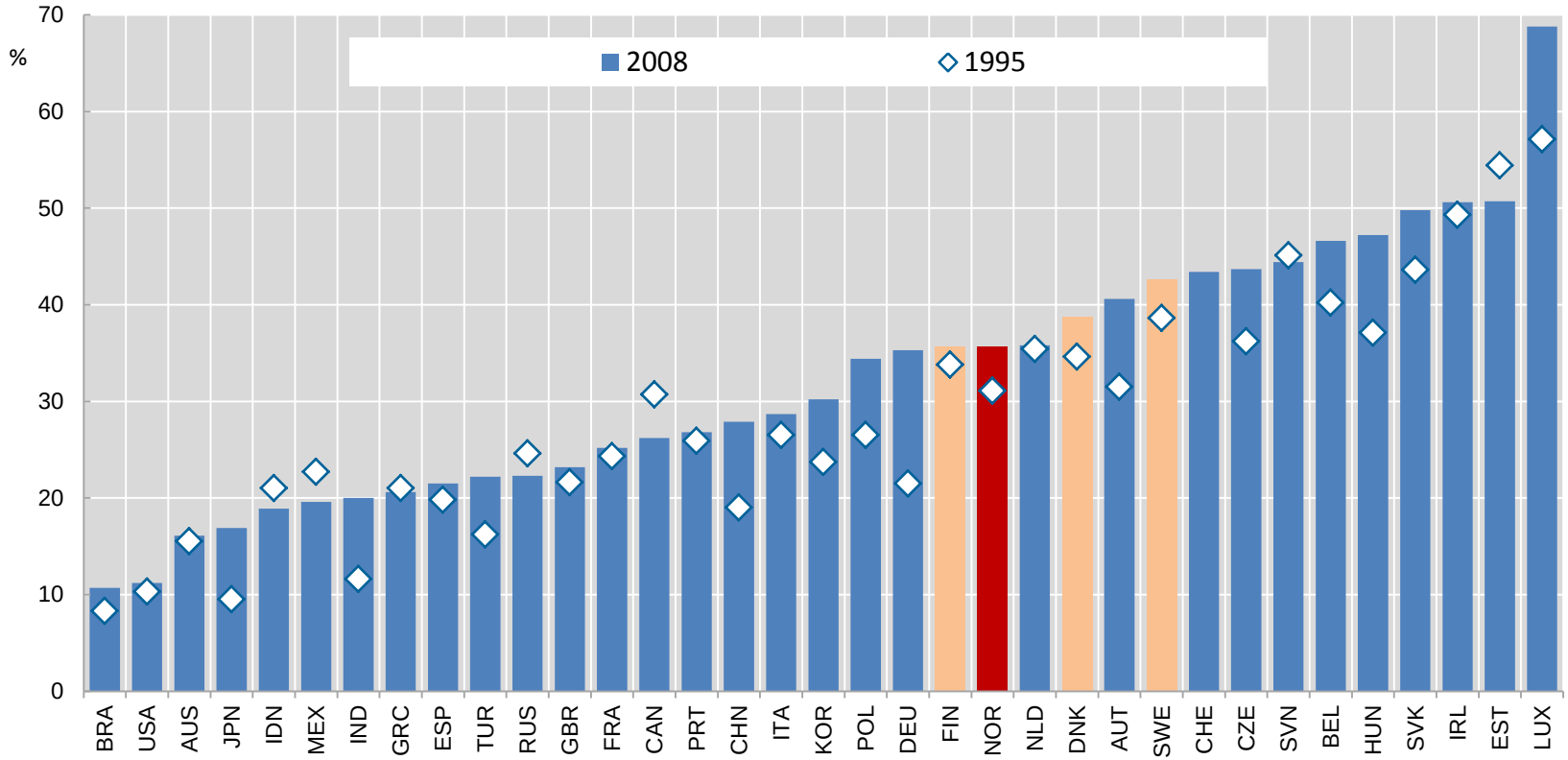
- Recent improvements in quality and availability of national stats.
- More widespread access to ICT (for processing, storage)
- Closer links between research groups leading in this field: IDE-Jetro, USITC, EU WIOD project, GTAP etc …

First extensions to indicators

- “Trade in jobs”
- Origins of value added in Household consumption
- Charts “Jobs sustained by foreign final demand” in September 2013 G20 report and 2013 edition of “STI Scoreboard”

Jobs in the business sector* sustained by foreign final demand

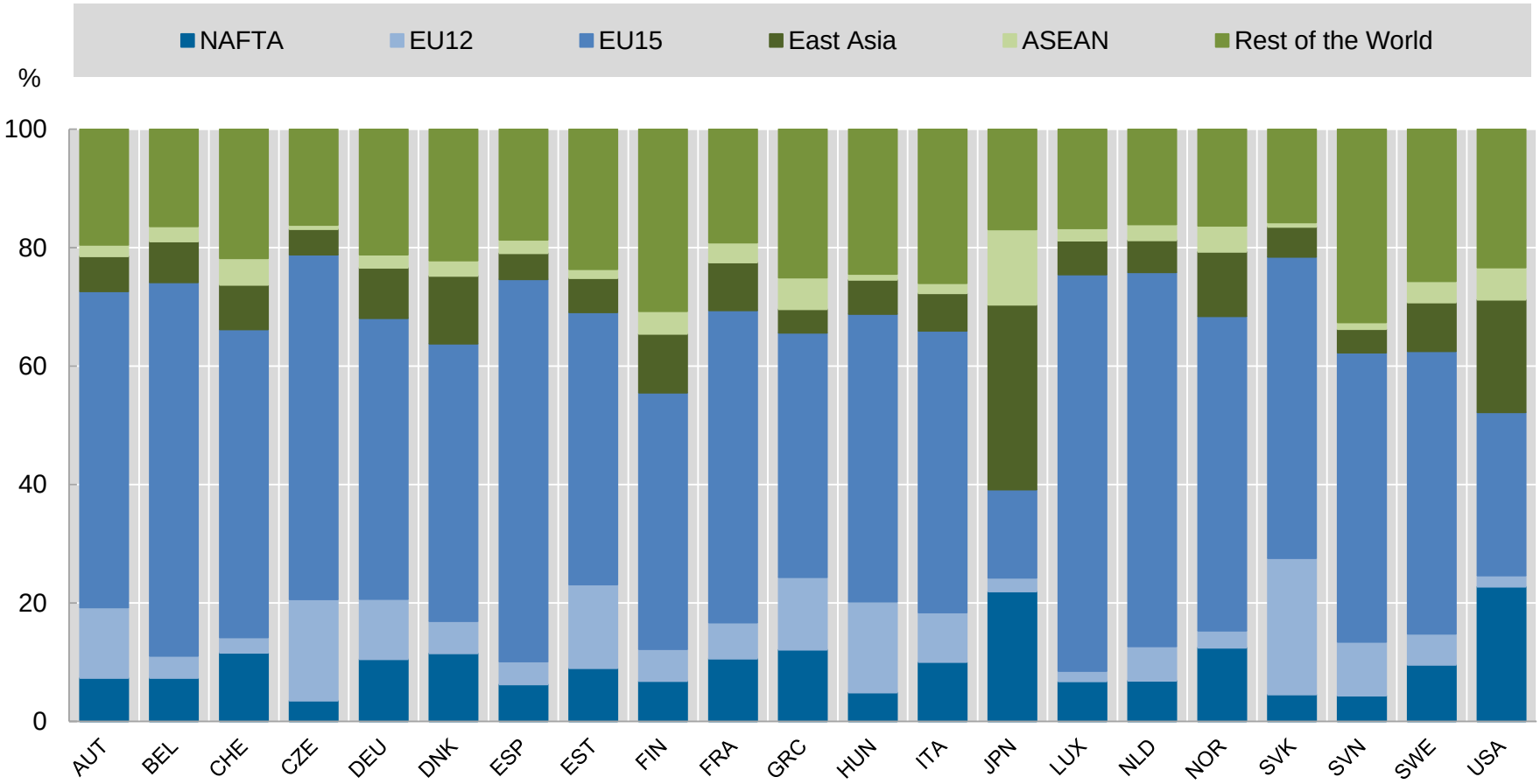
As a % of total business sector employment



* *Business sector = ISIC Rev.3 divisions 10 to 74*

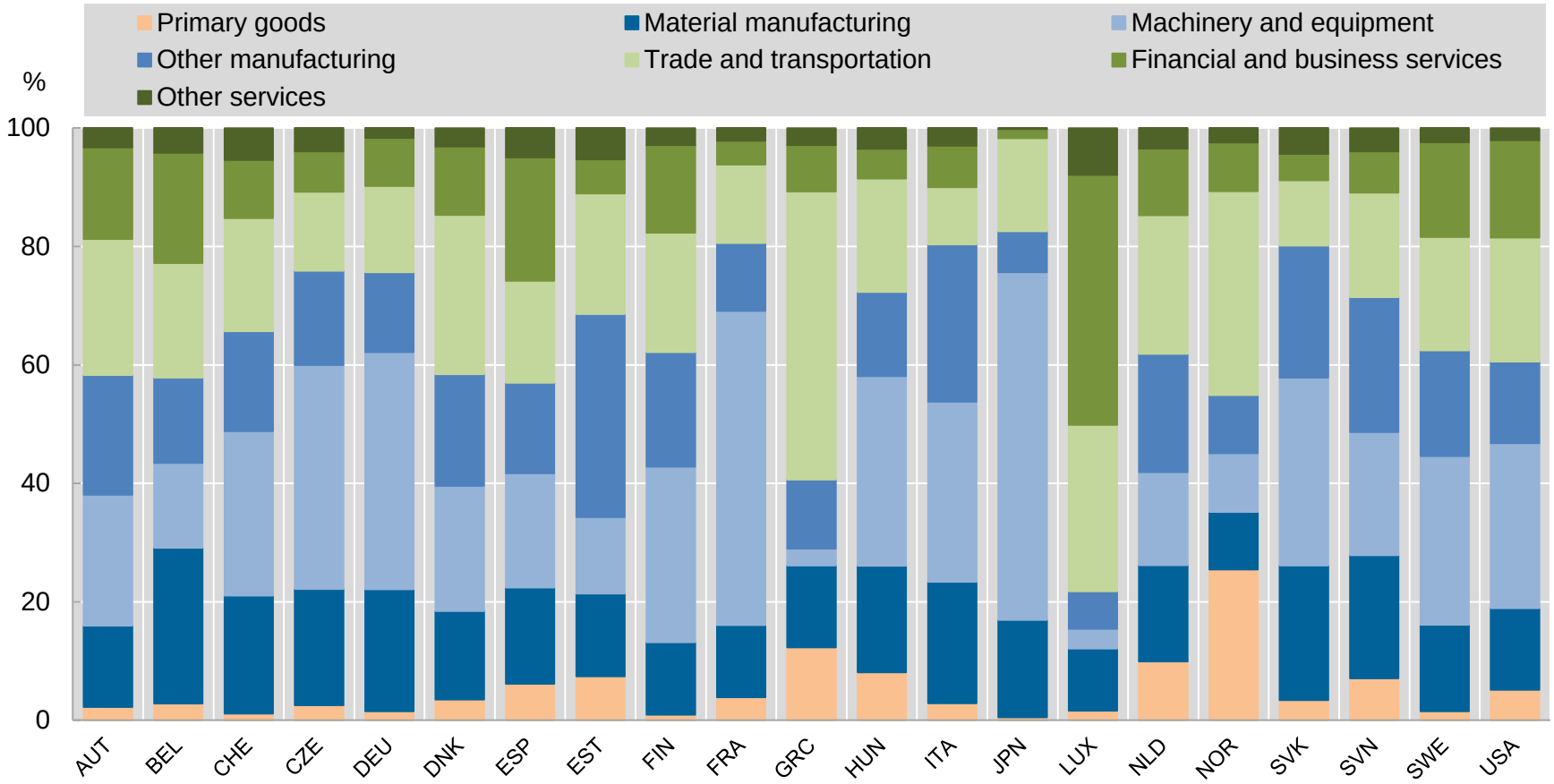
Source: OECD, Science, Technology and Industry Scoreboard, 2013

Distribution by region of demand, 2008 …



Source: OECD, Science, Technology and Industry Scoreboard, 2013

… and distribution by economic activity

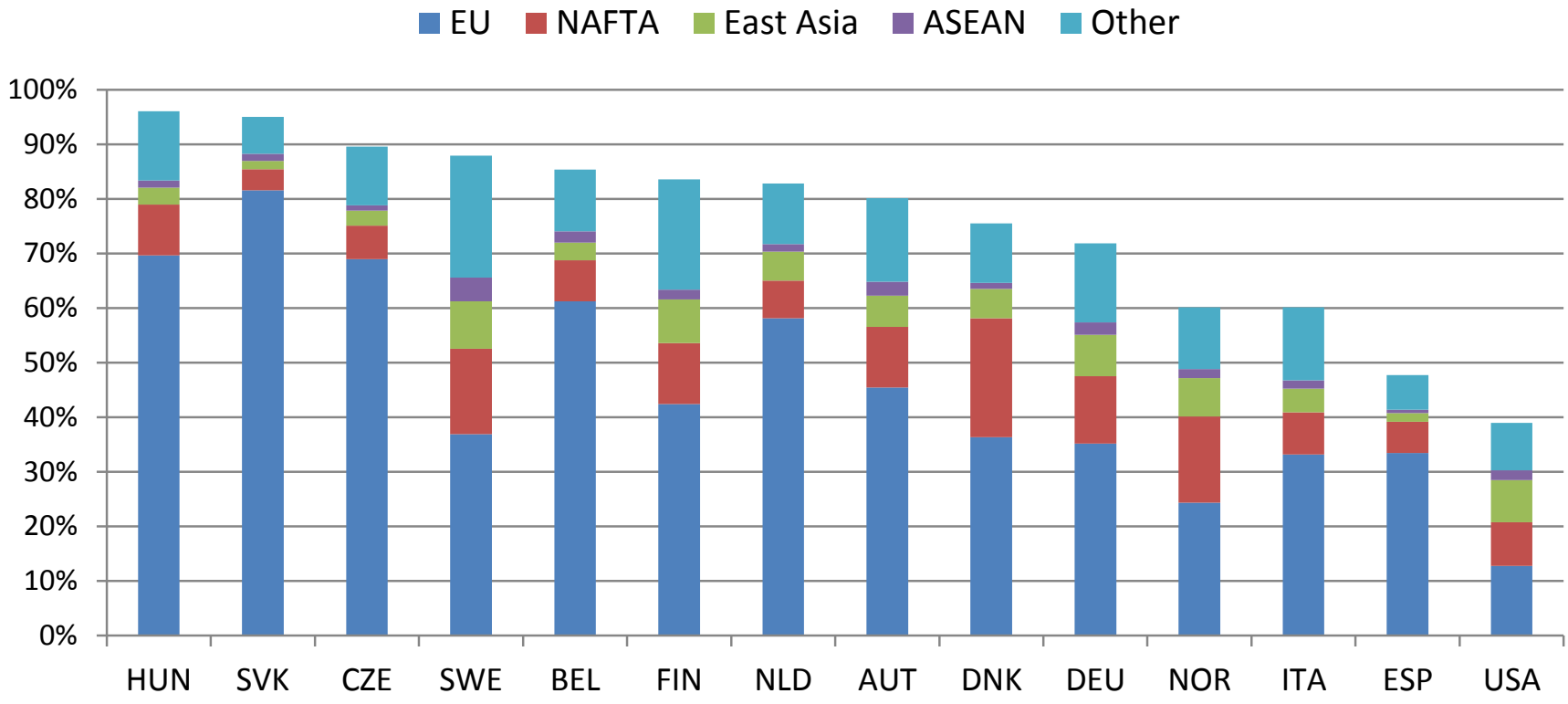


Source: OECD, Science, Technology and Industry Scoreboard, 2013

Some industries more dependent on foreign final demand than others ?

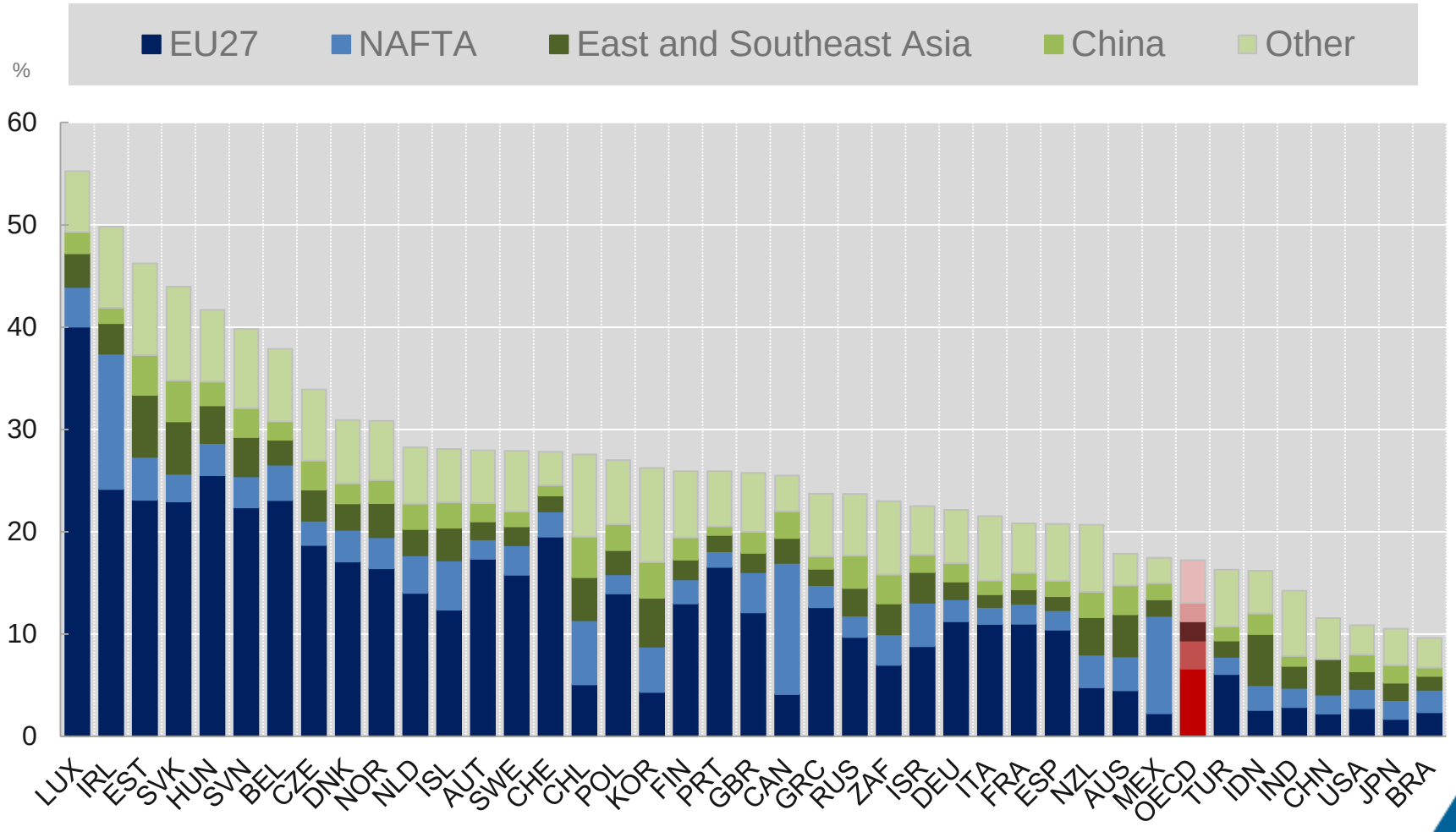
manufacture of electrical and optical equipment (ISIC Rev.3 30t33)

% of total employment sustained by foreign final demand



(preliminary chart)

Foreign value added in household consumption, by source region, 2009



Source: OECD, Science, Technology and Industry Scoreboard, 2013

It is important to stress …

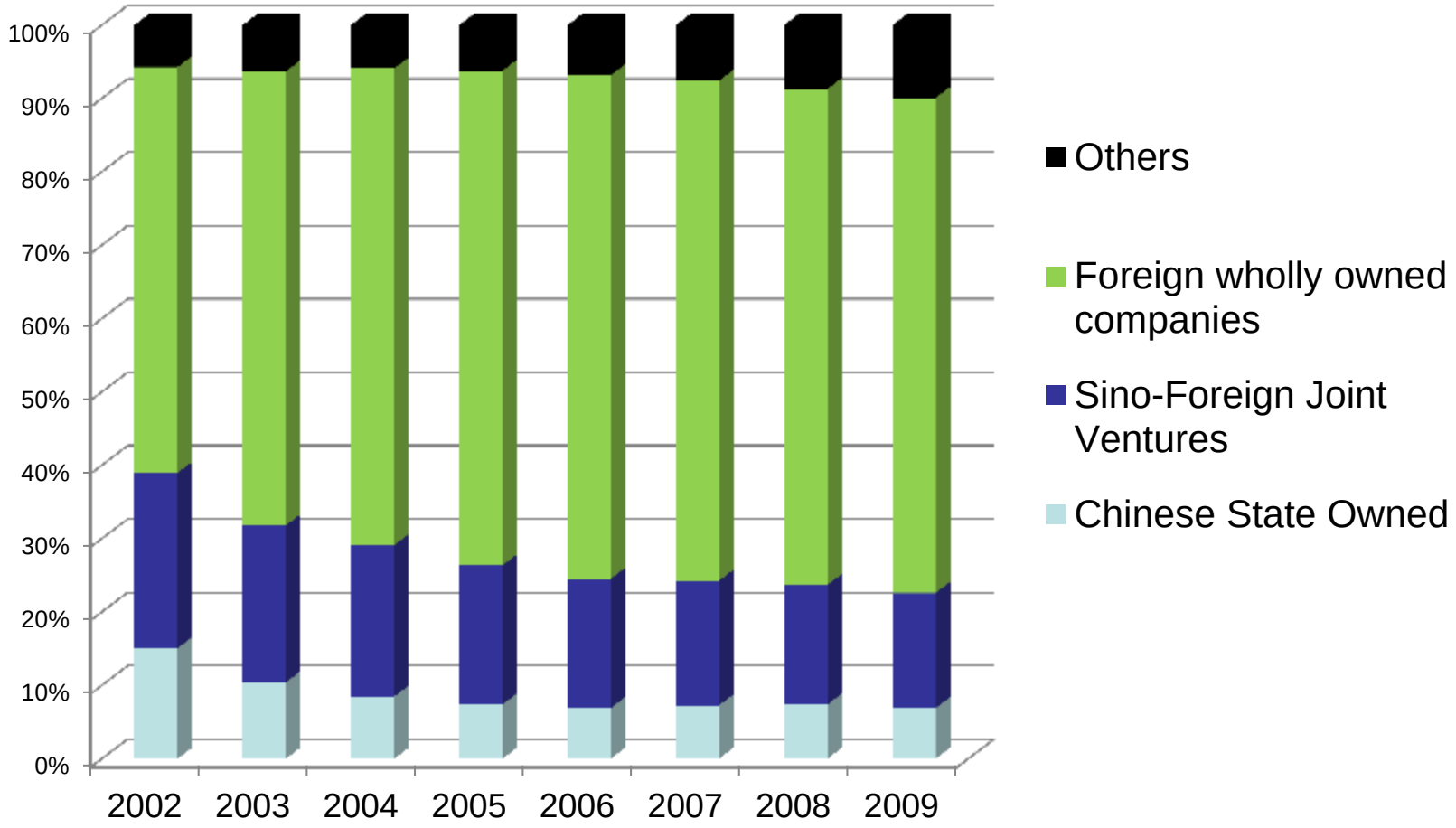
…that this is still a work in progress and that the results are estimates

- But they are robust enough to already begin to highlight the need for policies to account for GVCs
- But perhaps more importantly, they highlight
  - the importance of capacity building and better statistics
- **Improving data quality is essential**
  - Coherent statistics of trade in goods and services
  - A new approach to Supply-Use Tables?
    - to better reflect firm heterogeneity within domestic industries.
    - Import/export intensities, factoryless firms, processors, ownership, region etc.

Trade in Value-Added is only the beginning

Measuring “Trade in Income” - potentially very important

Chinese High Tech Exports by Ownership (% of total)



Source: Chinese Ministry of Science and Technology

In the meantime …

Next version of TiVA indicators, for release Q4 2014

- More countries (notably Colombia, Costa Rica, Croatia)
- At least one additional year – 2010
- Direct use of annual Supply Use Tables
- An extended industry list
- Quality enhancements
  - Use of better balancing techniques
  - Sectoral value-added and gross output
  - Improved Rest of the World table(s)
- Publication of new indicators – beyond TiVA: Jobs sustained by foreign final demand, origins of VA in HH consumption, sectoral export dependency etc..
  + Release of underlying ICIO

Concluding remarks

- Long term project at OECD.
- Co-operation with other organisations and projects – to share ideas and compare results, minimise duplication of efforts.
- OECD engaging with national statistical agencies to improve underlying source data
- Major challenge is presenting results that can be easily understood and interpreted by non-practitioners of National Accounts and I-O modelling (e.g. policy makers) and, managing expectations …

www.oecd.org/trade/valueadded

Thank you

www.oecd.org/trade/valueadded

Reference slides

Analysis of Global Supply Chains is useful to

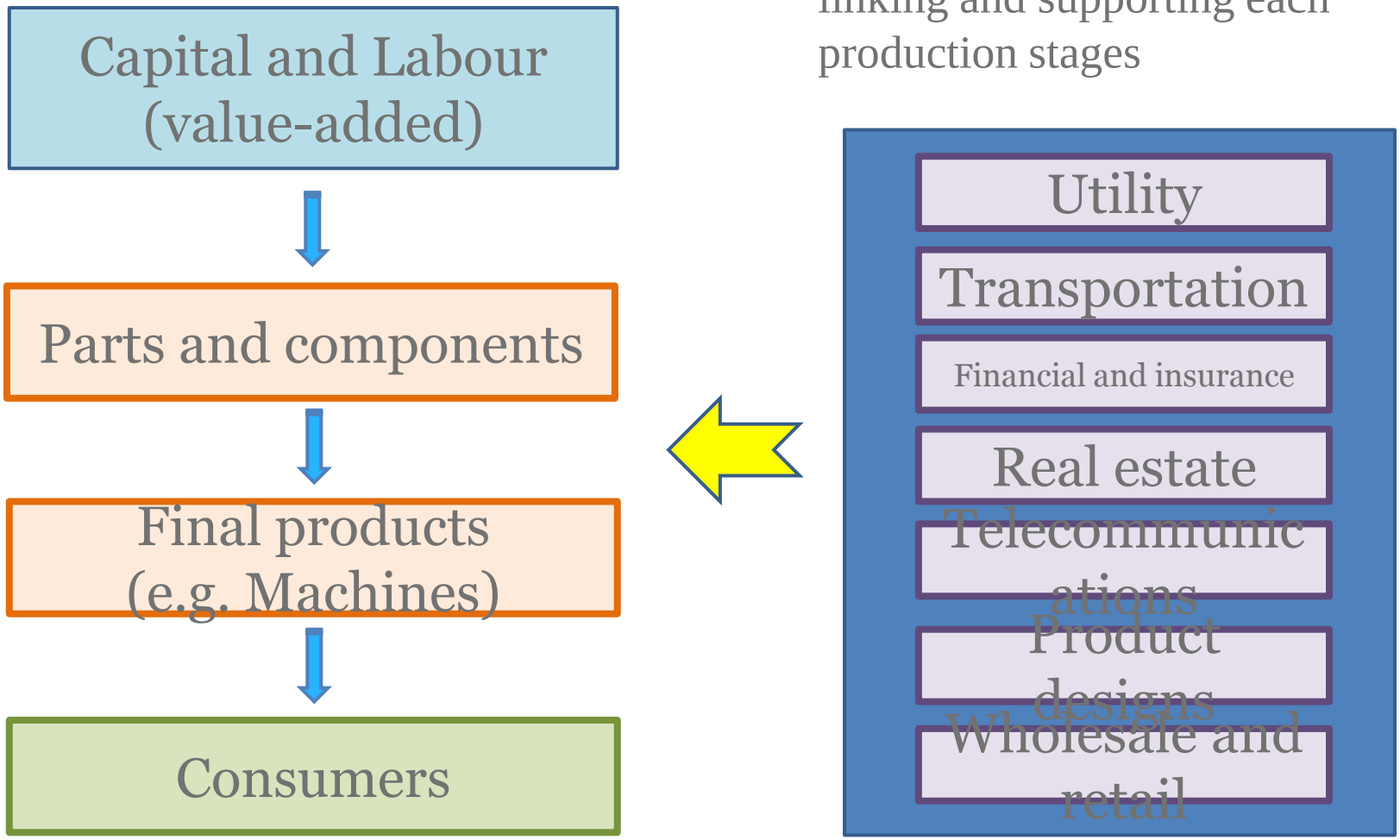
- Determine the impact of global value chains on sources for domestic growth and jobs (countries' trade and specialisation patterns along value chains).

- Assess cost of changes induced by trade policies (introduction of tariffs, FTAs) may directly hurt the competitiveness of domestic industries.

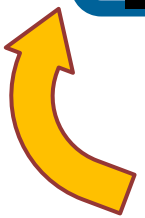
- Understand the impact of disruptions in global supply chains and the vulnerability of countries to macro-economic shocks (e.g. recent disasters in Japan and Thailand).

Production networks

Business service activities are linking and supporting each production stages



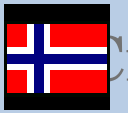
usehold consumption and capital formation



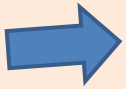
Exports of Automobiles

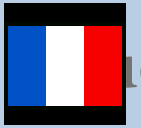
Import contents (VS)

Parts and components



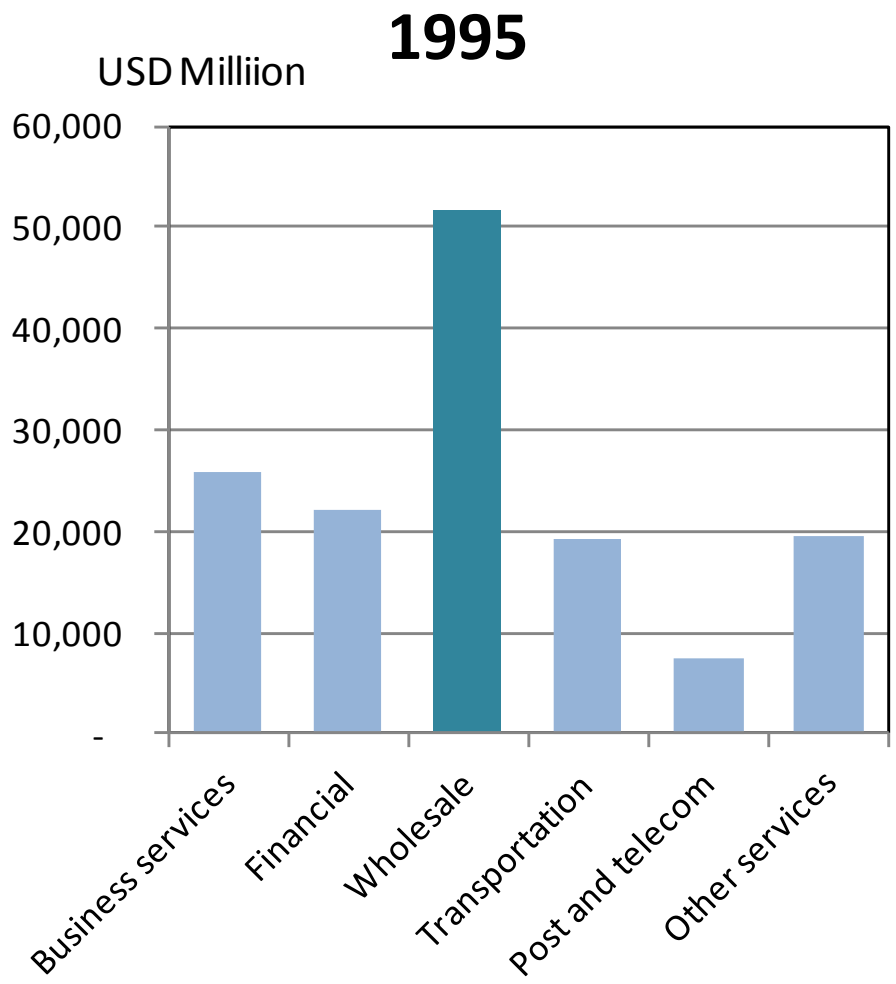
Crude oil

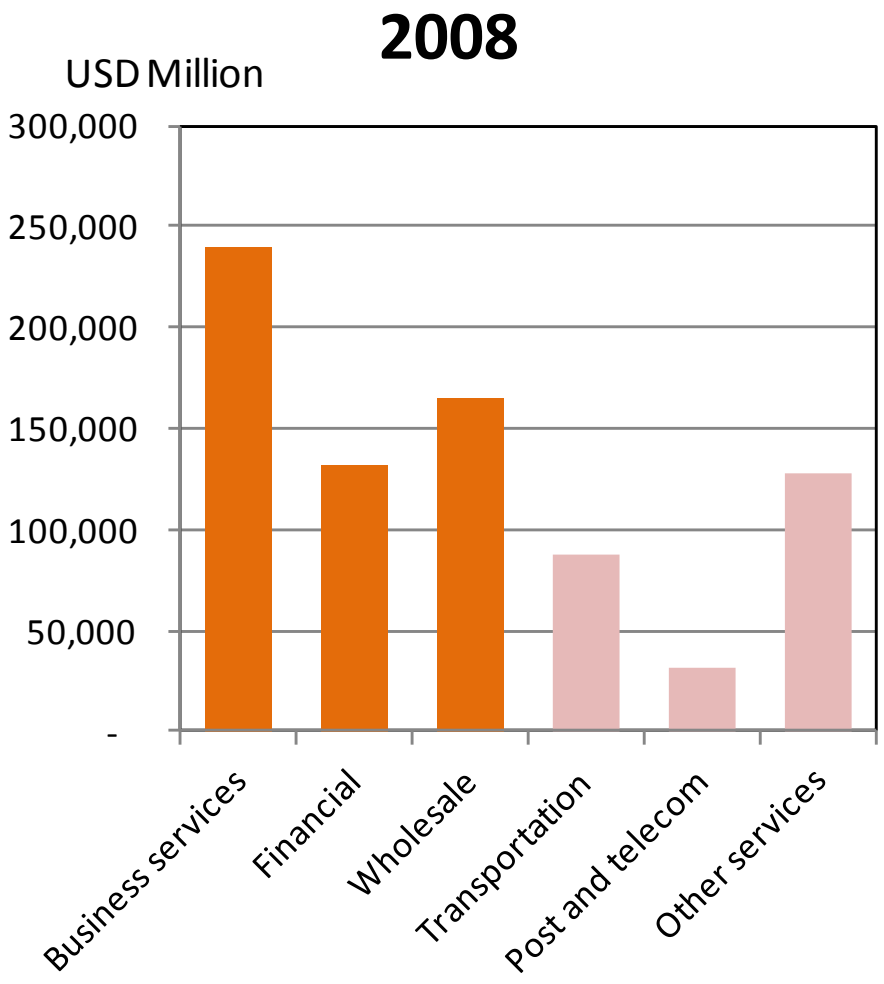




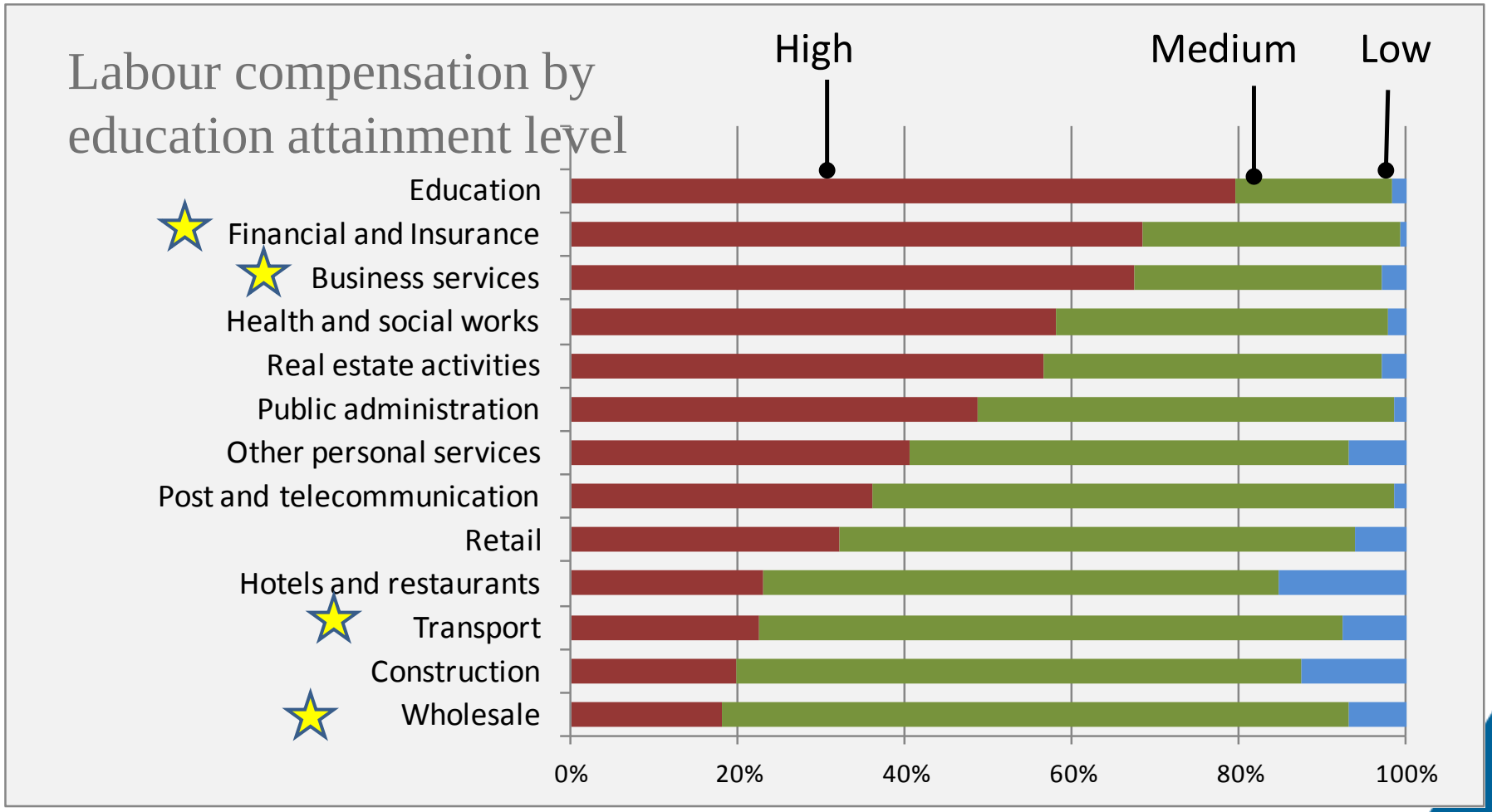
iel &materials

Value-added of Service sectors induced by Global Supply Chains (United States)





Labour composition by skill (United States, 2009)



Source: WIOD April 2012

Country coverage

57 economies + Rest of the World, 1995- 2009

OECD	All OECD 34 countries
BRIICS	Brazil, China, India, Indonesia, Russian Federation, South Africa
Other EU27	Bulgaria, 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	Rest of the World

Industry list

	ISIC Rev 3	Industry
1	01-05	Agriculture, hunting, forestry and fishing
2	10-14	Mining and quarrying
3	15-16	Food products, beverages and tobacco
4	17-19	Textiles, textile products, leather and footwear
5	20-22	Wood, paper, paper products, printing and publishing
6	23-26	Chemicals and non-metallic mineral products
7	27-28	Basic metals and fabricated metal products
8	29	Machinery and equipment, nec
9	30-33	Electrical and optical equipment
10	34-35	Transport equipment
11	36-37	Manufacturing nec; recycling
12	40-41	Electricity, gas and water supply
13	45	Construction
14	50-55	Wholesale and retail trade; Hotels and restaurants
15	60-64	Transport and storage, post and telecommunication
16	65-67	Financial intermediation
17	70-74	Real estate, renting and business activities
18	75-95	Community, social and personal services

Review: Input-Output Table

Domestic table

	Intermediate demand		Personal expenditur	Other final expenditures	Exports	Imports cif	Output
	ind 1	ind 2					
Industry 1: Goods	Z_{11}	Z_{12}	HC1	FE1	EX1	-IM1	X_1
Industry 2: Services	Z_{21}	Z_{22}	HC2	FE2	EX2	-IM2	X_2
Imports	IM_Z_1	IM_Z_2	IM_HC	IM_FE	Re-Exports	Total IM	
Taxes less subsidies on products	NTZ_1	NTZ_2	NTHC	NTFE	NTEX	NTIM	
Value-added (total)	V_1	V_2					
Labor compensation	VL_1	VL_2					
Operating surplus	VO_1	VO_2					
Net taxes on production	VT_1	VT_2					
Output at basic price	X_1	X_2					

Import matrix in c.i.f.

	Intermediate demand		Personal expenditure	Other final expenditures	Re-exports	Imports cif
	ind 1	ind 2				
Product p1: Goods	$ZM_{11}+TMZ_{11}$	$ZM_{12}+TMZ_{12}$	HCM_1+TMHC_1	FEM1+TMFE1	REX1+TMREX1	IM1+TM1
Product p2: Services	$ZM_{21}+TMZ_{21}$	$ZM_{22}+TMZ_{22}$	HCM_2+TMHC_2	FEM2+TMFE2	REX2+TMREX2	IM2+TM2

Components of OECD ICIO system

A simplified ICIO system, 2 countries, 2 sectors:

a) Domestic transactions

		Intermediate				Final Demand	
		Country A		Country B		Cou A	Cou B
		ind 1	ind 2	ind 1	ind 2		
Country A	Industry 1: Goods	Z_{11}^{AA}	Z_{12}^{AA}			Z_{11}	
	Industry 2: Services	Z_{21}^{AA}	Z_{22}^{AA}			Z_{21}	
Country B	Industry 1: Goods			Z_{11}^{BB}	Z_{12}^{BB}		Z_{11}
	Industry 2: Services			Z_{21}^{BB}	Z_{22}^{BB}		Z_{21}

b) International trade flows

		Country A		Country B		Cou A	Cou B	Exports
Country A	Product 1: Goods			Z_{11}^{AB}	Z_{12}^{AB}		F_1^{AB}	EX_1^A
	Product 2: Services			Z_{21}^{AB}	Z_{22}^{AB}		F_2^{AB}	EX_2^A
Country B	Product 1: Goods	Z_{11}^{BA}	Z_{12}^{BA}			F_1^{BA}		EX_1^B
	Product 2: Services	Z_{21}^{BA}	Z_{22}^{BA}			F_2^{BA}		EX_2^B

c) Net taxes, Value-added and Output

	Country A		Country B		Cou A	Cou B
Taxes less subsidies on products	NTZ_1^A	NTZ_2^A	NTZ_1^B	NTZ_2^B	NTF^A	NTF^B
Value-added	V_1^A	V_2^A	V_1^B	V_2^B		
Output at basic price	X_1^A	X_2^A	X_1^B	X_2^B		

Z_{12}^{AB}: Intermediate transaction from sector 1 of country A to sector 2 of Country B.

F_1^{AB}: Final demand transaction from sector 1 of country A to Country B.

ICIO: Next steps

Next version(s), 2013-2014

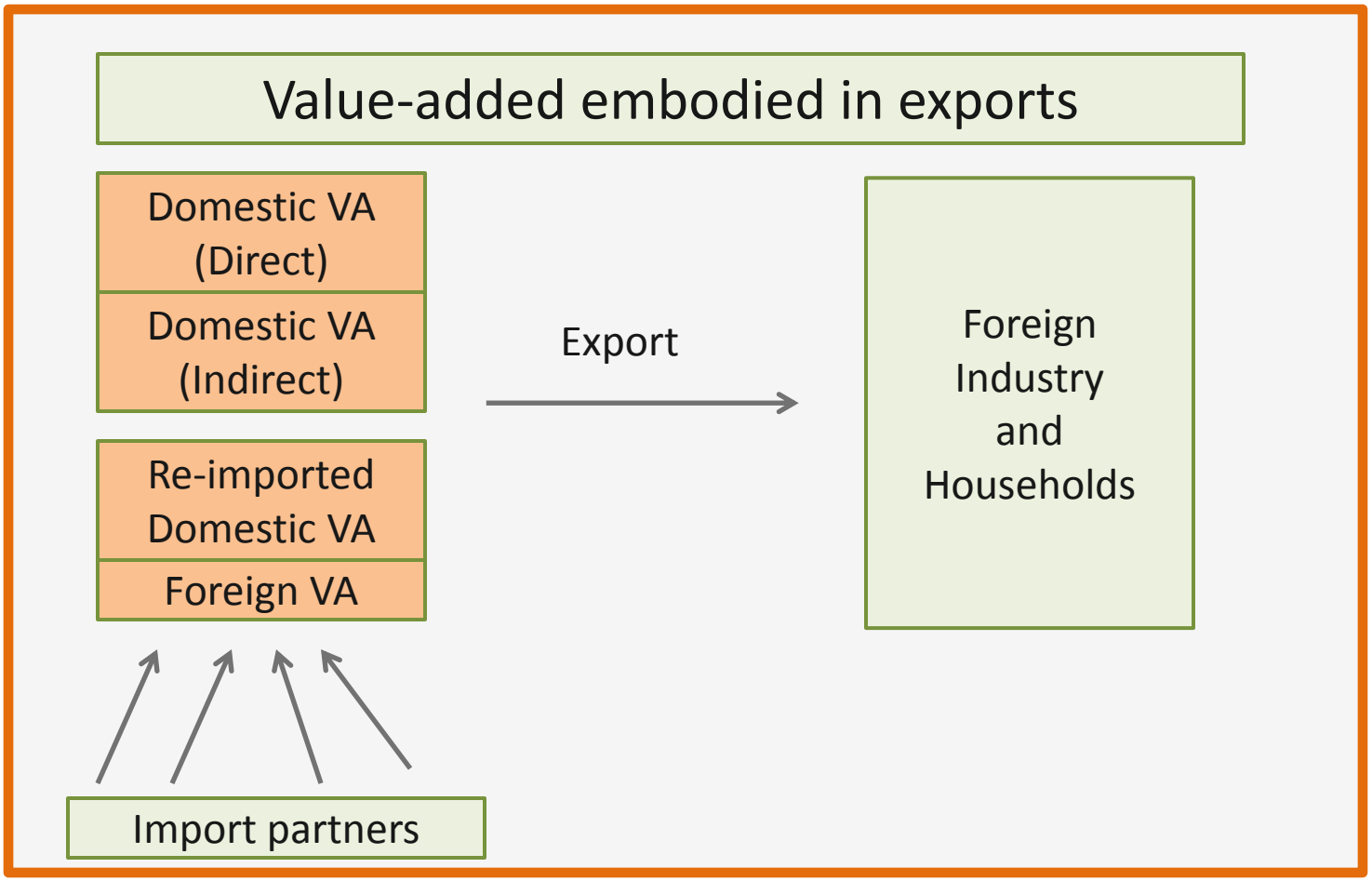
- Include more countries (notably Colombia, Costa Rica, Croatia)
- At least one additional year – 2010
- Direct use of annual Supply Use Tables
- Optimise detailed industry list? to account for ISIC Rev.4 (NACE Rev.2) inputs
- Quality enhancements
  - Introducing better balancing techniques
  - Sectoral value-added and gross output (esp. for non-OECD countries)
- Dissemination of ICIO tables with detailed documentation

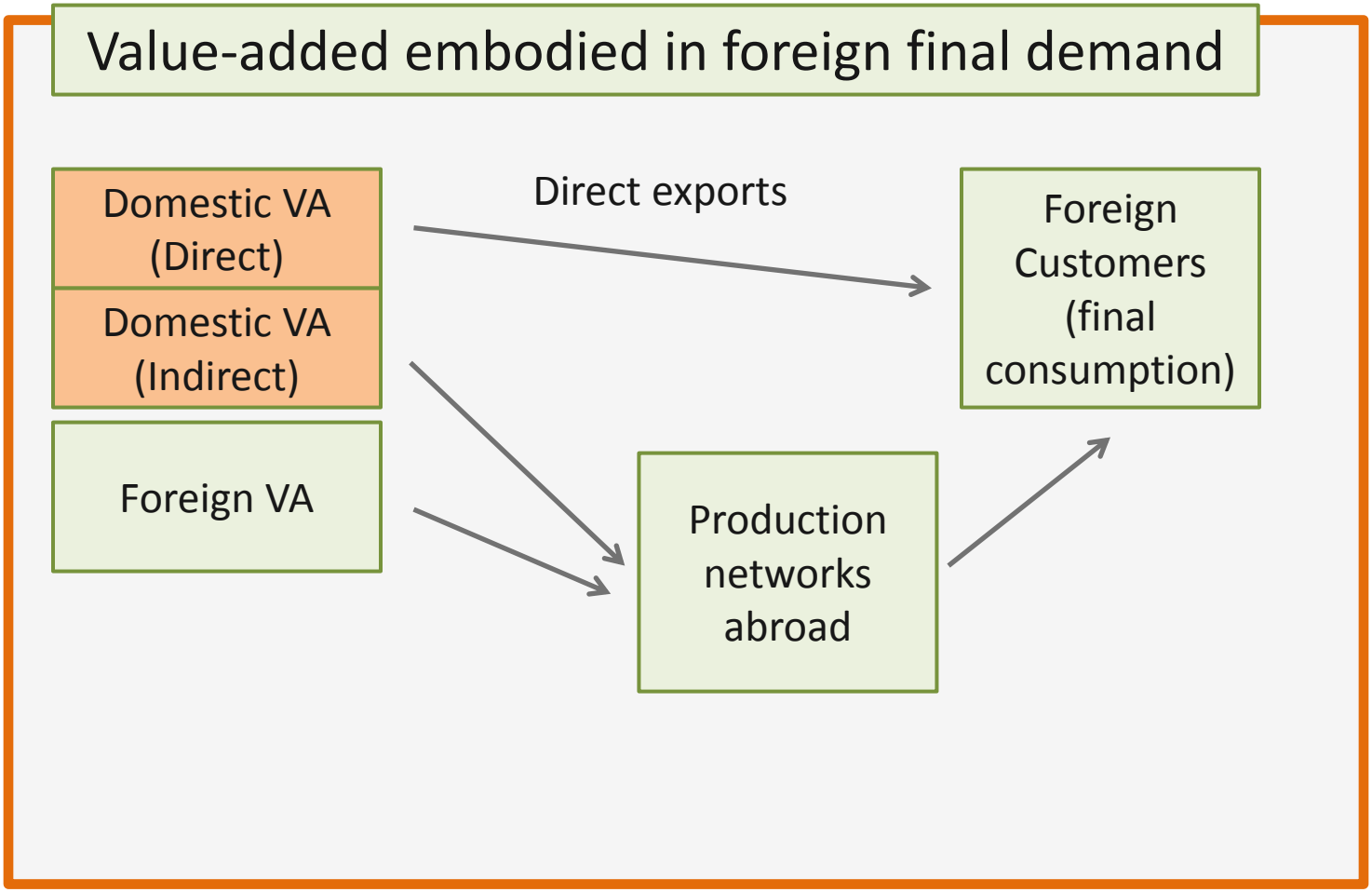
Longer term

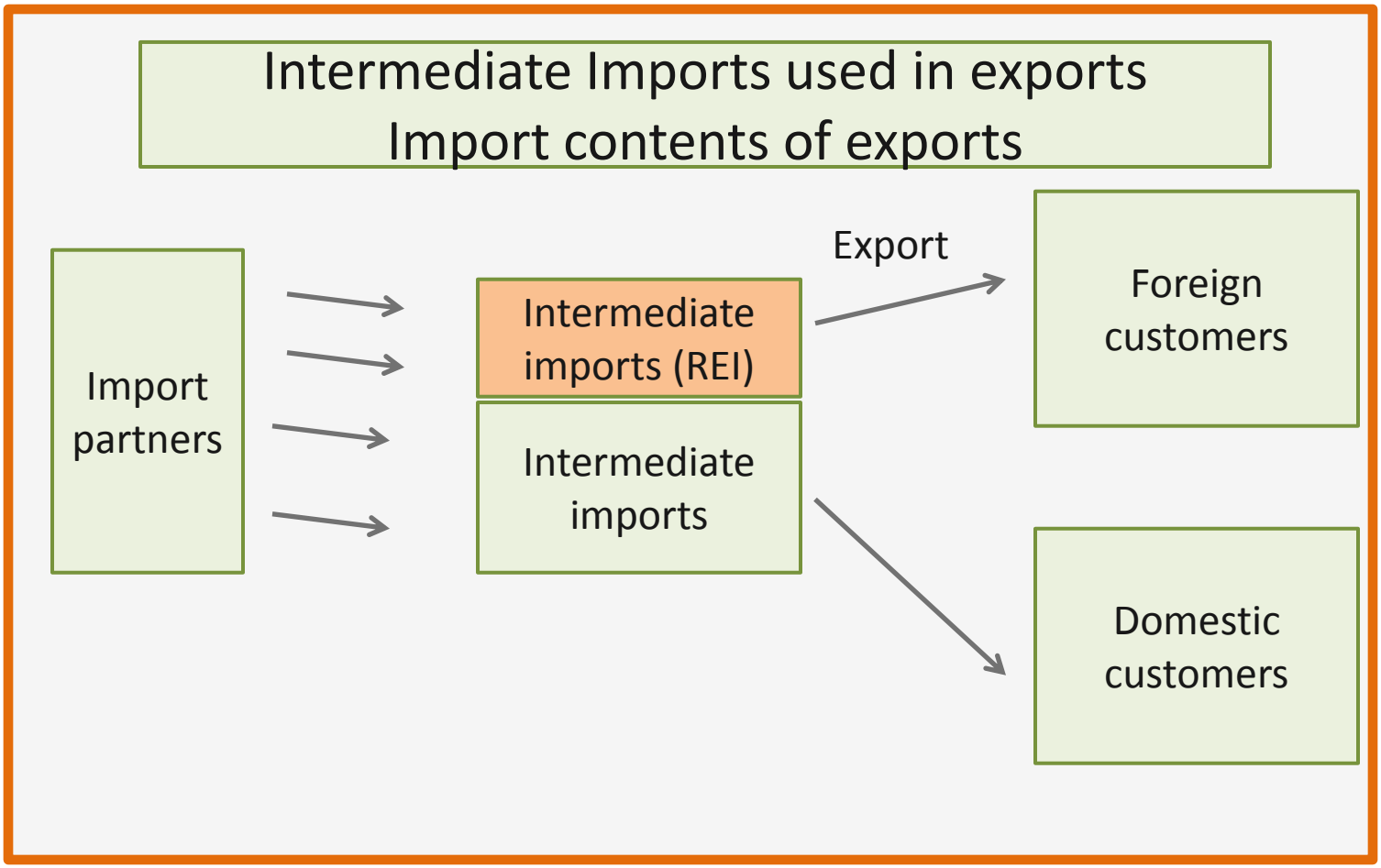
- Account for firm heterogeneity – exploit micro-data – linking trade and business statistics (STD)
- Dealing with SNA 2008, BPM6
- Develop techniques for extrapolating to provide estimates for more recent years …

TiVA Indicator groups

Indicator	Code
Gross exports (NOR to USA)	EXGR
NOR (VA) → NOR (exports) → World	EXGR_DVA
NOR (VA) → → → → → Consumption in foreign countries (e.g.DEU)	FDDVA
Foreign VA embodied in imports (e.g.FRA) → NOR(exports) → World	FVA_EXGR
Intermediate imports → NOR (exports) → World to total intermediate imports ratio	REI
Domestic VA embodied in imports → NOR	EXGR_RIM
Relative sectoral shares (RCAs)	RCA

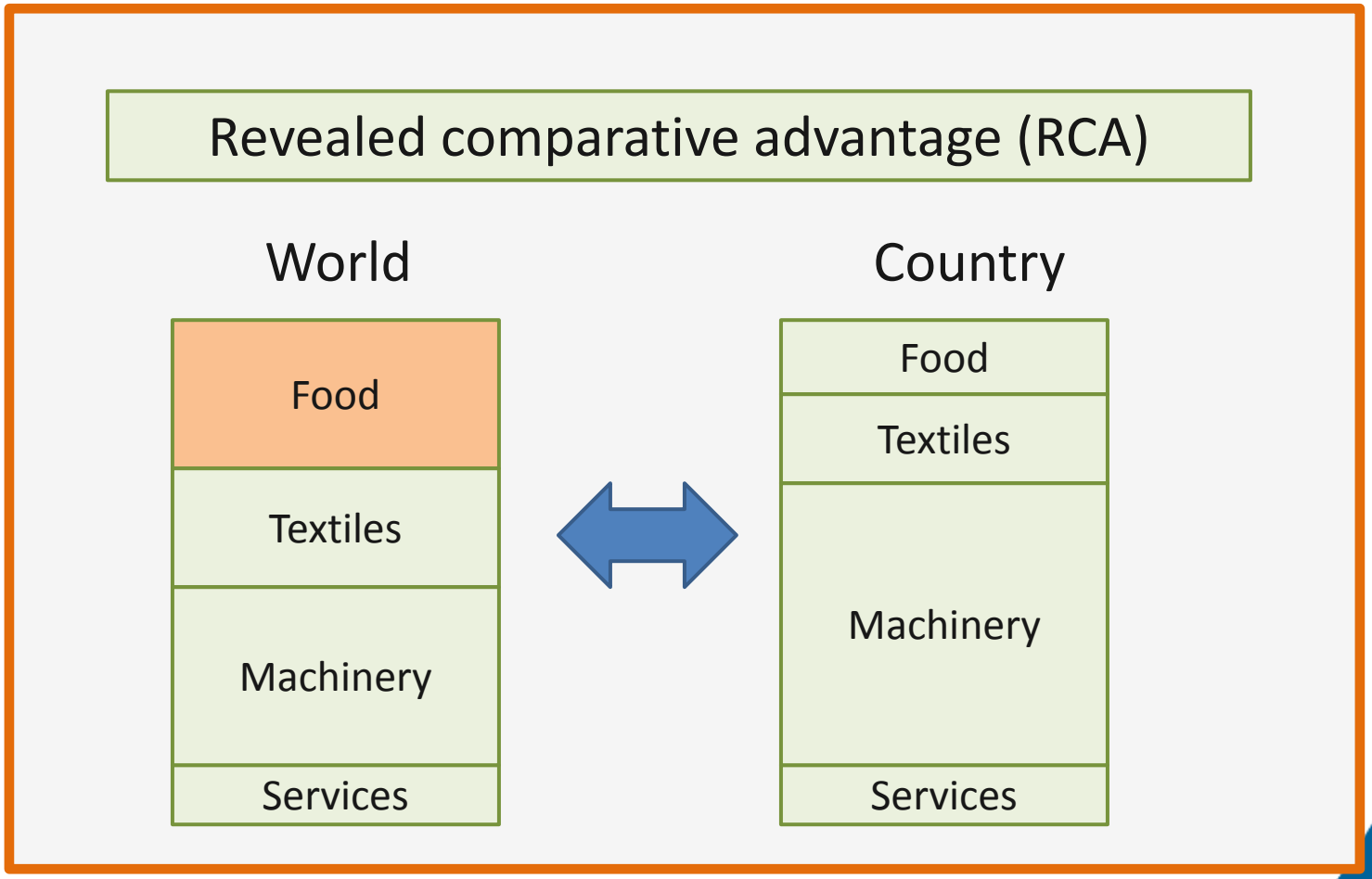

Value-added embodied in exports
Domestic VA (Direct)
Domestic VA (Indirect)
Re-imported Domestic VA
Foreign VA
Export
Foreign Industry and Households
Import partners


Value-added embodied in foreign final demand
Domestic VA (Direct)
Domestic VA (Indirect)
Foreign VA
Direct exports
Foreign Customers (final consumption)
Production networks abroad


Intermediate Imports used in exports
Import contents of exports
Import partners
Intermediate imports (REI)
Intermediate imports
Export
Foreign customers
Domestic customers

RCA index compares the export structure of a country and reference average structure (world average). If RCA is 1.0 for given country and sector , it means the sector has same export share.

$$RCAEX_p^r = \frac{EX_p^r / EX_t^r}{\sum_j EX_i^j / \sum_j EX_t^j}$$



Bilateral Trade by industry and end-use

- Current version of BTDIxE:
  - Exports and imports of goods for 40 goods producing industries (mainly 2-digit ISIC Rev.3) and 9 end-use categories, 1988-2011
  - 34 OECD + 30 non-Member countries
- Data source = OECD ITCS / UN Comtrade annual merchandise trade statistics (HS 6-digit)
- Standard conversion keys from HS to ISIC Rev. 3 and HS to End-use category (EUC) developed for each version of HS (1988, 1996, 2002, 2007) and applied to data according to reported HS.
- **Two new versions of BTDIxE forthcoming:**
  - A revised ISIC Rev. 3 version – following adjustments to conversion keys
  - A new ISIC Rev. 4 - based on new HS to ISIC Rev. 4 conversion keys
  - Both with significantly more countries - inclusion depends on quality of underlying ITCS/Comtrade data
- HS 2012 to ISIC and HS 2012 to end-use conversion keys developed

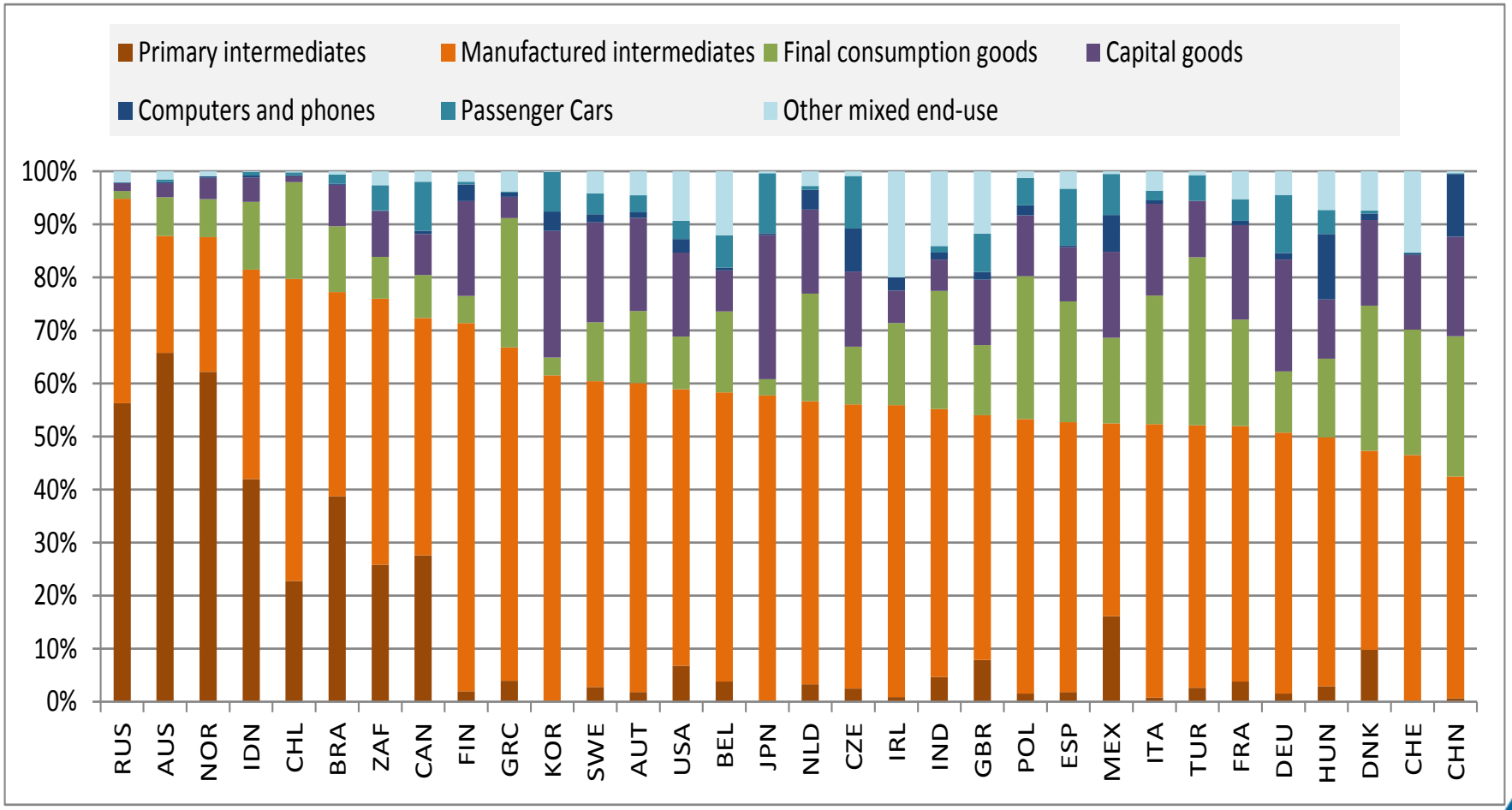
http://www.oecd.org/sti/btd

BTDIxE end-use categories

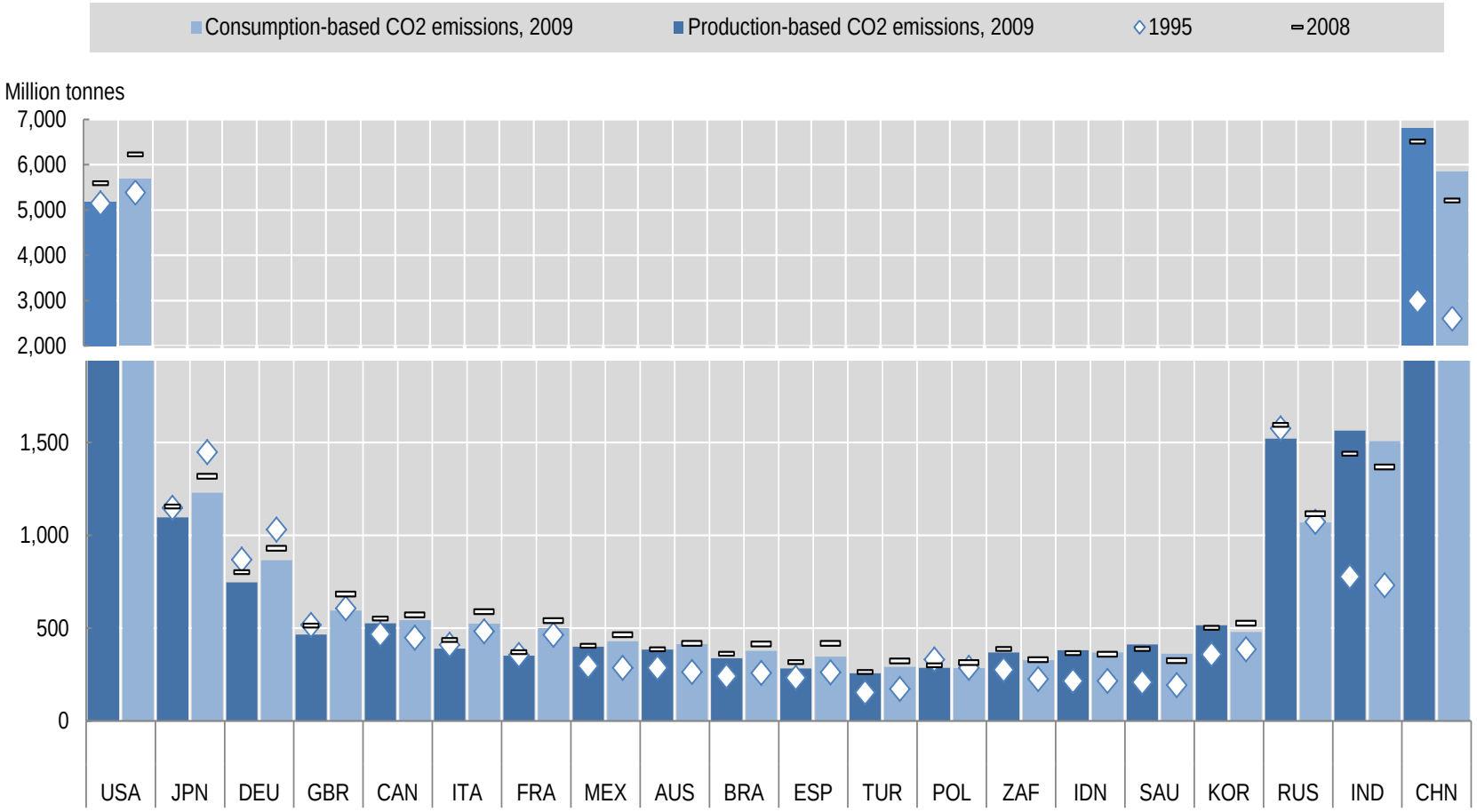
- 3 SNA end-use categories
  - Intermediate inputs
  - Household consumption
  - Capital goods
- 5 mixed end-uses
  - packed medicaments
  - personal computers
  - passenger cars
  - phones (fixed and mobile)
  - valuables

+ other n.e.c

Exports of goods by end-use category, 2011



Biggest net CO_2 importers and CO_2 exporters



Source: OECD, Science, Technology and Industry Scoreboard, 2013

See also: OECD Green Growth Indicators