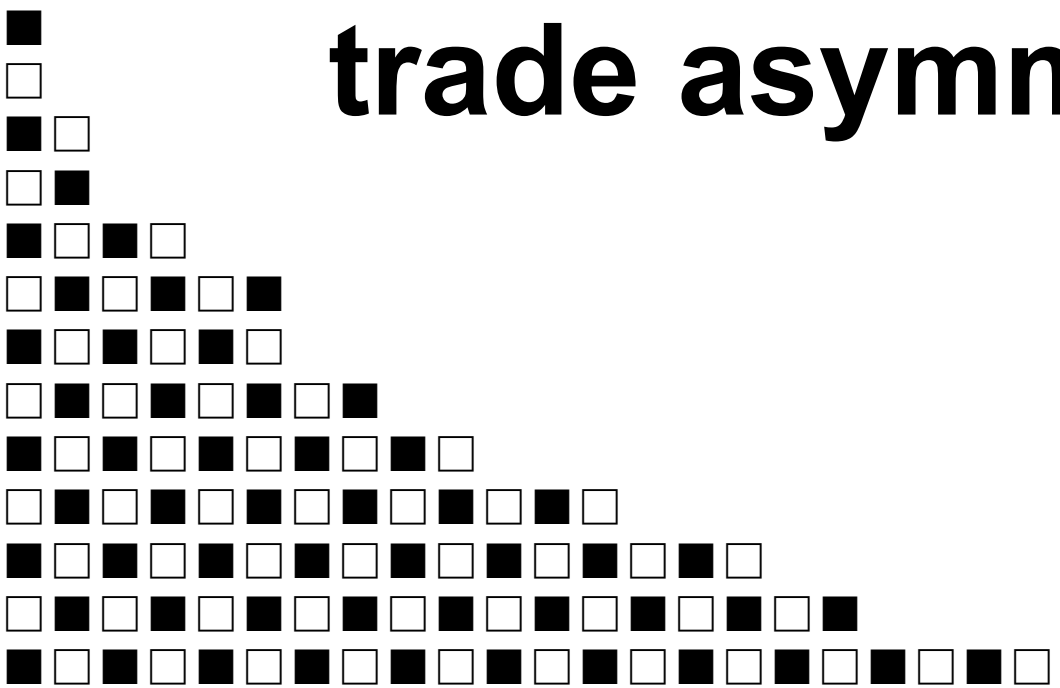
Constructing multi-country input-output tables and the issue of trade asymmetries



Satoshi Inomata
IDE-JETRO

Outline

1. Why are multi-country IO tables so popular these days?
2. Compilation procedure (from *the UN Handbook of Supply, Use and Input-Output Tables*).
3. The issue of trade asymmetries.

Why are multi-country input-output tables so popular these days?

Key areas

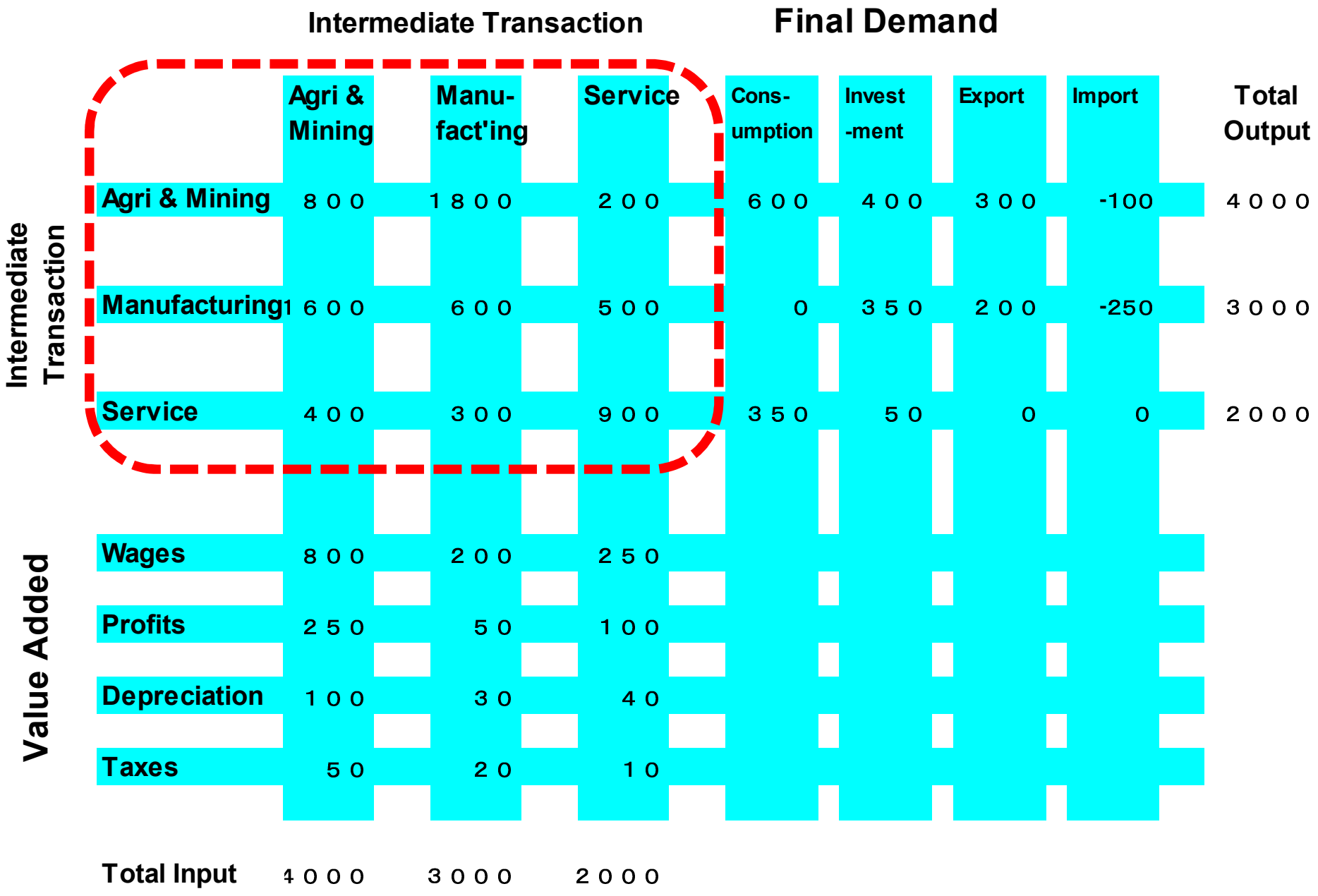
(1) “Environmental footprint”: greenhouse gases, water uses, biodiversity;

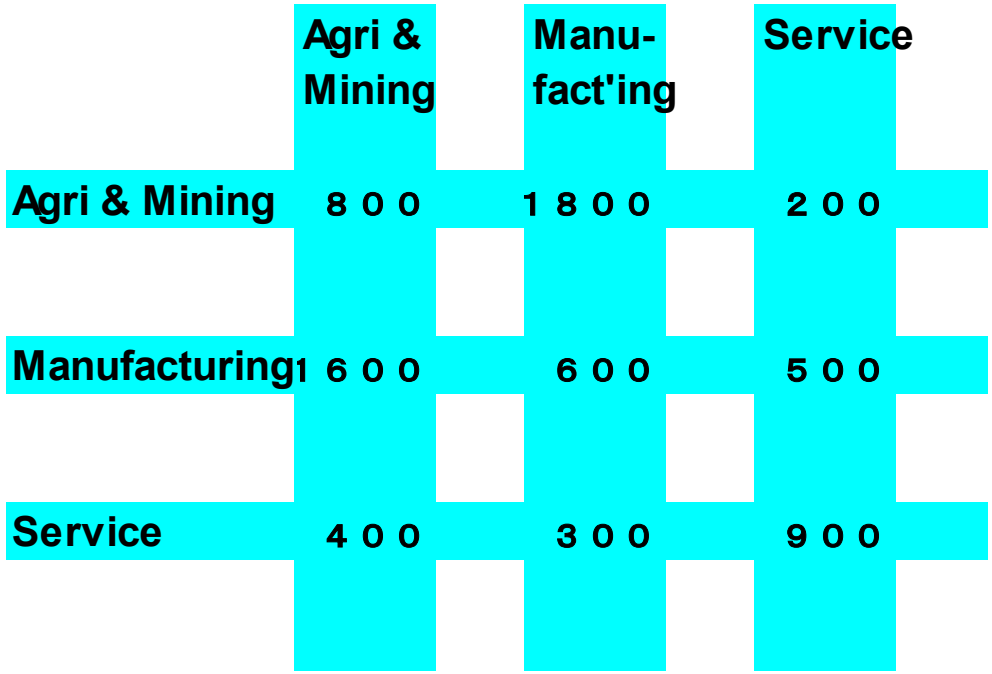
(2) “Trade in value-added”: gross versus value-added accounts;

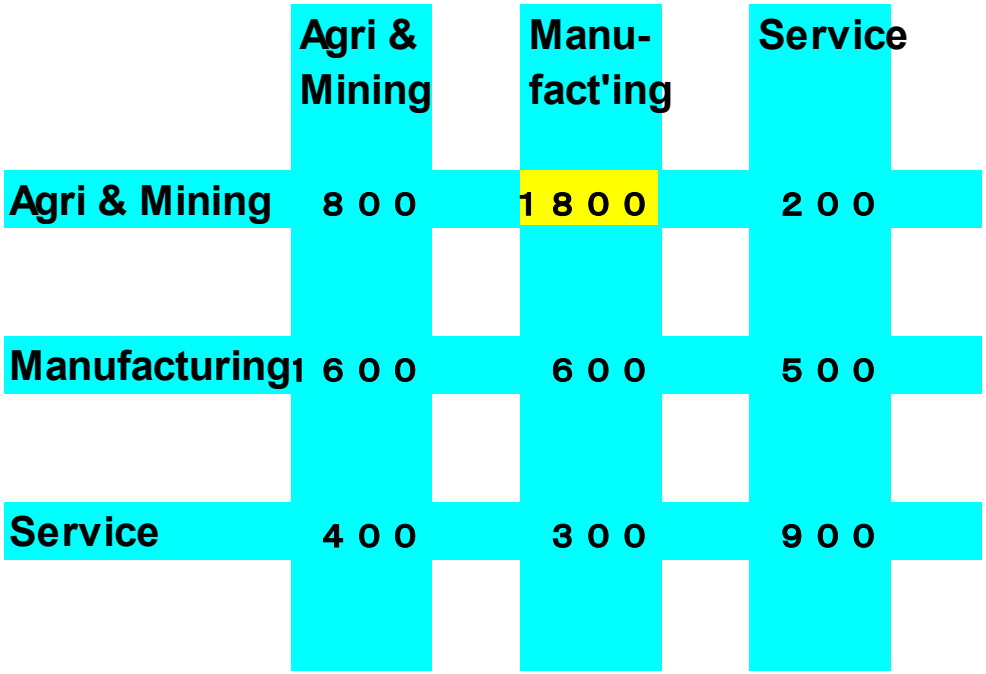
(3) Impact of globalization on labor markets: cross-border transfer of employment opportunities.

Compilation procedure

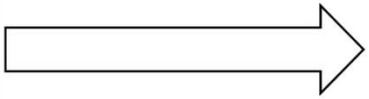
Input-Output Table (3 sectors)




Agri & Mining
Manu-fact'ing
Service
Agri & Mining
800
1800
200
Manufacturing
1600
600
500
Service
400
300
900

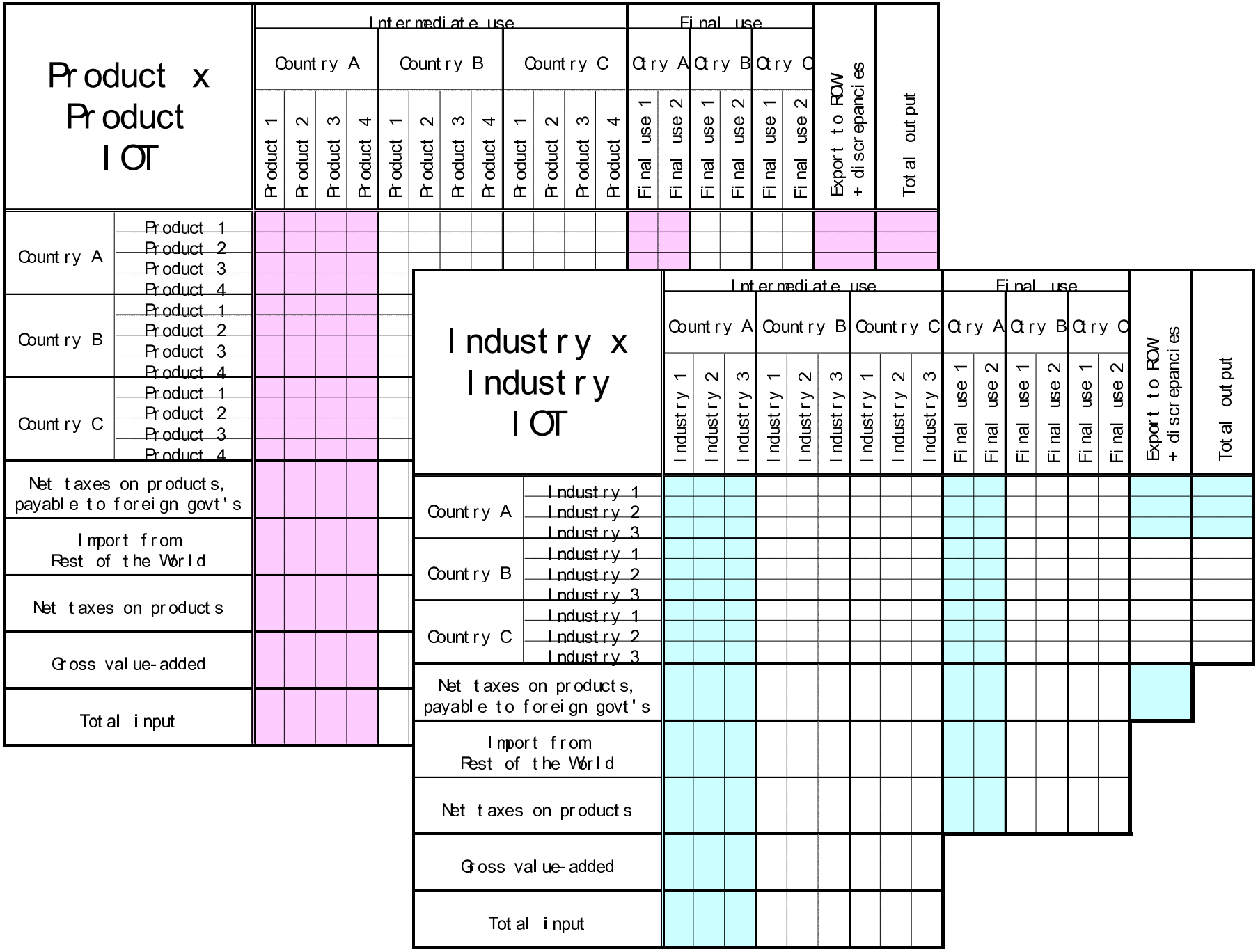

Agri & Mining
Manu-fact'ing
Service
Agri & Mining
800
1800
200
Manufacturing
1600
600
500
Service
400
300
900

	Agri & Mining	Manu-fact'ing	Service
Agri & Mining	800	1800	200
Manufacturing	1600	600	500
Service	400	300	900



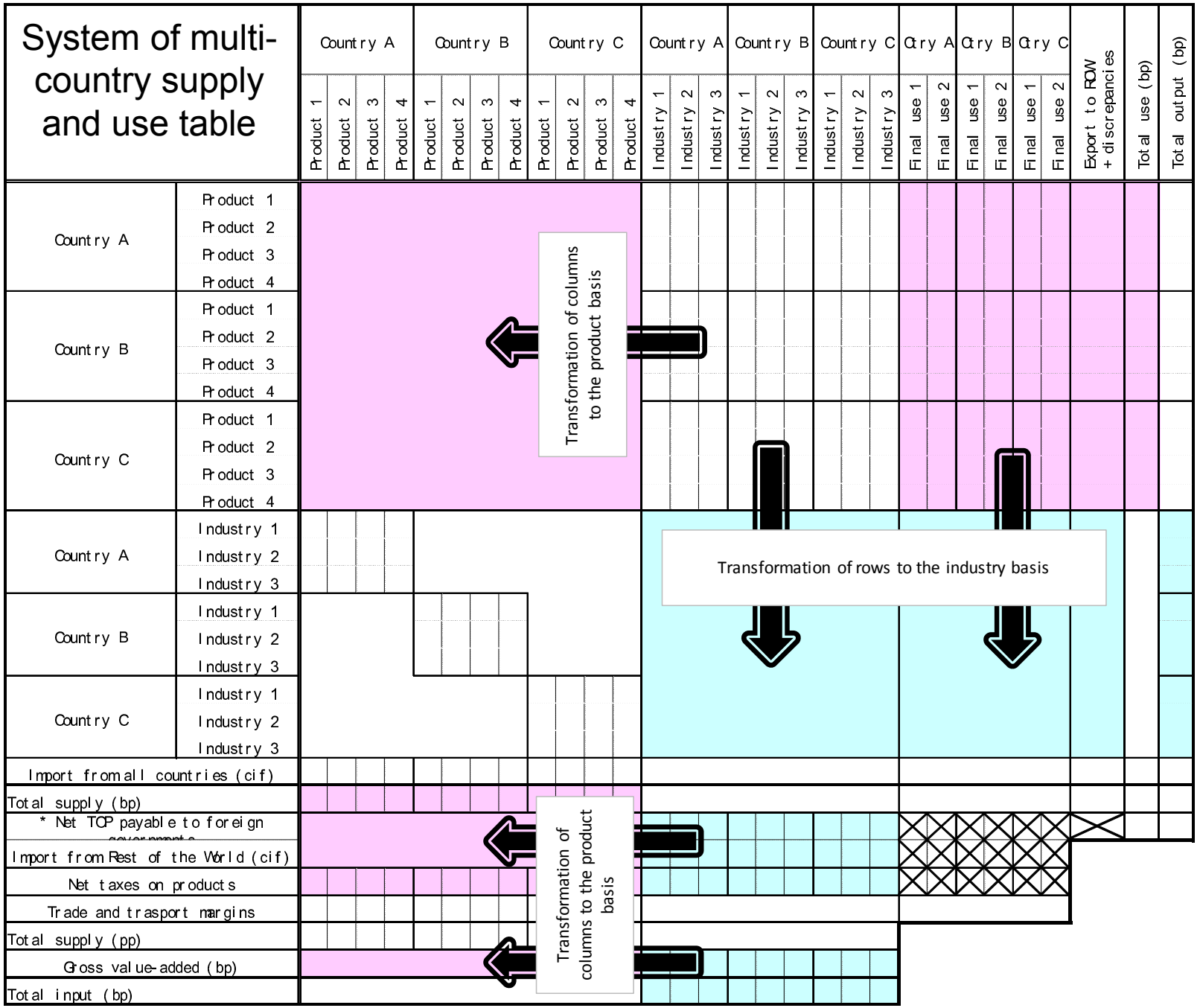
Output → / Input ↓		Intermediate use									Final use						Export to ROW + discrepancies	Total output
		Country A			Country B			Country C			Ctry A		Ctry B		Ctry C			
		Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2		
Country A	Industry 1																	
	Industry 2																	
	Industry 3																	
Country B	Industry 1																	
	Industry 2																	
	Industry 3																	
Country C	Industry 1																	
	Industry 2																	
	Industry 3																	
Net taxes on products, payable to foreign govt's																		
Import from Rest of the World																		
Net taxes on products																		
Gross value-added																		
Total input																		

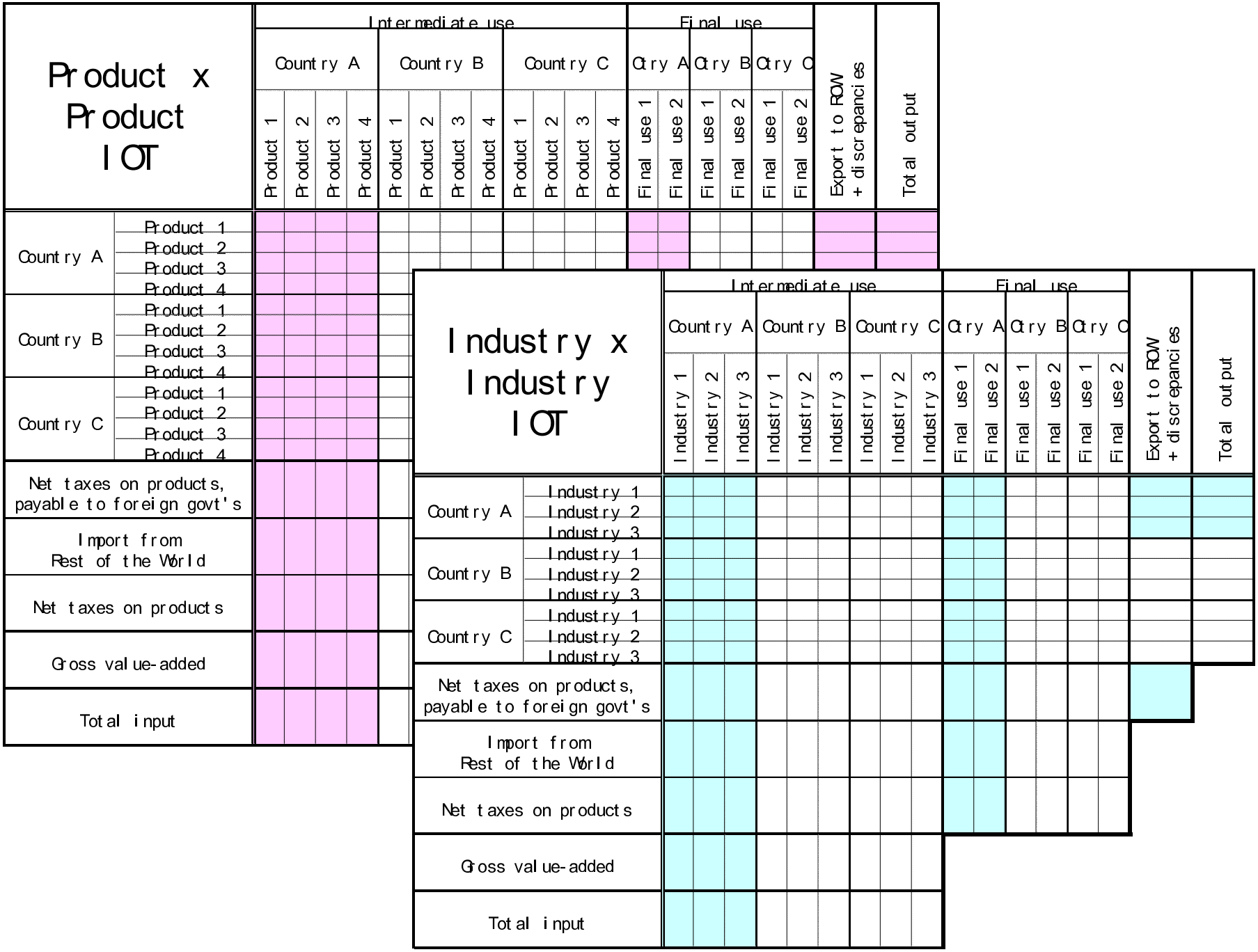
Output → / Input ↓		Intermediate use									Final use						Export to ROW + discrepancies	Total output
		Country A			Country B			Country C			Ctry A		Ctry B		Ctry C			
		Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2		
Country A	Industry 1																	
	Industry 2																	
	Industry 3																	
Country B	Industry 1																	
	Industry 2																	
	Industry 3																	
Country C	Industry 1																	
	Industry 2																	
	Industry 3																	
Net taxes on products, payable to foreign govt's																		
Import from Rest of the World																		
Net taxes on products																		
Gross value-added																		
Total input																		

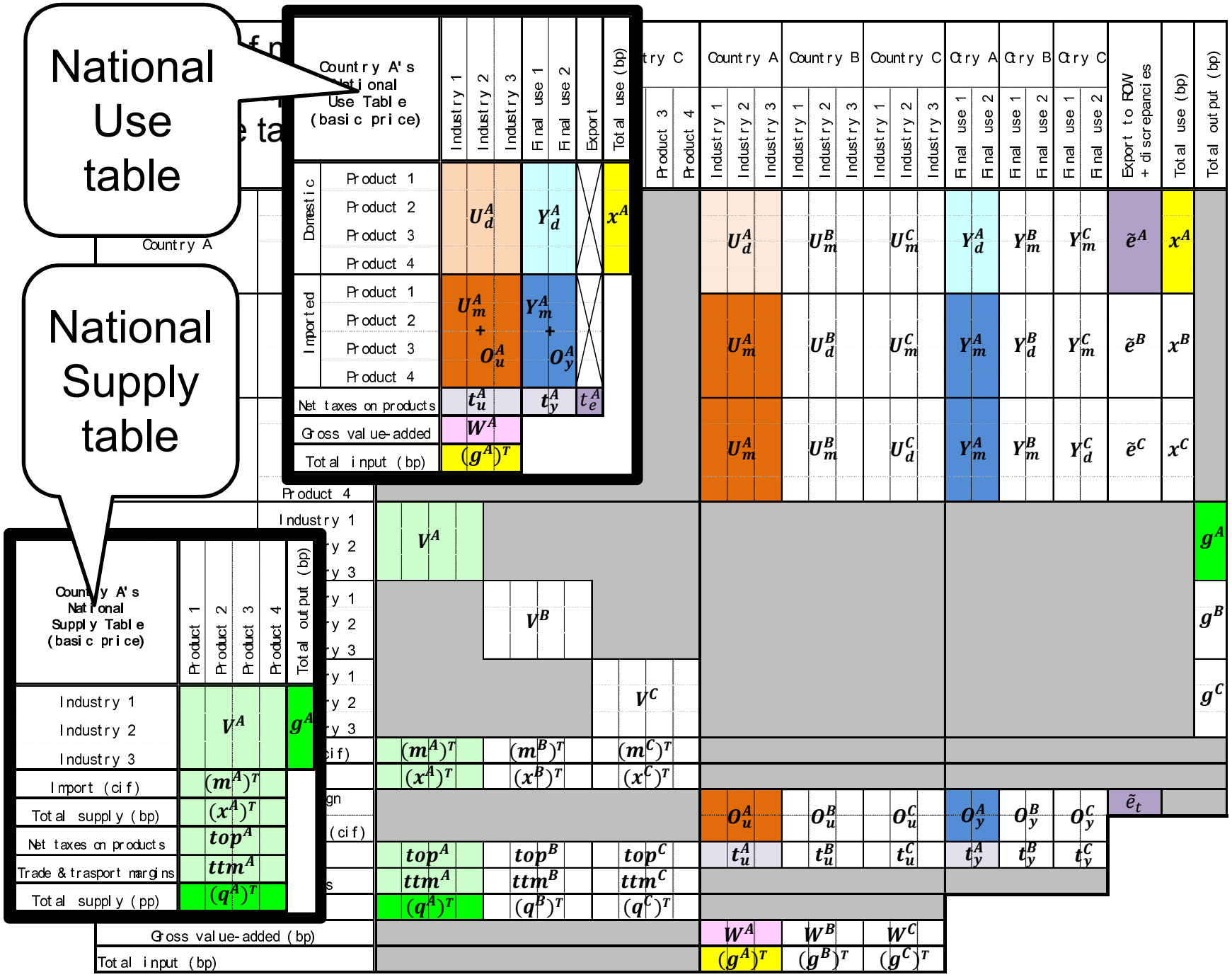

Product x Product IOT
Intermediate use
Final use
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Product 1
Product 2
Product 3
Product 4
Final use 1
Final use 2
Export to ROW + discrepancies
Total output
Country A
Country B
Country C
Net taxes on products, payable to foreign govt's
Import from Rest of the World
Net taxes on products
Gross value-added
Total input
Industry x Industry IOT
Industry 1
Industry 2
Industry 3

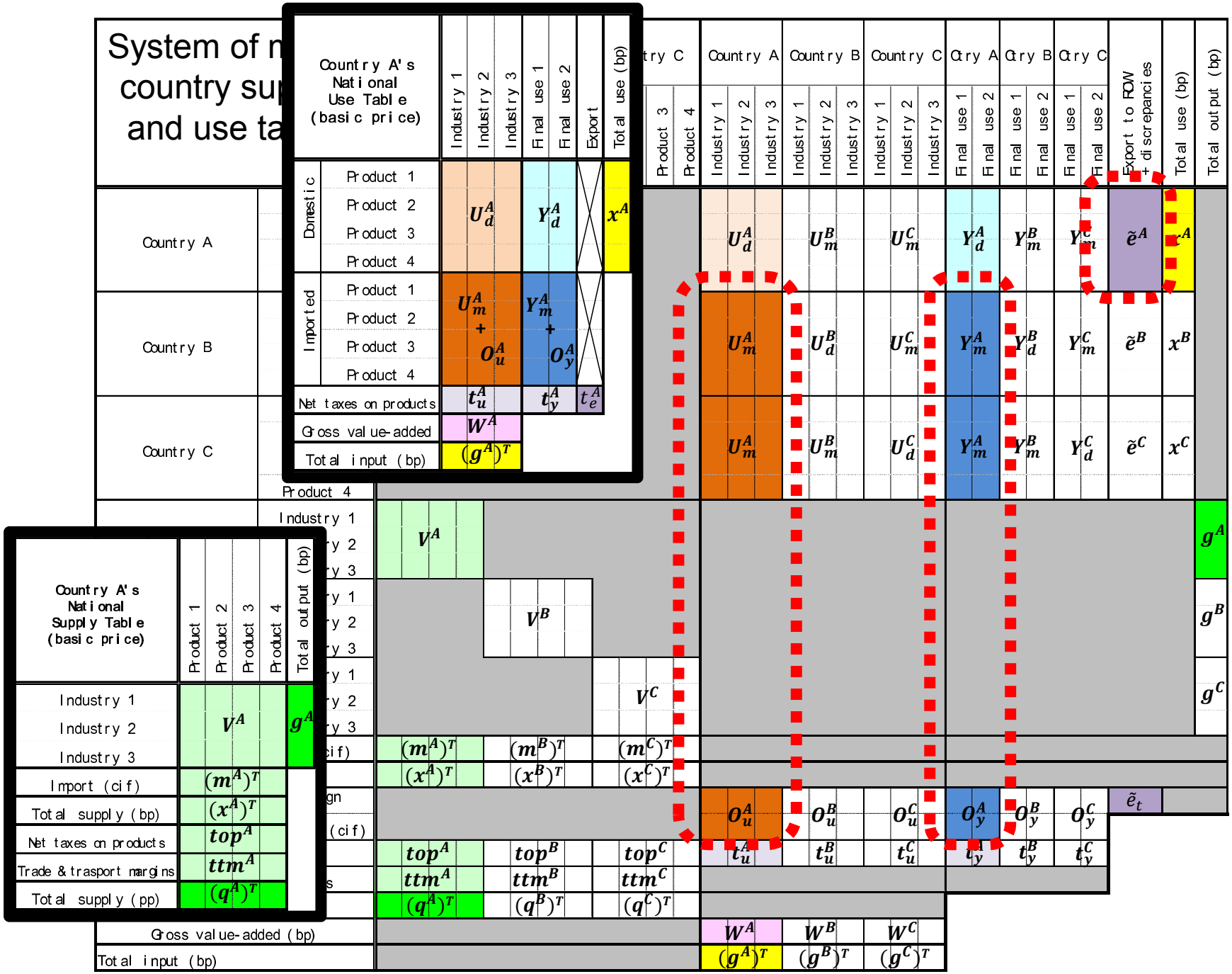
System of multi-country supply and use table

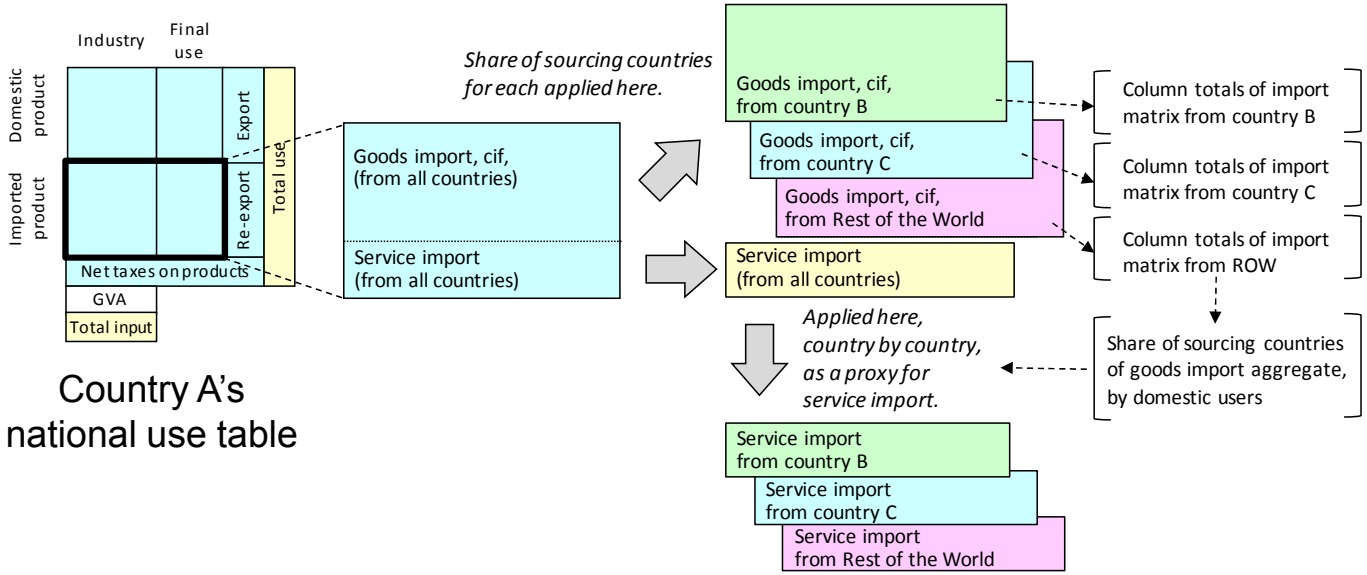
		Country A				Country B				Country C				Country A			Country B			Country C			Ctry A		Ctry B		Ctry C		Export to ROW + discrepancies	Total use (bp)	Total output (bp)
		Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Product 1	Product 2	Product 3	Product 4	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2			
Country A	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country B	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country C	Product 1																													
	Product 2																													
	Product 3																													
	Product 4																													
Country A	Industry 1																													
	Industry 2																													
	Industry 3																													
Country B	Industry 1																													
	Industry 2																													
	Industry 3																													
Country C	Industry 1																													
	Industry 2																													
	Industry 3																													
Import from all countries (cif)																														
Total supply (bp)																														
* Net TOP payable to foreign governments																														
Import from Rest of the World (cif)																														
Net taxes on products																														
Trade and trasport margins																														
Total supply (pp)																														
Gross value-added (bp)																														
Total input (bp)																														

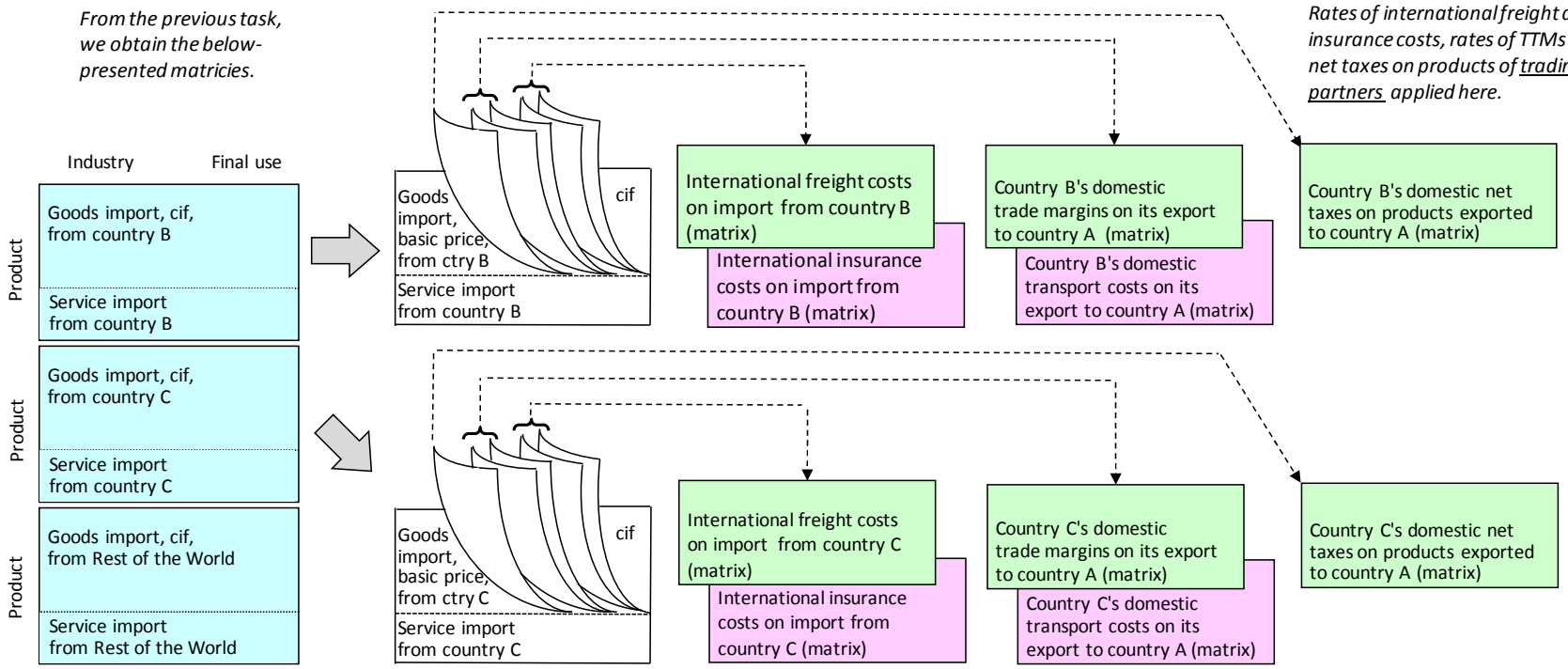

System of multi-country supply and use table
Country A
Country B
Country C
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Export to ROW + discrepancies
Total use (bp)
Total output (bp)
Product 1
Product 2
Product 3
Product 4
Industry 1
Industry 2
Industry 3
Final use 1
Final use 2
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Transformation of columns to the product basis
Transformation of rows to the industry basis
Import from all countries (cif)
Total supply (bp)
* Net TCP payable to foreign
Import from Rest of the World (cif)
Net taxes on products
Trade and trasport margins
Total supply (pp)
Gross value-added (bp)
Total input (bp)
Transformation of columns to the product basis


Product x Product IOT
Intermediate use
Final use
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Product 1
Product 2
Product 3
Product 4
Final use 1
Final use 2
Export to ROW + discrepancies
Total output
Country A
Country B
Country C
Net taxes on products, payable to foreign govt's
Import from Rest of the World
Net taxes on products
Gross value-added
Total input
Industry x Industry IOT
Industry 1
Industry 2
Industry 3


National Use table
National Supply table
Country A's National Use Table (basic price)
Industry 1
Industry 2
Industry 3
Final use 1
Final use 2
Export
Total use (bp)
Domestic
Imported
Product 1
Product 2
Product 3
Product 4
Net taxes on products
Gross value-added
Total input (bp)
Country A's National Supply Table (basic price)
Product 1
Product 2
Product 3
Product 4
Total output (bp)
Import (cif)
Total supply (bp)
Trade & trasport margins
Total supply (pp)
Country A
Country B
Country C
Export to ROW + discrepancies
Total use (bp)
Total output (bp)


System of n
country sup
and use ta
Country A's National Use Table (basic price)
Industry 1
Industry 2
Industry 3
Final use 1
Final use 2
Export
Total use (bp)
Domestic
Imported
Product 1
Product 2
Product 3
Product 4
U_d^A
Y_d^A
x^A
$U_m^A + O_u^A$
$Y_m^A + O_y^A$
Net taxes on products
t_u^A
t_y^A
t_e^A
Gross value-added
W^A
Total input (bp)
$(g^A)^T$
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Export to ROW + discrepancies
Total use (bp)
Total output (bp)
U_m^B
U_m^C
Y_m^A
Y_m^B
Y_m^C
$\tilde{e}^A$
x^A
U_m^A
U_d^B
U_m^C
Y_m^A
Y_d^B
Y_m^C
$\tilde{e}^B$
x^B
U_m^A
U_m^B
U_d^C
Y_m^A
Y_m^B
Y_d^C
$\tilde{e}^C$
x^C
Product 4
Industry 1
Industry 2
Industry 3
V^A
V^B
V^C
g^A
g^B
g^C
$(m^A)^T$
$(m^B)^T$
$(m^C)^T$
$(x^A)^T$
$(x^B)^T$
$(x^C)^T$
O_u^A
O_u^B
O_u^C
O_y^A
O_y^B
O_y^C
$\tilde{e}_t$
t_u^A
t_u^B
t_u^C
t_y^A
t_y^B
t_y^C
top^A
top^B
top^C
ttm^A
ttm^B
ttm^C
$(q^A)^T$
$(q^B)^T$
$(q^C)^T$
W^A
W^B
W^C
$(g^A)^T$
$(g^B)^T$
$(g^C)^T$
Gross value-added (bp)
Total input (bp)
Country A's National Supply Table (basic price)
Product 1
Product 2
Product 3
Product 4
Total output (bp)
Industry 1
Industry 2
Industry 3
Import (cif)
Total supply (bp)
Net taxes on products
Trade & trasport margins
Total supply (pp)
V^A
g^A
$(m^A)^T$
$(x^A)^T$
top^A
ttm^A
$(q^A)^T$


Industry
Final use
Domestic product
Imported product
Export
Re-export
Total use
Net taxes on products
GVA
Total input
Country A's national use table
Goods import, cif, (from all countries)
Service import (from all countries)
Share of sourcing countries for each applied here.
Goods import, cif, from country B
Goods import, cif, from country C
Goods import, cif, from Rest of the World
Service import (from all countries)
Column totals of import matrix from country B
Column totals of import matrix from country C
Column totals of import matrix from ROW
Share of sourcing countries of goods import aggregate, by domestic users
Applied here, country by country, as a proxy for service import.
Service import from country B
Service import from country C
Service import from Rest of the World


From the previous task, we obtain the below-presented matricies.
Industry
Final use
Product
Goods import, cif, from country B
Service import from country B
Goods import, cif, from country C
Service import from country C
Goods import, cif, from Rest of the World
Service import from Rest of the World
Goods import, basic price, from ctry B
cif
Service import from country B
Goods import, basic price, from ctry C
Service import from country C
International freight costs on import from country B (matrix)
International insurance costs on import from country B (matrix)
Country B's domestic trade margins on its export to country A (matrix)
Country B's domestic transport costs on its export to country A (matrix)
International freight costs on import from country C (matrix)
International insurance costs on import from country C (matrix)
Country C's domestic trade margins on its export to country A (matrix)
Country C's domestic transport costs on its export to country A (matrix)
Rates of international freight and insurance costs, rates of TTMs and net taxes on products of trading partners applied here.
Country B's domestic net taxes on products exported to country A (matrix)
Country C's domestic net taxes on products exported to country A (matrix)

The issue of trade asymmetries

Behind the trade asymmetries …

① Difference in valuation schemes of import (= CIF) and export (= FOB);

② Recorded difference between the country of origin (for import) and the country of destination (for export);

③ Improper declaration of product classification at the customs border, either entry or exit;

Behind the trade asymmetries …

(continued)

④ Different treatment of the customs warehousing;

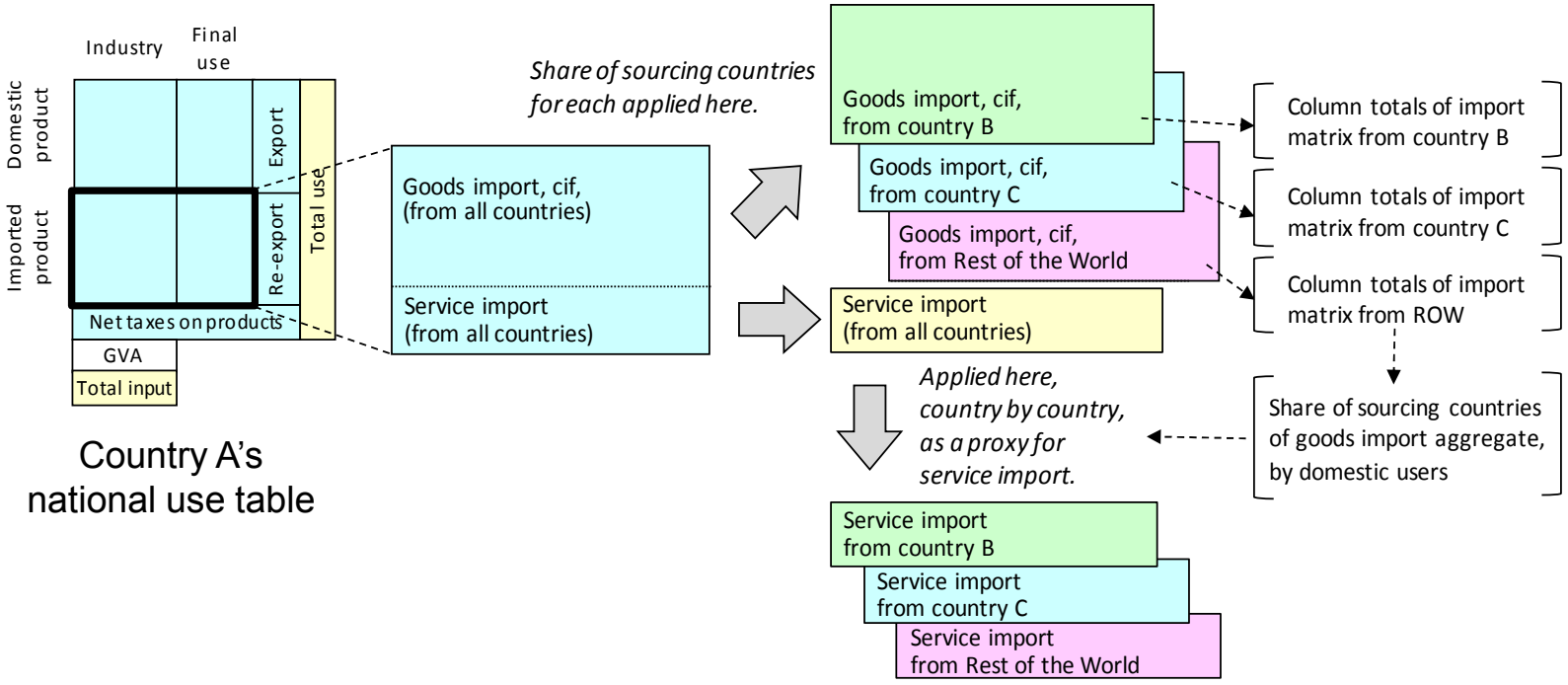
⑤ Shipping time-lag across different accounting periods;

⑥ Goods entering or leaving the territory illegally such as smuggling;

⑦ Unspecified transactions (the issue of confidentiality).

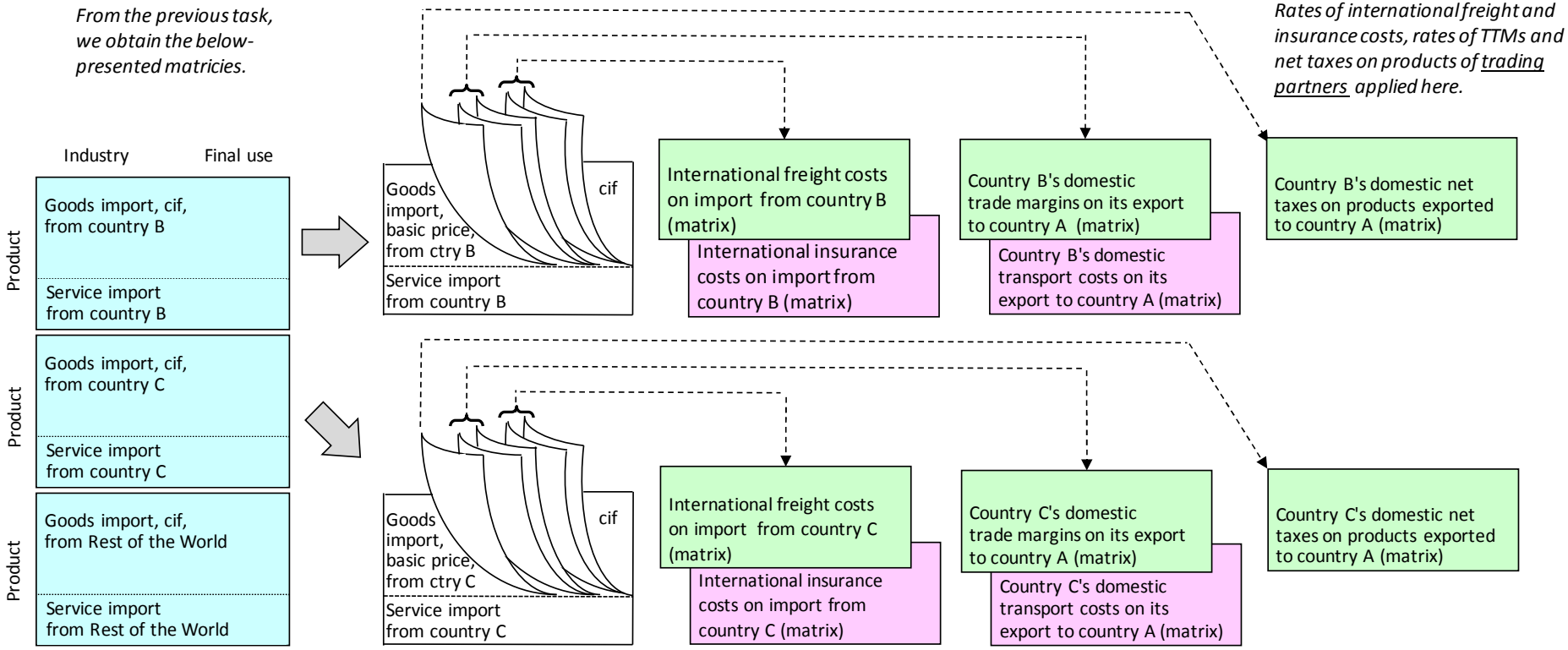
Not only trade asymmetries …

- Mismatches between the record of international transactions in Supply and Use tables (i.e., National Accounts) and those from the customs statistics.



Not only trade asymmetries …

- Inappropriate estimation of transaction margins in converting the valuation scheme of import tables.



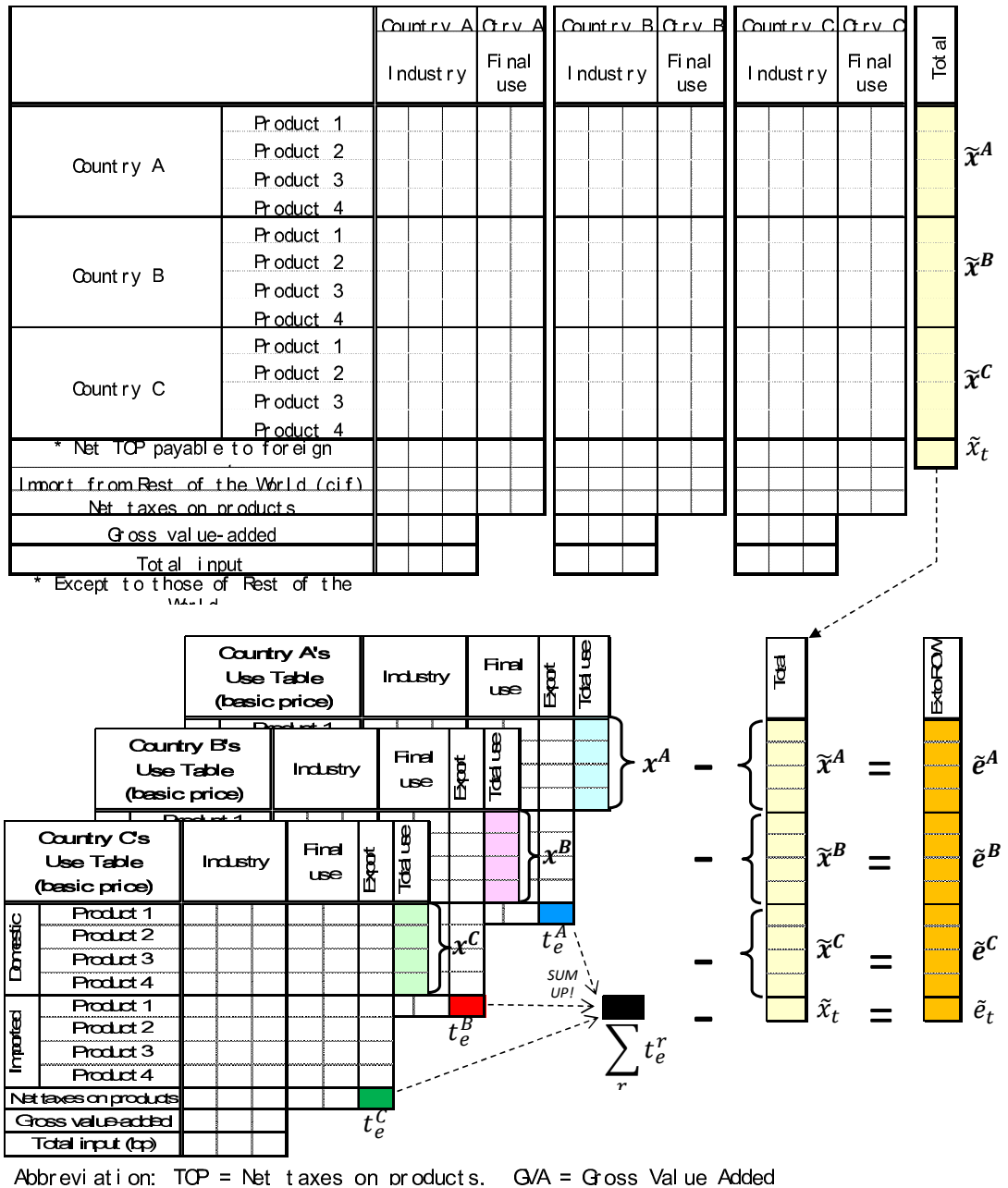
Inter-bureaucratic collaboration is absolutely essential !!

More aspects to consider …

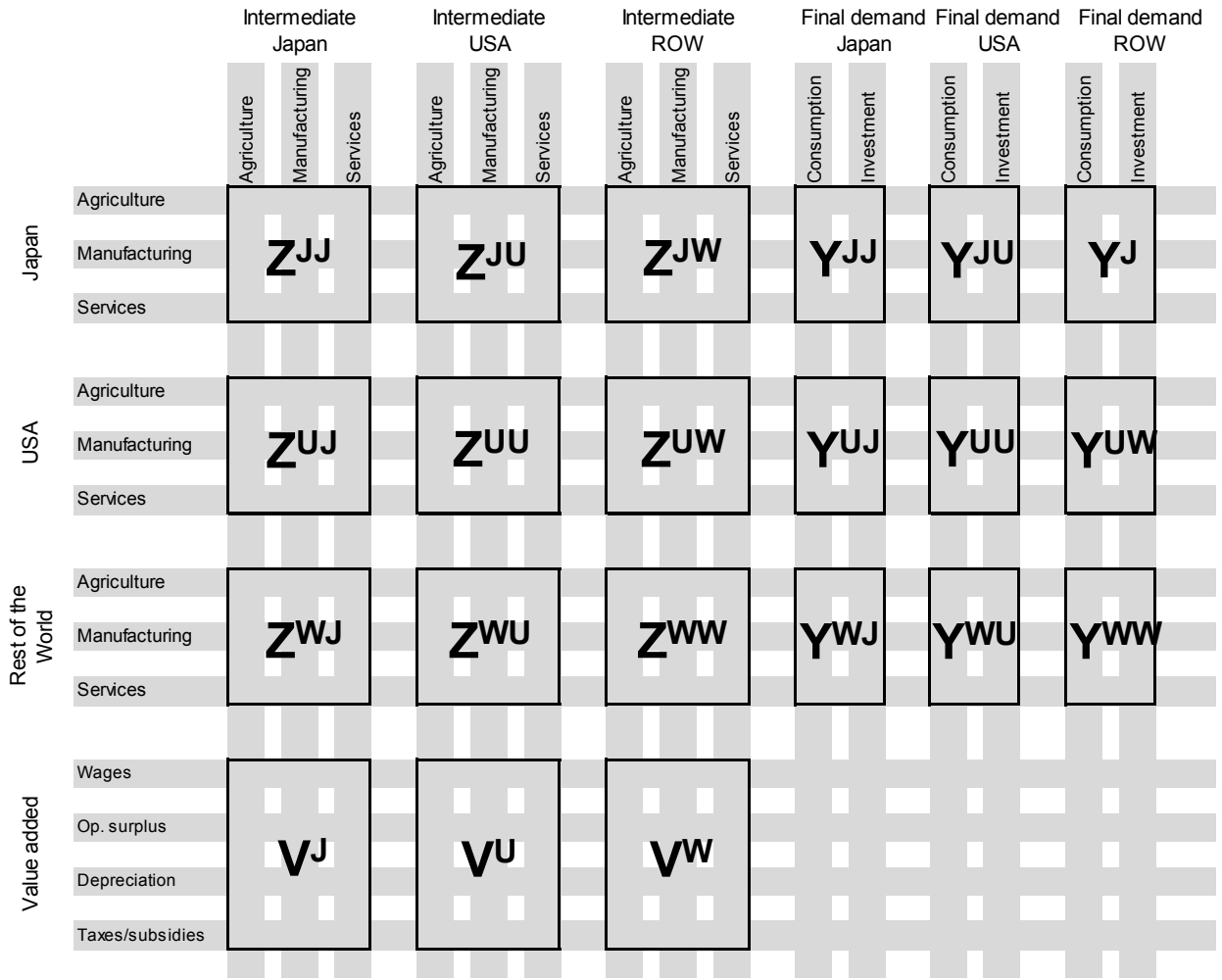
- Trade data by end-users[illegible]ad Economic Categories, [illegible]d goods at the custo[illegible]
- Trade in se[illegible] origin and d[illegible]
- [illegible] (both for private consumption);
- [illegible]merce (and any other new features of international trade).

Trade asymmetries matter !!

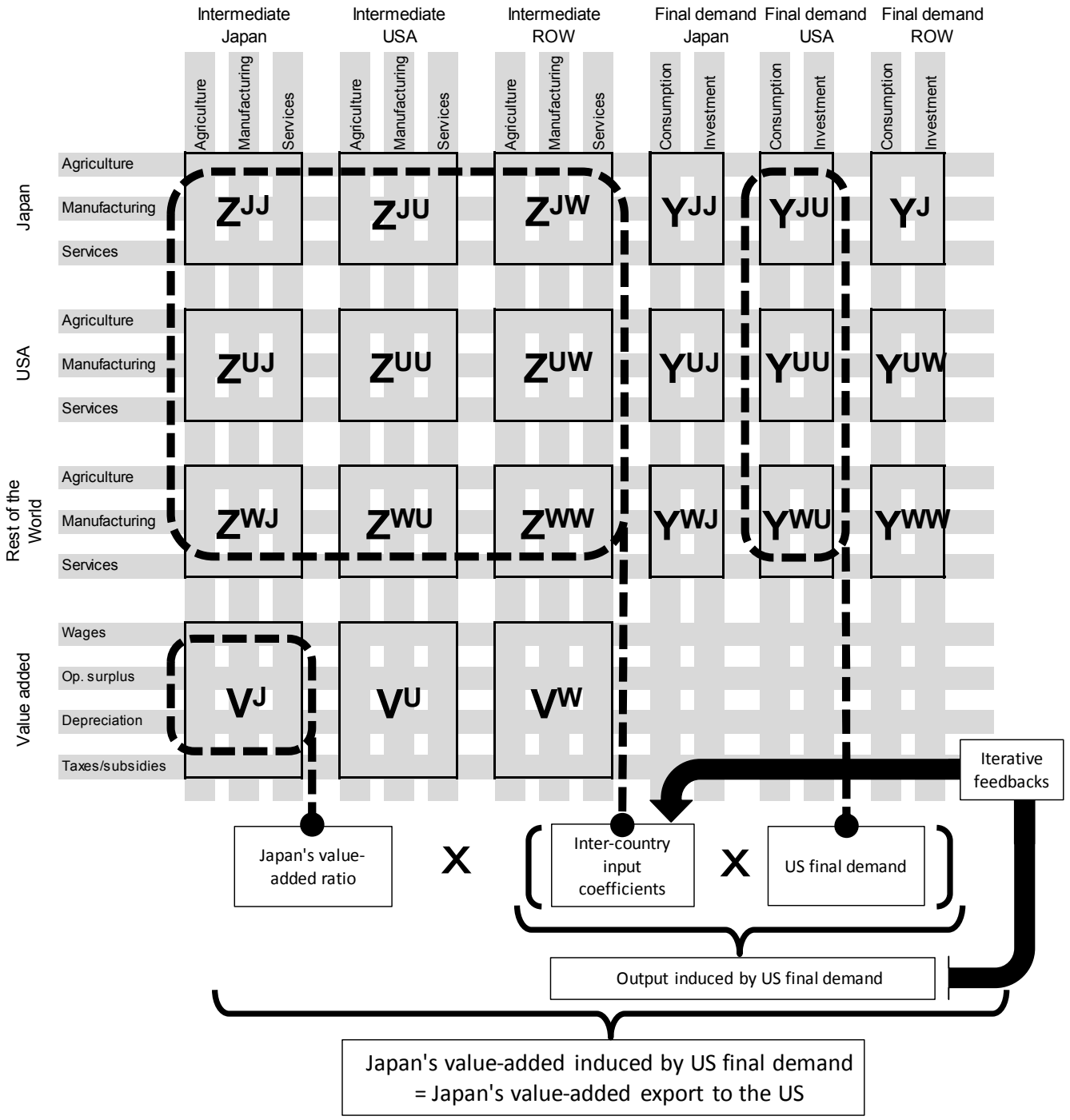
Thank you !!

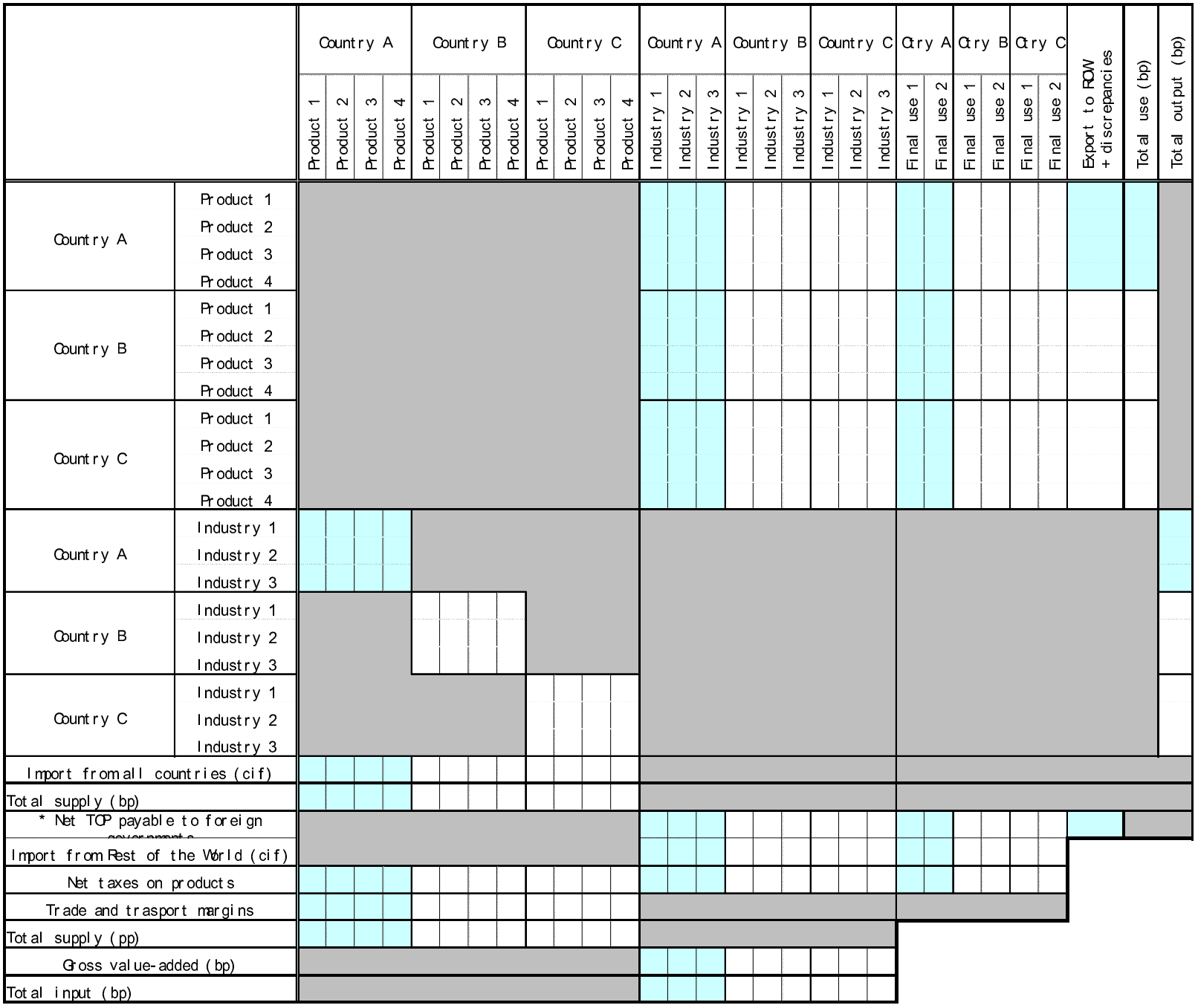


Abbreviation: TOP = Net taxes on products. GVA = Gross Value Added



Multi-country input-output table, US-Japan


Intermediate Japan
Intermediate USA
Intermediate ROW
Final demand Japan
Final demand USA
Final demand ROW
Agriculture
Manufacturing
Services
Consumption
Investment
Japan
USA
Rest of the World
Value added
Wages
Op. surplus
Depreciation
Taxes/subsidies
Z^{JJ} Z^{JU} Z^{JW} Y^{JJ} Y^{JU} Y^{J}
Z^{UJ} Z^{UU} Z^{UW} Y^{UJ} Y^{UU} Y^{UW}
Z^{WJ} Z^{WU} Z^{WW} Y^{WJ} Y^{WU} Y^{WW}
V^{J} V^{U} V^{W}
Iterative feedbacks
Japan's value-added ratio
X
Inter-country input coefficients
X
US final demand
Output induced by US final demand
Japan's value-added induced by US final demand
= Japan's value-added export to the US


Country A
Country B
Country C
Country A
Country B
Country C
Ctry A
Ctry B
Ctry C
Product 1
Product 2
Product 3
Product 4
Industry 1
Industry 2
Industry 3
Final use 1
Final use 2
Export to ROW + discrepancies
Total use (bp)
Total output (bp)
Country A
Country B
Country C
Import from all countries (cif)
Total supply (bp)
* Net TOP payable to foreign
Import from Rest of the World (cif)
Net taxes on products
Trade and trasport margins
Total supply (pp)
Gross value-added (bp)
Total input (bp)

Industry x Industry IOT		Intermediate use									Final use						Export to ROW + discrepancies	Total output
		Country A			Country B			Country C			Ctry A		Ctry B		Ctry C			
		Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Industry 1	Industry 2	Industry 3	Final use 1	Final use 2	Final use 1	Final use 2	Final use 1	Final use 2		
Country A	Industry 1																	
	Industry 2																	
	Industry 3																	
Country B	Industry 1																	
	Industry 2																	
	Industry 3																	
Country C	Industry 1																	
	Industry 2																	
	Industry 3																	
Net taxes on products, payable to foreign govt's																		
Import from Rest of the World																		
Net taxes on products																		
Gross value-added																		
Total input																		

Overview of the main features of the various databases

Database Name	Number of countries	Number of industries and products	Years	Availability of data
EXIOBASE	43 countries; 5 world regions	220 products; 163 industries	2000, 2007	Yes
EORA	187	Varying across countries; simplified version with 26 industries	1990-2012	Yes
GTAP-MRIO	140 GTAP regions	57 GTAP commodities	2004, 2007, 2011	Only to GTAP members
OECD/WTO	64 (incl. Rest of the World)	34 industries; 34 products	1995, 2000, 2005, 2008-2011; nowcasted indicators for 2012-2014	Yes
WIOD	41 (incl. Rest of the World)	35 industries; 35 products	1995-2011	Yes
GRAM	228	n.a.	n.a.	No
AIIOT	10 (8 for 1975 table)	76 products (56 for 1975 table, 77 for 1985 table)	1975, 1985, 1990, 1995, 2000, 2005	Yes