



DEVELOPMENT OF INTER-COUNTRY INPUT-OUTPUT TABLE FOR OECD-WTO TIVA INDICATORS : PRACTICAL SOLUTIONS USING AVAILABLE DATA SOURCES

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Outline

- 1. ICIO database, a core model for TiVA**
- 2. Specification of ICIO database required for TiVA indicators**
- 3. Ideal statistics to build ICIO**
- 4. Reasons of asymmetries and unharmonised reported statistics**
- 5. Methodology**
- 6. Wishlist (short-term)**



ICIO and policy applications

Core of the TiVA database is an economic model based on **Inter-Country Input-Output table** (ICIO).

ICIO models allow us to analyse

- Trade in Value-added & Global Value-Chains
- Foreign contents in consumption and exports
- Jobs sustained by foreign demand
- Carbon emissions embodied in trade



What does ICIO look like?

basic price		Intermediate demand				Final demand		Output
		Country A		Country B		Country A	Country B	
		Sector 1	Sector 2	Sector 1	Sector 2			
Country A	Sector 1: Goods	Z_{11}^{AA}	Z_{12}^{AA}	Z_{11}^{AB}	Z_{12}^{AB}	F_1^{AA}	F_1^{AB}	X_1^A
	Sector 2: Services	Z_{21}^{AA}	Z_{22}^{AA}	$Z_{21}^{AB}+TMZ_1^{AB}$	$Z_{22}^{AB}+TMZ_2^{AB}$	F_2^{AA}	$F_2^{AB}+FNR_2^{AB}-CFA^A$	X_2^A
Country B	Sector 1: Goods	Z_{11}^{BA}	Z_{12}^{BA}	Z_{11}^{BB}	Z_{12}^{BB}	F_1^{BA}	F_1^{BB}	X_1^B
	Sector 2: Services	$Z_{21}^{BA}+TMZ_1^{BA}$	$Z_{22}^{BA}+TMZ_2^{BA}$	Z_{21}^{BB}	Z_{22}^{BB}	$F_2^{BA}+FNR_2^{BA}-CFA^B$	F_2^{BB}	X_2^B
Taxes less subsidies on products		NTZ_1^A	NTZ_2^A	NTZ_1^B	NTZ_2^B	$NTFD^A+NTFN^B$	$NTFD^B+NTFN^A$	
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			

November 2014 release

- 34 Industry (ISIC rev3)
- 61 countries and regional average e.g. 34 OECD, BRIICS, G20, EU28, NAFTA, ASEAN*, APEC*)
- Year: 1995,2000,05,08,09,10, 2011*
- Format: industry-by-industry, basic price



Development flow

- **Collection of national data sources**
- **Harmonisation and filling gaps**
 - National Accounts main components
 - Sectoral constraints of value-added and output
 - National I-O and Use tables
 - Bilateral trade in goods and services
- **Numerical adjustment for solving asymmetries in bilateral trade coefficients**
- **Global use table and ICIO**
- **Indicator calculations & Dissemination**



Our approach

- Official *published* I-O/SUT, National Accounts and Trade databases used for
 - Institutional long-term
 - Recognized starting point
- Benchmarked to National Accounts (final expenditures, value-added, output, definitions of exports and imports)
- Benchmarked to Balance of Payment trade balances
- Rest of the world (closed model)



1) Ideal I-O/SUT to build an ICIO

- Both in purchasers' prices and basic price
- Domestic and import tables
- Enough sectoral details to aggregate to harmonised sector classification
- Compatible with BoP / SNA (at least definitions)



‘Output and Value-added’

- **Output = Intermediate inputs + imports + taxes less subsidies + Value added components**

‘Trade’

- **Exports = Expenditure by non-resident in domestic and foreign territories**
- **Imports = Expenditure by residents in domestic and foreign territories**
- **Household consumption (by residents)**
- **Capital formation**
- **Recycling source appears in inventory adjustment**



OECD National Input-Output database

Domestic table

	Intermediate demand		Personal expenditure	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	$FEM2+TMFE2$	$REX2+TMREX2$	$IM2+TM2$



2) Ideal trade statistics to build an ICIO

For combining with national SUTs or IOTs:

best estimates of bilateral trade in goods and services by industry (product group) and by end-use (intermediate and final consumption) ...

- Bilaterally consistent (mirror trade)
- cif/fob margin allocation to origin transport support activities
- Reflect recent production activities
- Complete (by product and partners)
- Compatible with BoP / SNA (SUTs and IOTs)
- Reexports and reimports by origin & destination



Data sources for OECD Inter-country inter-industry model

Data sources

- Supply-use and Input-Output tables (National sources/ Eurostat / Asian Dev Bank)
- Bilateral trade statistics for goods and services (OECD / UN)
- National Accounts: main aggregate and satellite (NSIs, OECD, UN)
- Balance of Payments (National source / IMF)

Intermediate analytical data products at OECD

- Harmonised symmetric Input-Output tables (OECD I-O)
- Bilateral Trade Database by Industry and by End-use for goods (BTDIxE)
- Sectoral Value-Added (STAN)
- Harmonised Bilateral Trade in Services (OECD-WTO)
- Adjusted National Accounts (currency, discrepancy and re-exports)



General data issues

- **Harmonisation issues of SNA and National IO/SUT**
- **Price valuation (producers' price / basic price/purchasers' price)**
- **Relationship between imported goods and trade related services (cif/fob)**
- **Non-resident expenditures (65-75 % svc)**
- **Time series comparability (services)**



Wide ranging activities to improve underlying statistics

- **CSSP: Expert Group on Extended Supply and Use Tables**
- **Coordinate contributions from other international organisations including Eurostat, APEC, ADB, UN ECLAC and UN ESCWA**
- ***WPTGS*: Reflection Group on more detailed services trade statistics, as well as active appeals for certain service category data (for CIF/FOB adjustments)**
- **Analytical work on trade asymmetries as well as facilitation of bilateral meetings on asymmetries via *WPTGS***
- **WPTGS stocktaking questionnaire on activities at NSOs related to linked trade and business statistics (TEC, TEC+, STEC)**
- **Analytical work on**
 - **CIF/FOB ratios for countries reporting imports on both CIF and FOB basis (few)**
 - **Comparing trade by industry data from SUTs, TEC and using conversion keys**



Balancing issues: Bilateral trade

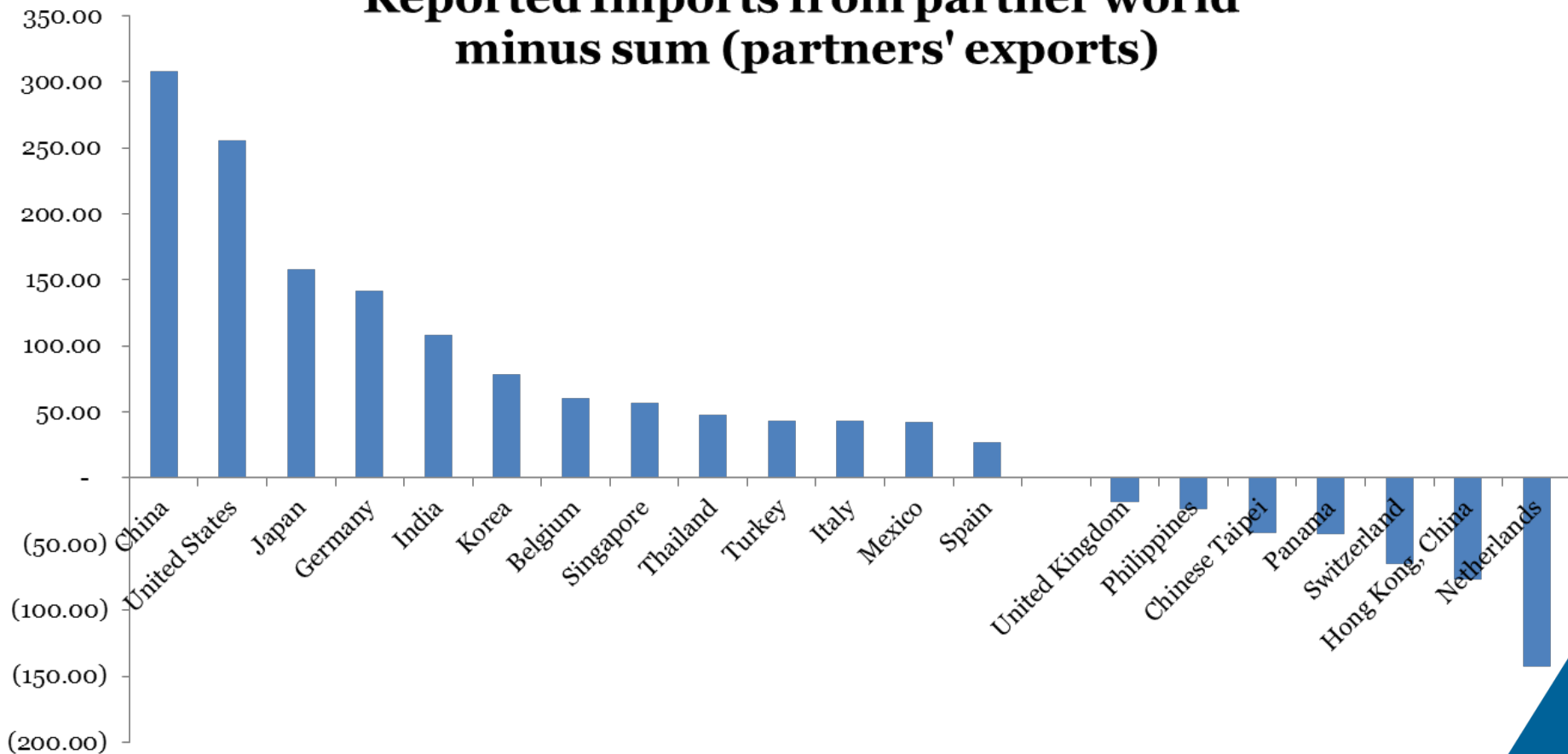
Balancing issue : Bilateral trade matrix

		Importing country			Total exports	SNA
		cou A	cou B	cou C		
Exporting country	cou A		15	30	45	40
	cou B	10		5	15	30
	cou C	20	10		30	20
	Total imports	30	25	35	90	
SNA constraints		30	35	25		90



Difference: reported imports – sum of key partners' exports (2011)

**Reported Imports from partner world
minus sum (partners' exports)**





Costa Rica

	Costa Rica reported exports	Partners' reported imports from Costa Rica	ratio
Total	9045	26766	2.96
Close neighbours	2255	2284	1.01
USA	3385	8944	2.64
Mexico	254	1902	7.48
Canada	95	424	4.45
Brazil	40	388	9.79
Netherlands	634	3047	4.81
Belgium	312	468	1.50
UK	160	330	2.06
Germany	139	476	3.43
Other Europe	373	830	2.23
China	269	3107	11.56
Hong Kong	438	994	2.27
Malaysia	169	1286	7.62
Singapore	42	555	13.29
Japan	85	345	4.07
Rest of World	396	1388	3.50

BTDIxE2013

*What is happening ? Not all due to multiple counting of re-exports?
High transport costs, big mark-ups, transfer pricing by MNEs ?*



After collection and filling gaps for 212 economies ...

- **Classification conversion: reported HS, EBOPS, national industry classification**
- **Estimation of bilateral trade flows in use table sector classification**
- **Estimation of national IO and use tables reconciled with NA based figures**
- **Balancing international trade flow using adjusted use table and bilateral partner shares**



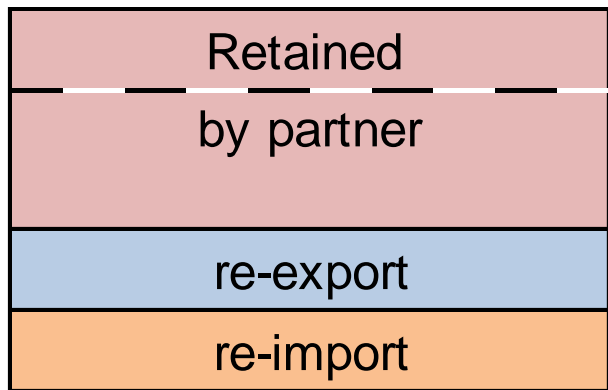
BTDIxE end-use categories

- **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



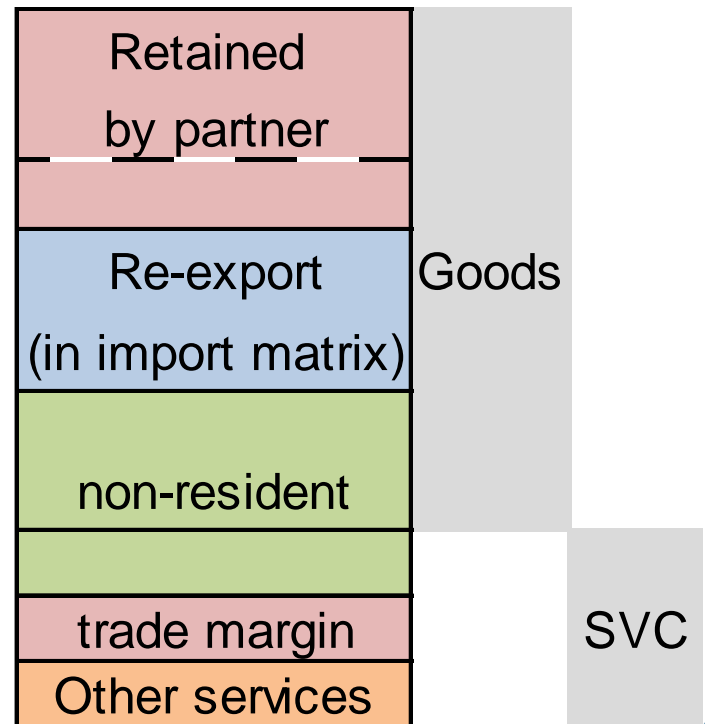
Adjusting merchandise trade statistics to NA framework (goods exports)

Merchandise trade (fob)



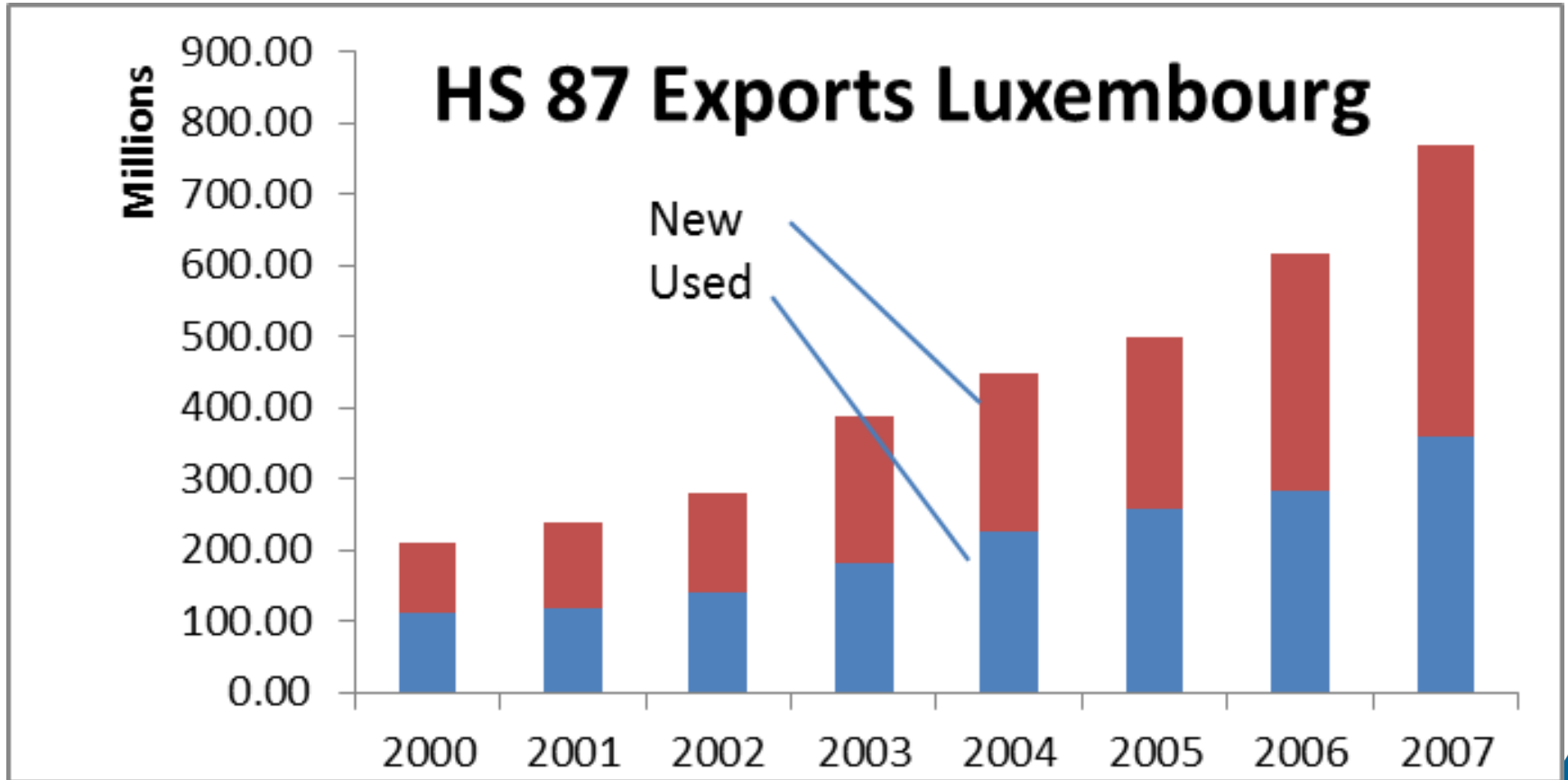
goods

SUT / IO / NA export





Beyond 6digit trade statistics: Used (second-hand) products



Source: Eurostat



Adjusting bilateral trade in services

- **National accounts benchmarked**
- **Reconciliation of exports and imports at EBOPS at 10 categ. (OECD-WTO)**
- **Filling gaps (unavailable pairs, construction and renting equipment)**
- **Converted to product dimension in SUT**
- **Bilateral trade flows**



Balancing procedure of Wang *et al* (2013), eds Mattoo, Wang & Wei

- **Stage 1: Reconciliation of sectoral exports and imports**
 - Sum of total exports of goods and services of all countries matches total imports
- **Stage 2: Reconciliation of national SUTs using adjusted trade vectors and national accounts constraints**
- **Stage 3: Linking national use table with bilateral trade coefficients**



Balancing Inter-country Use table (ICUT)

basic price		Intermediate demand				Final demand		Non-resident expenditures		CIF/FOB adjustment	Output (prd)	
		Country A		Country B		Country A	Country B	Country A	Country B			
		Sector 1	Sector 2	Sector 1	Sector 2							
Country A	Sector 1: Goods	Z_{11}^{AA}	Z_{12}^{AA}	Z_{11}^{AB}	Z_{12}^{AB}	F_1^{AA}	F_1^{AB}		FNR_1^{AB}	- CFA ^A + CFA ^A	X_1^A	
	Sector 2a: Services	Z_{21}^{AA}	Z_{22}^{AA}	Z_{21}^{AB}	Z_{22}^{AB}	F_2^{AA}	F_2^{AB}		FNR_2^{AB}		X_{2a}^A	
	Sector 2b: Services (trade/insurance)			TMZ_1^{AB}	TMZ_2^{AB}		TMF^{AB}				X_{2b}^A	
	CIF/FOB adjustment			$-CFA_{11}^{AB}$	$-CFA_{12}^{AB}$		$-CFA_{F1}^{AB}$					
Country B	Sector 1: Goods	Z_{11}^{BA}	Z_{12}^{BA}	Z_{11}^{BB}	Z_{12}^{BB}	F_1^{BA}	F_1^{BB}	FNR_1^{BA}		- CFA ^B + CFA ^B	X_1^B	
	Sector 2a: Services	Z_{21}^{BA}	Z_{22}^{BA}	Z_{21}^{BB}	Z_{22}^{BB}	F_2^{BA}	F_2^{BB}				FNR_2^{BA}	X_{2a}^B
	Sector 2b: Services (trade/insurance)	TMZ_1^{BA}	TMZ_2^{BA}			TMF^{BA}						X_{2b}^B
	CIF/FOB adjustment	$-CFA_{11}^{BA}$	$-CFA_{12}^{BA}$			$-CFA_{F1}^{BA}$						
Taxes less subsidies on products		NTZ_1^A	NTZ_2^A	NTZ_1^B	NTZ_2^B	$NTFD^A$	$NTFD^B$	$NTFN^B$	$NTFN^A$			
Value-added		V_1^A	V_2^A	V_1^B	V_2^B							
Output at basic price (ind)		X_1^A	X_2^A	X_1^B	X_2^B							



Wishlist (short-term)

- Statistics that are ***timely*** and ***nationally consistent*** (across sources)
- Statistics with appropriate ***detailed breakdowns*** (by country and industry/product category) which are ***internationally comparable***
- An international trade matrix that is perfectly ***symmetrical, complete*** (no missing values), ***consistent*** with data in IO/SUT/NA, and converted to end-use categories



Data sources

	Available	Requirement	Extended ICIO/SUT
Value added and Output	SNA: Value-added and Output by Industry (all) Manuf. Census/SBS: detail sectoral info	By product	By HGT
Final expenditure	Purchasers' prices	Basic price	

*HGT: Heterogeneity within industry e.g. exporter/non-exporter, firm size, Processing/domestic, foreign-owned, sub-national regions



Data sources

	Available	Requirement	Extended ICIO/SUT
Trade (national total)	BOP (total goods and services)	Conversion from EBOPS to product and industry dimensions	
Bilateral trade	Export fob, pu prices Import cif, pu prices Service by EBOPS (6dgt – 10dgt)	Trade partner shares by end-use category; International trade margin, fob and basic price based estimate	Import partner shares by HGT

*HGT: Heterogeneity within industry e.g. exporter/non-exporter, firm size, Processing/domestic, foreign-owned, sub-national regions



Data sources

	Available	Requirement	Extended ICIO/SUT
Input-Output	SIOT(p x p) Import matrices (p x p)		
Use table	Use pu prices and pr prices	Use at bp Import (p x i)	
Harmonisation with SNA	Trade margin, tax- less-subsidy on products, non- resident expenditures		
Supply	Country total supply by industry	Supplying industry by exported and domestically consumed products	Supply (product by exporter & non- exporter)



THANK YOU

www.oecd.org/trade/valueadded