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CAPACITY BUILDING WORKSHOP TRADE AND TRADE POLICY ANALYSIS FOR THE POST COVID-19 RECOVERY

TUESDAY, 7 DECEMBER 2021
10:00 - 11:15 AM BKK TIME (UTC+7)

THURSDAY 9 DECEMBER 2021
09:30 AM - 15:45 PM BKK TIME (UTC+7)

FRIDAY 10 DECEMBER 2021
13:30 - 15:15 PM BKK TIME (UTC+7)

VIRTUAL MEETING, MS TEAMS

Trade in Value Added
Measurement Issues

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Learning Objectives

1. **Importance of Trade in Value Added and why it should be measured**
2. **How Input-Output table helps to track value addition in production process**
3. **How Inter-country input-output table accommodates- a) exports, b) imports of intermediate and final goods, and c) return of own exports with a value addition in importing country**
4. **How to extract trade in value added- a) Domestic Value Added (DVA), b) Foreign Value Added (FVA), and c) Indirect Value Addition (DVX)**
5. **How double-counting of values (back and forth trade of intermediate goods) can be tracked and over valuation of gross trade be measured**
6. **Understanding dynamics of Forward and Backward linkage through GVC Participation and GVC Position**

Contents

- Trade in Value Added: **Basics**
- Measuring Trade in Value Added: **Fundamentals**
- Two Country Case model: **Main Tenets of Measuring Value Added-** DVA, FVA, DVX and issue of Double Counting
- **Generalised Model** for Trade in Value Added
- GVC **Participation and Position Index**
- Currently available **Databases**

1. Trade in Value Added: Basics

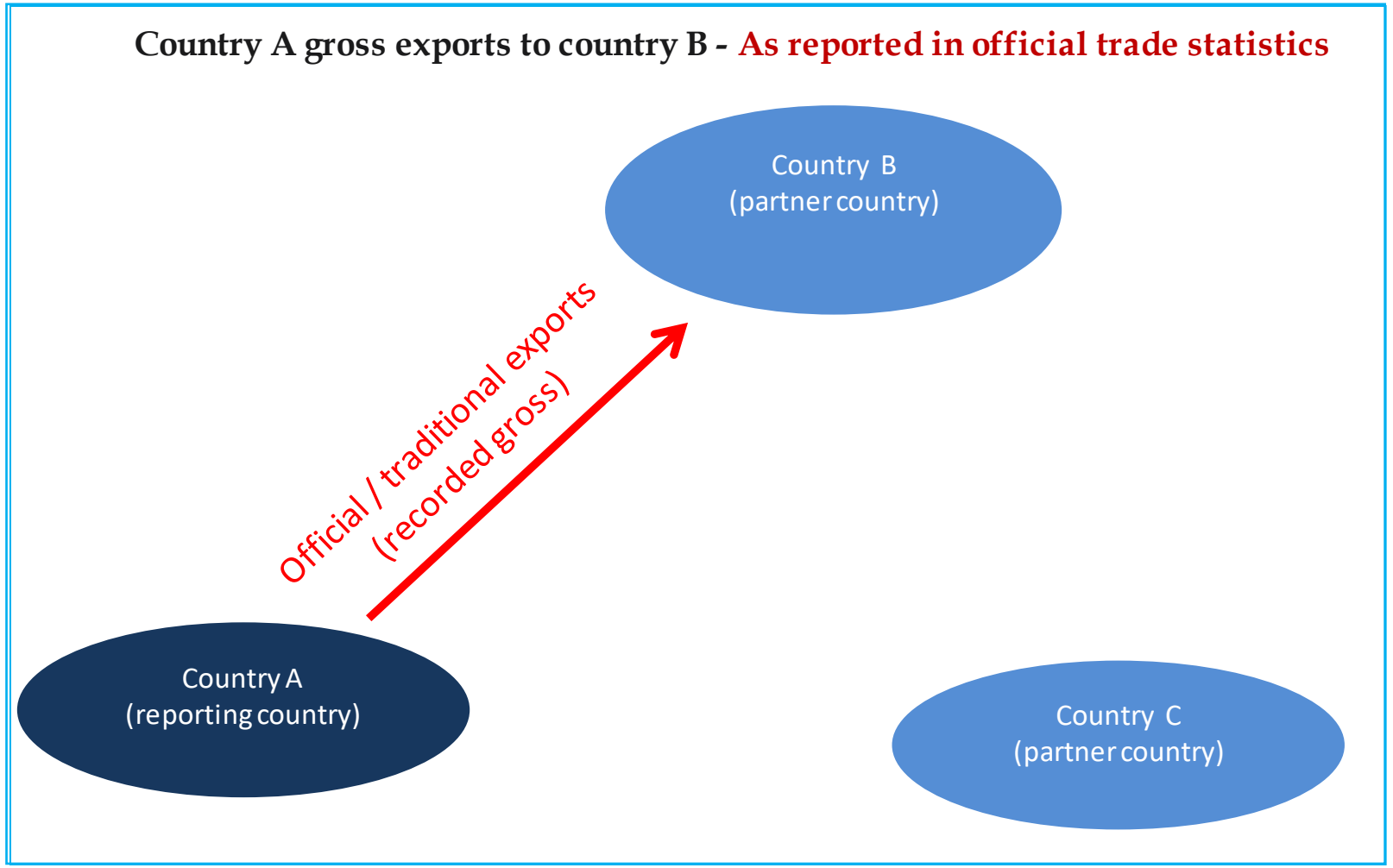
Why to Measure Trade in Value Added?

- Unbundling of Production Process
  - First Generation: Falling transport costs leading to outsourcing components.
  - Second Generation: ICT driven trade cost reduction and technology permitting fragmentation of production process
- Trade in Tasks: Multiple time crossing borders
- Servicification of production process
- Gross Trade vs Value Added Trade: Debate
- Importance of identifying sources of value added (domestic and foreign content)
- Moving-up the value chain by firms (upgrading)

Trade is measured on a gross shipments basis (invoice value) but GDP is measured on a value added basis (i.e. invoice price less the cost of intermediate inputs).

So, explaining openness through Trade-GDP ratio does not reflect the right picture. Hence, trade statistics from Customs are not directly compatible with the GDP. Value chains put a further twist on the problem

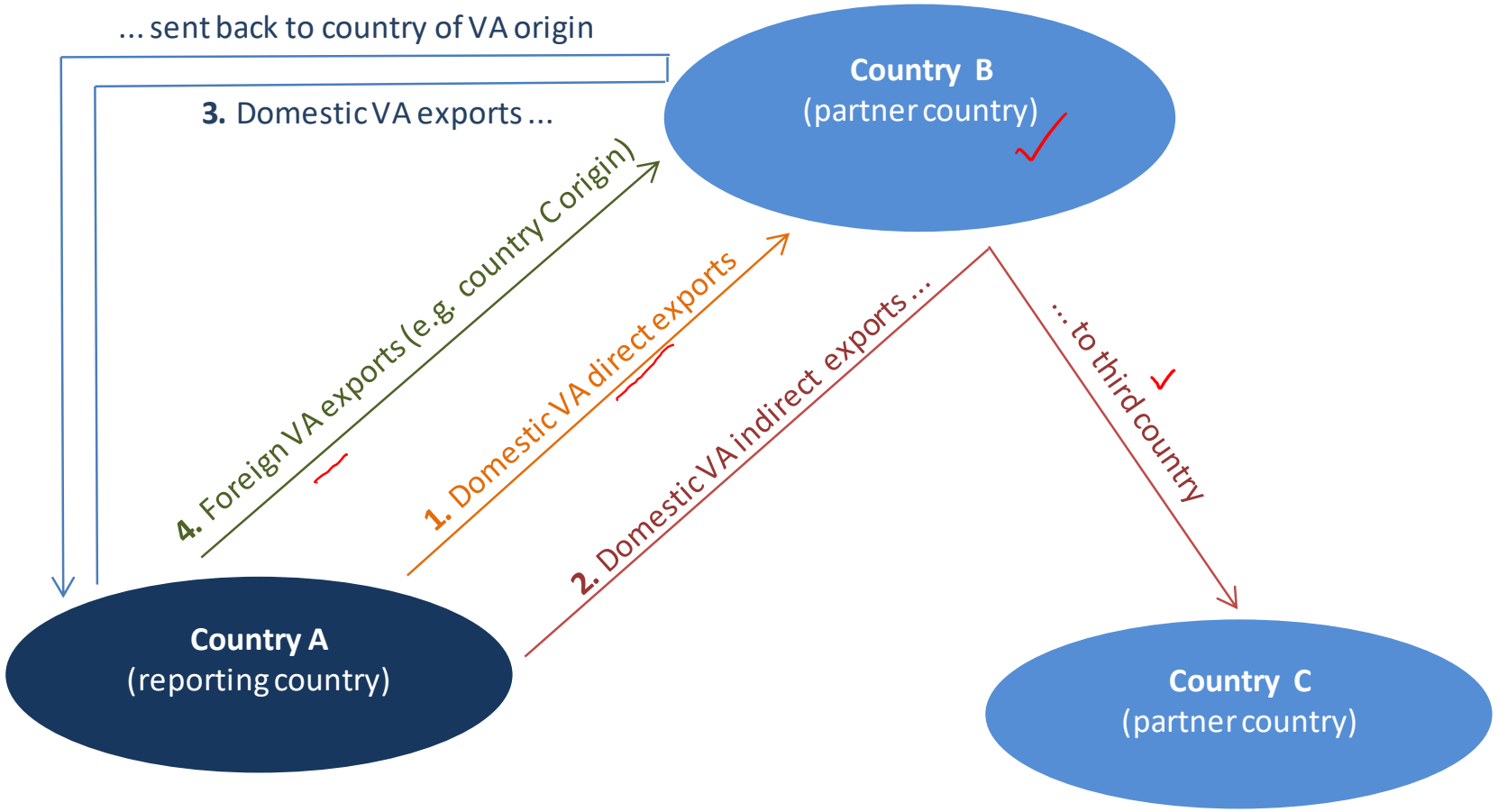
Where to find value added in gross trade flows ?



Source: WTO

Where to find value added in gross trade flows ?

Country A gross exports to country B - Decomposition into their value added components



- **The value added embodied in gross exports:**
  - Domestic value added content of gross exports
  - Foreign value added content of gross exports

- **The value added created by final demand:**
  - Domestic value added embodied in foreign final demand
  - Foreign value added embodied in domestic final demand

Source: WTO

Gross Trade vs. Value Added Trade

Trade	Exports	Imports	Balance
Gross basis	Domestic VA that stays overseas +	Foreign VA that stays home +	Domestic VA that stays overseas - Foreign VA that stays home
	Domestic VA that will return home in imports +	Domestic VA that is embedded in imports +	
	Foreign VA that is embedded in exports	Foreign VA that will be embedded in exports	
Value added basis	Domestic value added that stays overseas	Foreign value added that stays home	Domestic VA that stays overseas - Foreign VA that stays home

(Benedetto 2012)

- The VA measure is less than the gross measure due to domestic VA returned in imports for countries at the beginning of the value chain.
- The VA measure is less than the gross measure due to foreign VA embedded in exports for countries at the end of the value chain.

To separate the VA, we need to refer to input-output table where output value is reported as sum of inputs and value added. Similarly, use of the output is separated into intermediate use and final use. Further, international I-O table accommodates exports and imports in the same framework.

2. Measuring Trade in Value Added: Fundamentals

How to Measure Trade in Value Added?

- Measuring Trade in Value Added needs basic knowledge of Input-Output table, Matrix Algebra
- In practical purpose, it requires, extensive effort to collate large data, matching the trade flow to make them consistent
- Several global organisations have made effort to create international input-output table popularly known as multi-regional input output (MRIO) table
- The important indicators of trade in value added are-
  - Foreign Value Added
  - Domestic Value Added
  - Indirect Value Added
  - Identifying double counting
  - GVC Position and Participation

There is a growing literature in recent years to estimate value-added trade with the advent of global Inter-Country Input-Output (ICIO) tables based on the Global Trade Analysis Project (GTAP) and World Input-Output database (WIOD) , such as Daudin, Rifflart, and Schweisguth (2011), Johnson and Noguera (2012) and Foster, Stehrer and de Vries (2011)

In this lecture, we'll refer to EORA database prepared by UNCTAD and follow the method proposed by Koopman, et. al (2012)

Basic Structure of Supply-Use Table and Input-Output Table

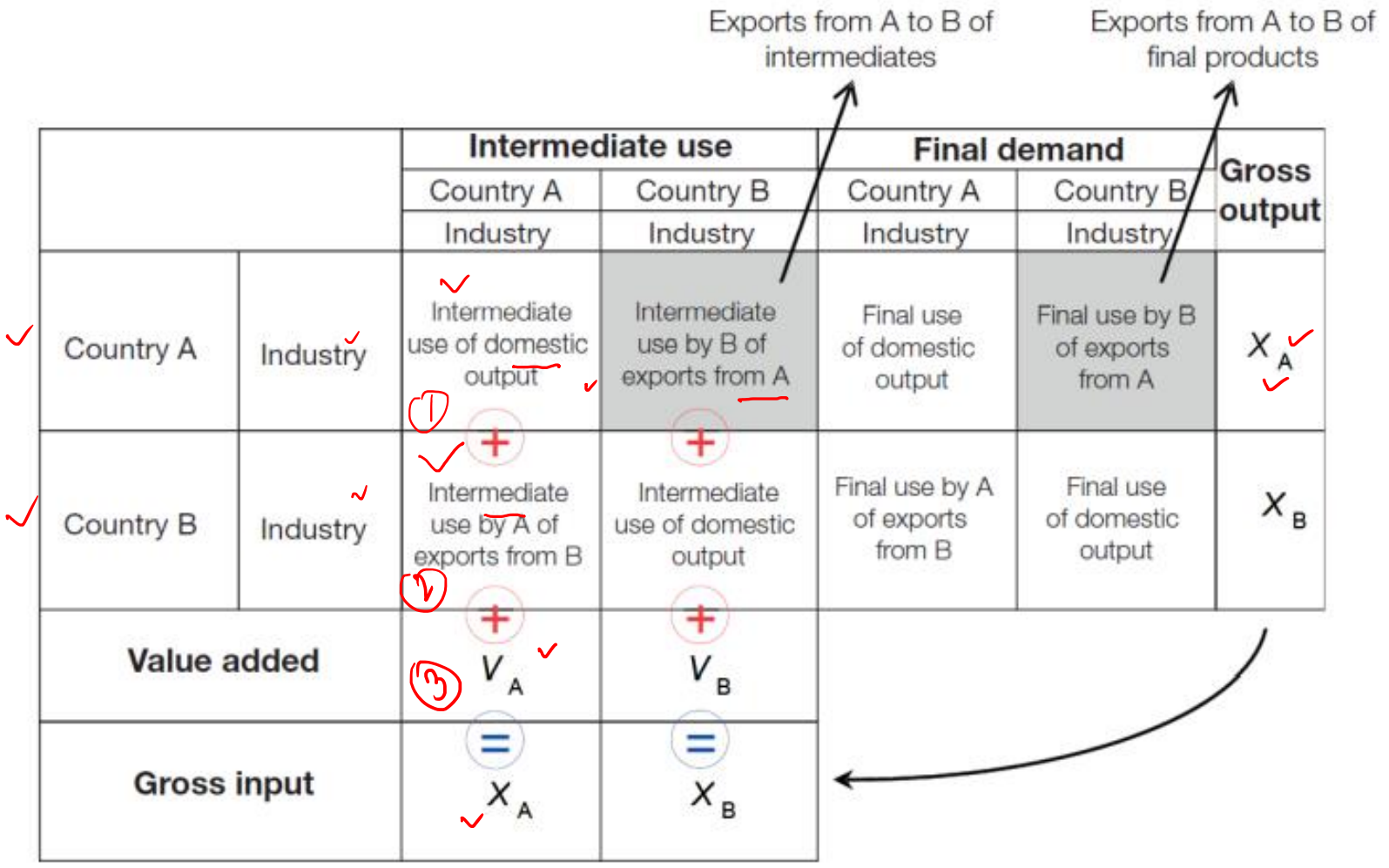
Goods and services	Supply		Total supply = total use	Use						
					Final Consumption Expenditure			Capital Formation		
	Domestic Production	Imports		Intermediate Consumption	Government	Households	Nonprofit institutions Serving Households	Gross Fixed Capital Formation	Changes in Inventories	Exports
Goods										
1										
2										
Services										
1										
2										
Total										

Source: ADB, 2012.

		Producers as Consumers								Final Demand			
		Agriculture	Mining	Const.	Manuf.	Trade	Transp.	Services	Other	Personal Consumption Expenditures	Gross Private Domestic Investment	Govt. Purchases of Goods and Services	Net Exports of Goods and Services
Producers	Agriculture												
	Mining												
	Const.												
	Manuf.												
	Trade												
	Transp.												
	Services												
	Other												
Value Added	Employees	Employee compensation								Gross Domestic Product			
	Business Owners and Capital	Profit-type income and capital consumption allowance											
	Government	Indirect business taxes											

Source: Miller and Blair, 2009.

International Input-Output Table



Source: UNCTAD (2013)

MRIO Example

Year: 2000

		Country 1				Country 2				Country 3				Final Demand (FD) Matrix				
	T matrix	Sector 1	Sector 2	Sector 3	Sector 4	Sector 1	Sector 2	Sector 3	Sector 4	Sector 1	Sector 2	Sector 3	Sector 4	Country 1 Households	Country 2 Households	Country 3 Households	Gross Output	Gross Exports
Country 1	Sector 1	346	156	95	594	819	154	832	397	409	562	241	554	394	902	446	6,901	5,316
Country 1	Sector 2	354	443	7	908	42	92	561	839	470	770	83	368	514	694	512	6,657	4,431
Country 1	Sector 3	291	795	243	825	753	2	340	232	251	605	526	610	384	753	909	7,518	4,980
Country 1	Sector 4	637	259	289	813	500	716	947	645	856	221	898	41	91	653	301	7,868	5,778
Country 2	Sector 1	547	466	910	276	518	149	779	553	197	285	305	828	630	565	857	7,864	5,300
Country 2	Sector 2	752	936	822	638	611	496	98	924	608	689	872	972	847	209	37	9,511	7,173
Country 2	Sector 3	295	444	7	828	929	535	367	257	890	429	641	26	165	419	886	7,117	4,610
Country 2	Sector 4	113	518	791	459	79	748	254	218	586	673	424	157	800	355	501	6,677	5,022
Country 3	Sector 1	46	457	552	572	632	680	730	607	796	186	15	958	338	320	194	7,082	4,934
Country 3	Sector 2	962	96	544	96	675	113	711	337	787	571	241	211	479	14	608	6,445	4,027
Country 3	Sector 3	531	190	686	191	374	615	788	738	351	32	565	622	269	814	559	7,326	5,197
Country 3	Sector 4	857	776	897	18	915	482	308	458	253	145	982	270	700	822	729	8,612	6,233
																	89,578	
	VA matrix																	
Country 1	Value Added	1,172	1,120	1,676	1,648	-	-	-	-	-	-	-	-					
Country 2	Value Added	-	-	-	-	1,019	4,730	401	471	-	-	-	-					
Country 3	Value Added	-	-	-	-	-	-	-	-	626	1,278	1,532	2,995					
	Total input	6,901	6,657	7,518	7,868	7,864	9,511	7,117	6,677	7,082	6,445	7,326	8,612	89,578				

Source: Eora MRIO database (http://worldmrio.com/simplified/).

Intermediate goods demand (the ***T*** matrix in Eora), Final demand (the ***FD*** matrix in Eora), and Value added or primary inputs (the ***V*** matrix in Eora)

T has 12 rows and 12 columns (3 countries × 4 sectors = 12). The FD matrix has 12 rows (one for each country- sector) and 6 columns (two types of final demand for each country). The VA matrix has 3 rows (one for each country) and 12 columns (one for each country-sector)

The VA Matrix normally includes six items: (1) compensation of employees; (2) taxes on production; (3) subsidies on production; (4) net operating surplus; (5) net mixed income, and (6) consumption of fixed capital.

3.Two Country Case model: Basic Tenets of Measuring Value Added

Two Country Case model: Input-Output Structure with trade and final demand

Country s's gross output x_s can be written as

$$x_s = a_{ss}x_s + a_{sr}x_r + y_{ss} + y_{sr}, r,s = 1,2$$

Where y_{sr} is the final demand in country r for the final good produced in Country s, and a_{sr} is the input-output (IO) coefficient, describing units of intermediate goods produced in s used in the production of one unit gross output in Country r.

The two-country production and trade system can be written as an inter-country input-output (ICIO) model

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} y_{11} + y_{12} \\ y_{21} + y_{22} \end{bmatrix}$$

Leontief Inverse

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} I - a_{11} & -a_{12} \\ -a_{21} & I - a_{22} \end{bmatrix}^{-1} \begin{bmatrix} y_{11} + y_{12} \\ y_{21} + y_{22} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$$

- b_{11} is the total amount of Country 1's gross output needed to produce an extra unit of the final good in Country 1 (which is for consumption in both Countries 1 and 2); b_{12} is the total amount of Country 1's gross output needed to produce an extra unit of the final good in Country 2 (again for consumption both at home and abroad). Similar interpretations can be assigned to the other two coefficients in the B matrix

Interpretation of Leontief Inverse

Starting from $AX + Y = X$, we can perform some rearrangements, and solve for X:

- $Y = X - AX$
- $Y = (I - A)X$
- $\therefore X = (I - A)^{-1}Y \equiv BY$

Matrix B is the Leontief inverse

- $B = (I - A)^{-1} = I + A + A^2 + A^3 + \cdots$

The Leontief inverse neatly captures an infinite series:

- A is direct input requirements.
- A^2 is input requirements taking account of direct and one step effects.
- … and so on.

Leontief inverse indeed captures all direct and indirect input demand effects associated with a single unit increase in final demand.

Example

$$X_1 = x_{11} + x_{12} + x_{13} + Y_1$$
$$X_2 = x_{21} + x_{22} + x_{23} + Y_2$$
$$X_3 = x_{31} + x_{32} + x_{33} + Y_3$$

$$a_{ij} = \frac{x_{ij}}{X_j}$$

i . . . row

j . . . column

$$x_{ij} = a_{ij}X_j$$
$$\Rightarrow X_1 = a_{11}X_1 + a_{12}X_2 + a_{13}X_3 + Y_1$$
$$\Rightarrow X_2 = a_{21}X1 + a_{22}X_2 + a_{23}X_3 + Y_2$$
$$\Rightarrow X_3 = a_{31}X_1 + a_{32}X_2 + a_{33}X_3 + Y_3$$

$$X_1 = z_1Y_1 + z_2Y_2 + z_3Y_3$$

where z_1, z_2 and z_3 are interdependence coefficients.

In Matrix format, we can write as

$$(I - A)X = Y$$
$$X = (I - A)^{-1}Y$$

Value Added: Two Country Case

$$v_1 = 1 - a_{11} - a_{21} \qquad v_2 = 1 - a_{12} - a_{22}$$

We define V, the 2×2 matrix

$$V = \begin{bmatrix} v_1 & 0 \\ 0 & v_2 \end{bmatrix}.$$

Value-added share (VB) matrix: Basic measure of value-added shares by source of production

$$VB = \begin{bmatrix} v_1 b_{11} & v_1 b_{12} \\ v_2 b_{21} & v_2 b_{22} \end{bmatrix}$$

Within VB, v_1b_{11} and v_2b_{22} denote the domestic value-added share of domestically produced products for country 1 and country 2 respectively, v_2b_{21} and v_1b_{12} denote the share of foreign country's value-added in the same goods. Because all value added must be either domestic or foreign, the sum along each column is unity:

$$v_1 b_{11} + v_2 b_{21} = v_1 b_{12} + v_2 b_{22} = 1$$

Value Added and Exports: Two Country Case

$e_{12} = y_{12} + a_{12}x_2$ Country 1's exports consist of final goods and intermediate goods used in country 2.

$$e_{12} = (v_1 b_{11} + v_2 b_{21})(y_{12} + a_{12}x_2) = v_1 b_{11} y_{12} + v_2 b_{21} y_{12} + v_1 b_{11} a_{12} x_2 + v_2 b_{21} a_{12} x_2$$
$$= v_1 b_{11} y_{12} + v_2 b_{21} y_{12} + v_1 b_{12} y_{22} + v_1 b_{12} y_{21} + v_1 b_{12} a_{21} x_1 + v_2 b_{21} a_{12} x_2$$

$$v_1 b_{11} a_{12} x_2 = v_1 b_{12} y_{22} + v_1 b_{12} y_{21} + v_1 b_{12} a_{21} x_1$$

This needs additional calculation. Refer to Koopman et al (2012)

The total value of country 1's intermediate exports must include two types of value.

First, it must include all value added by Country 1 in its imports from Country 2. Note that in order for exported value produced by Country 1 to come back through its imports, it must have first been embodied in Country 1's intermediate exports, which is $v_1 b_{12} y_{21} + v_1 b_{12} a_{21} x_1$

Second, it must include all value added generated in Country 1 that is absorbed in Country 2 after being used as intermediate inputs by Country 2, which $v_1 b_{12} y_{22}$

Double Counting: Two Country Case

Multiplying the Leontief inverse with intermediate goods exports leads to some double counting of gross output and thus some value terms in exports. (The main troubling issue in GVC). This can be sorted out while understanding the accounting equation.

Gross Exports can be written as

$$x_1 = y_{11} + a_{11}x_1 + e_{12}$$

$$x_1 = (1 - a_{11})^{-1} y_{11} + (1 - a_{11})^{-1} e_{12}$$

$$x_2 = y_{22} + a_{22}x_2 + e_{21}$$

$$x_2 = (1 - a_{22})^{-1} y_{22} + (1 - a_{22})^{-1} e_{21}$$

Also,

$$b_{12}a_{21}(1 - a_{11})^{-1} y_{11} = b_{11}y_{11} - (1 - a_{11})^{-1} y_{11}$$

For proof, see Koopman, et al (2012)

$$(I - a_{11})^{-1} y_{11}$$

is the gross output needed to sustain final goods that are both produced and consumed in country 1, using domestically produced intermediate goods.

Deducting it from country 1's total gross output, what is left is the gross output needed to sustain country 1's production of its gross exports e_{12}

The total gross output needed to sustain final goods both produced and consumed in country 1, but using intermediate goods that originated in Country 1 and shipped to Country 2 for processing before being re-imported by Country 1 (gross output sold indirectly in the domestic market).

Sources of Double Counting

After substituting in the gross export equation, it'll be

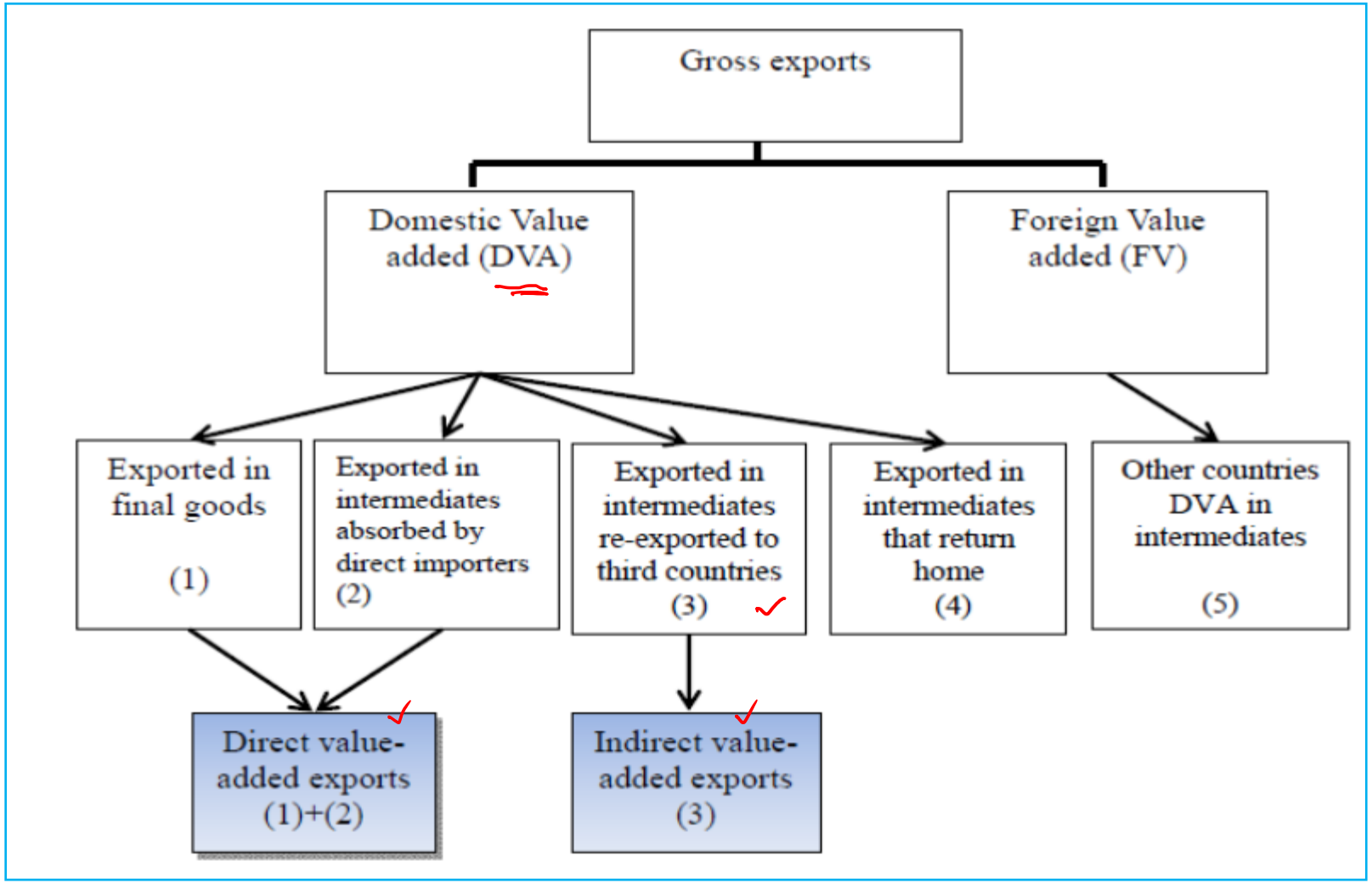
$$e_{12} = v_1 b_{11} e_{12} + v_2 b_{21} e_{12} = [v_1 b_{11} y_{12} + v_1 b_{12} y_{22}]$$
$$+ [v_1 b_{12} y_{21} + v_1 b_{12} a_{21} (1 - a_{11})^{-1} y_{11}] + v_1 b_{12} a_{21} (1 - a_{11})^{-1} e_{12}$$
$$+ [v_2 b_{21} y_{12} + v_2 b_{21} a_{12} (1 - a_{22})^{-1} y_{22}] + v_2 b_{21} a_{12} (1 - a_{22})^{-1} e_{21}$$

Terms in accounting equation
v1= $v_1 b_{11} y_{12}$
v2= $v_1 b_{12} y_{22}$
v3= $v_1 b_{12} y_{21}$
v4= $v_1 b_{12} a_{21} (1 - a_{11})^{-1} y_{11}$
v5= $v_1 b_{12} a_{21} (1 - a_{11})^{-1} e_{12}$
v6= $v_2 b_{21} y_{12}$
v7= $v_2 b_{21} a_{12} (1 - a_{22})^{-1} y_{22}$
v8= $v_2 b_{21} a_{12} (1 - a_{22})^{-1} e_{21}$
E=Gross exports (sum v1 to v8)
VT=Value-added exports (sum of v1 and v2)
DV=Domestic value-added in gross exports (sum of v1 to v4)
FV=Foreign value-added in gross exports (v6+v7)
DC=Domestic content in gross exports (sum of v1 to v5)
VS=Vertical specialization(sum v6 to v8) = $v_1 b_{12}$

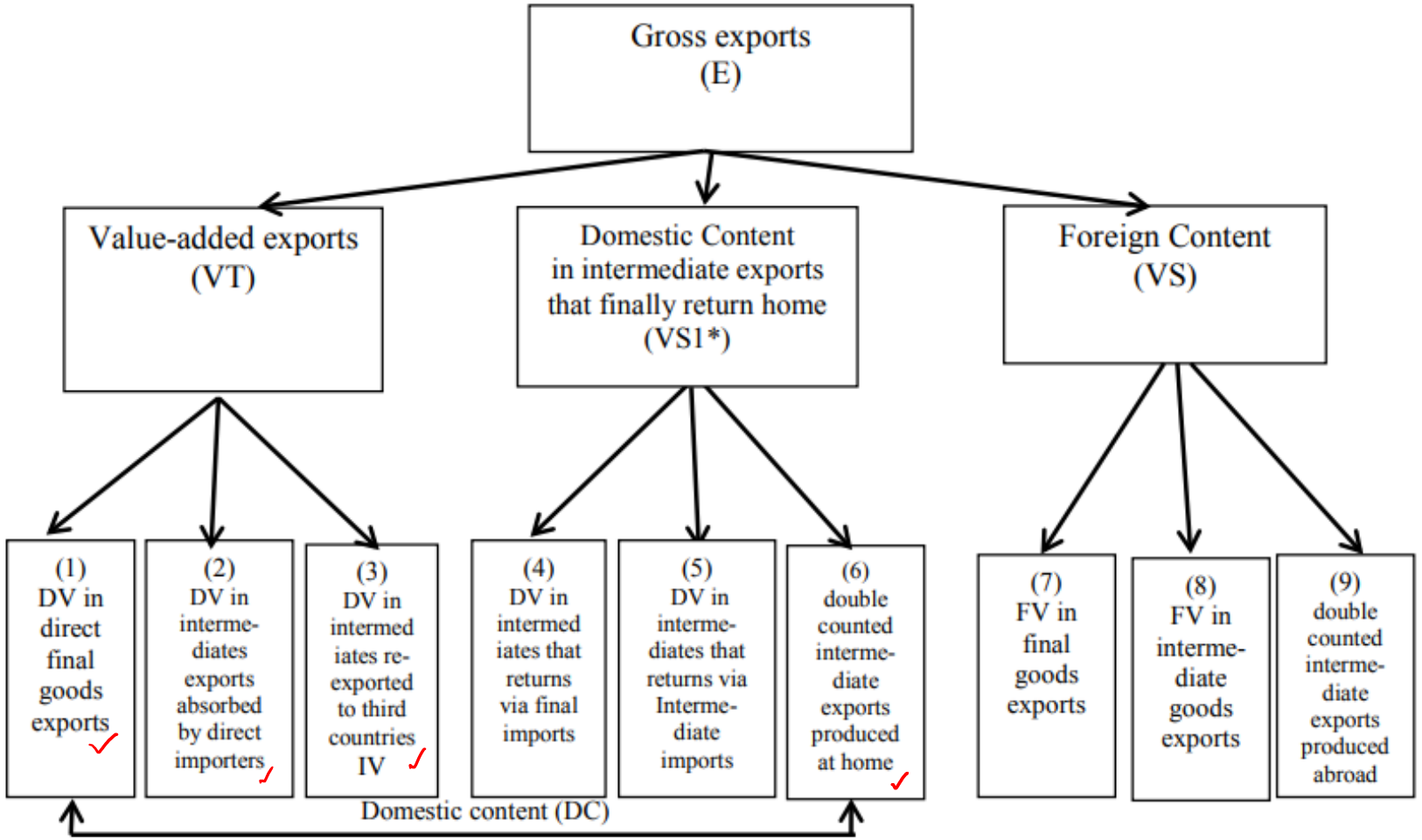
Pure Double counting V_5 and V_8

v_3 & v_6 explain indirect value added (DVX)

DVA and FVA : A Simple Structure



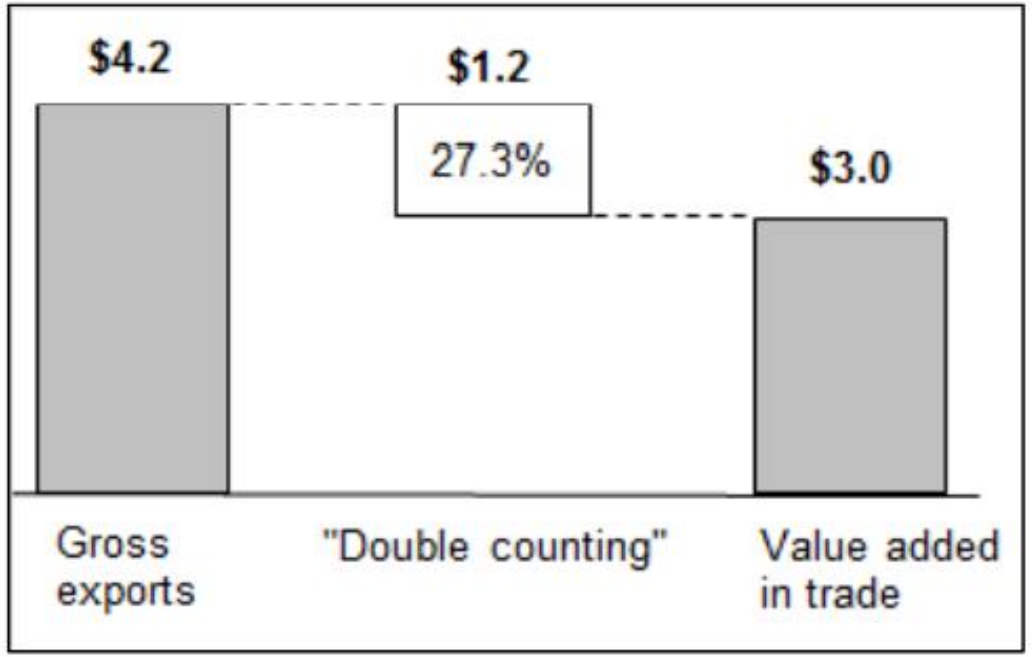
Identifying Double Counting



(4) through (9) involve value added that crosses national borders at least twice, and are the sources of multiple counting in official trade statistics

Double Counting contributes a significant portion of Gross Exports

Disaggregation of gross exports for 17 ESCAP economies in Asia-Pacific, 2009 in trillion US$



Source: OCDE-WTO, 2013a.

3. Generalised Model for Trade in Value Added

Generalised Model

X=AX+Y

Y=X-AX

$X=(I-A)^{-1}Y$

X=BY

$$\boldsymbol{B = (I - A)^{-1}}$$ Leontief Inverse

With G countries and N sectors, A, and B are GN×GN matrices; V and VB are G×GN matrices. V_s denotes a 1 by N row vector of direct value-added coefficient, A_{sr} is a N×N block input-output coefficient matrix, B_{sr} denotes the N×N block Leontief inverse matrix, which is the total requirement matrix that gives the amount of gross output in producing country s required for a one-unit increase in final demand in destination country r

Let $\hat{V}_s$ be a N by N diagonal matrix with direct value-added coefficients along the diagonal. (Note $\hat{V}_s$ has a dimension that is different from V_s). We can define a GN by GN diagonal value-added coefficient matrix as

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_G \end{bmatrix} = \begin{bmatrix} I-A_{11} & -A_{12} & \cdots & -A_{1G} \\ -A_{21} & I-A_{22} & \cdots & -A_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ -A_{G1} & -A_{G2} & \cdots & I-A_{GG} \end{bmatrix}^{-1} \begin{bmatrix} \sum_r^G Y_{1r} \\ \sum_r^G Y_{2r} \\ \vdots \\ \sum_r^G Y_{Gr} \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1G} \\ B_{21} & B_{22} & \cdots & B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B_{G1} & B_{G2} & \cdots & B_{GG} \end{bmatrix} \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_G \end{bmatrix}$$

$$\begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1G} \\ X_{21} & X_{22} & \cdots & X_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ X_{G1} & X_{G2} & \cdots & X_{GG} \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1G} \\ B_{21} & B_{22} & \cdots & B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B_{G1} & B_{G2} & \cdots & B_{GG} \end{bmatrix} \begin{bmatrix} Y_{11} & Y_{12} & \cdots & Y_{1G} \\ Y_{21} & Y_{22} & \cdots & Y_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ Y_{G1} & Y_{G2} & \cdots & Y_{GG} \end{bmatrix}$$

$$VB = \begin{bmatrix} V_1B_{11} & V_1B_{12} & \cdots & V_1B_{1G} \\ V_2B_{21} & V_2B_{22} & \cdots & V_2B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ V_GB_{G1} & V_GB_{G2} & \cdots & V_GB_{GG} \end{bmatrix}$$

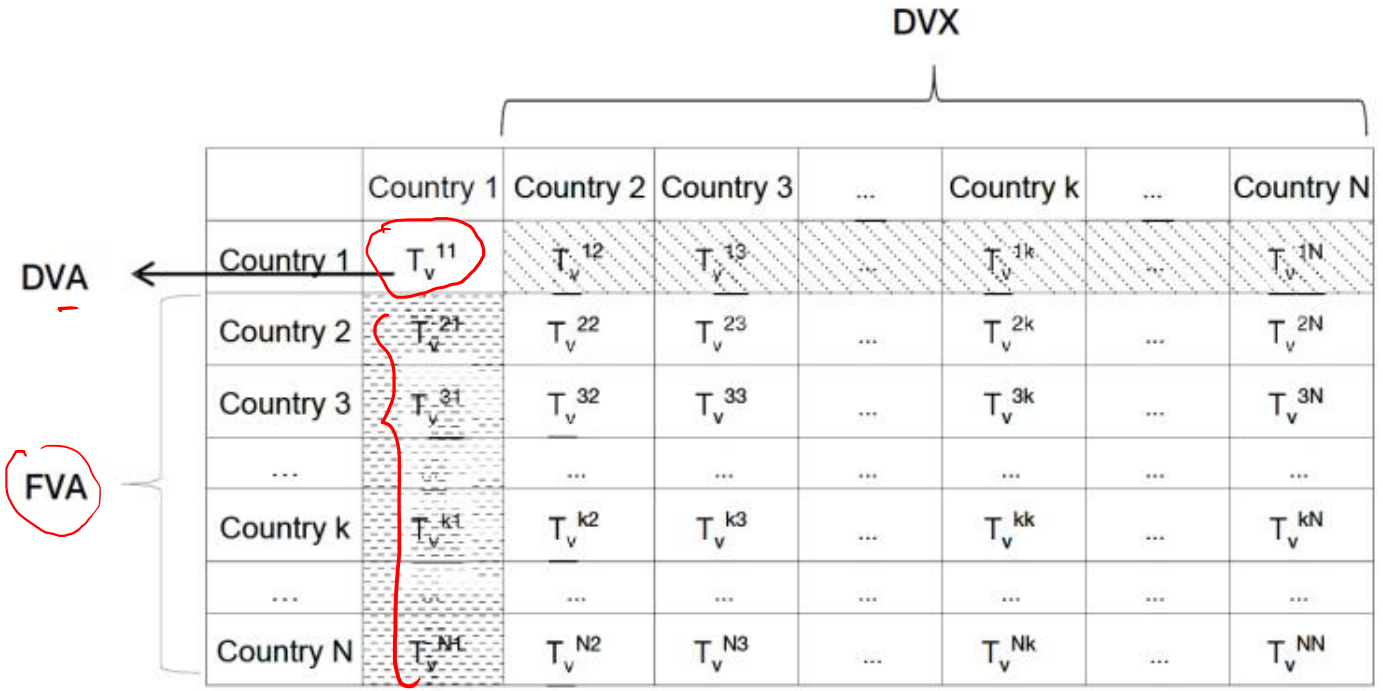
$$\hat{V} = \begin{bmatrix} \hat{V}_1 & 0 & \cdots & 0 \\ 0 & \hat{V}_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \hat{V}_G \end{bmatrix}$$

$$\hat{V}BY = \begin{bmatrix} \hat{V}_1 & 0 & \cdots & 0 \\ 0 & \hat{V}_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \hat{V}_G \end{bmatrix} \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1G} \\ X_{21} & X_{22} & \cdots & X_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ X_{G1} & X_{G2} & \cdots & X_{GG} \end{bmatrix} = \begin{bmatrix} V_1\sum_r^G B_{1r}Y_{r1} & V_1\sum_r^G B_{1r}Y_{r2} & \cdots & V_1\sum_r^G B_{1r}Y_{rG} \\ V_2\sum_r^G B_{2r}Y_{r1} & V_2\sum_r^G B_{2r}Y_{r2} & \cdots & V_2\sum_r^G B_{2r}Y_{rG} \\ \vdots & \vdots & \ddots & \vdots \\ V_G\sum_r^G B_{Gr}Y_{r1} & V_G\sum_r^G B_{Gr}Y_{r2} & \cdots & V_G\sum_r^G B_{Gr}Y_{rG} \end{bmatrix}$$

Calculating GVC Indices

$$T_v = \begin{bmatrix} \hat{v}_1 & 0 & \cdots & 0 \\ 0 & \hat{v}_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \hat{v}_{GN} \end{bmatrix} \begin{bmatrix} \boldsymbol{B}_{11} & \boldsymbol{B}_{12} & \cdots & \boldsymbol{B}_{1G} \\ \boldsymbol{B}_{21} & \boldsymbol{B}_{22} & \cdots & \boldsymbol{B}_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ \boldsymbol{B}_{G1} & B_{G2} & \cdots & \boldsymbol{B}_{GG} \end{bmatrix} \begin{bmatrix} e_1 & 0 & \cdots & 0 \\ 0 & e_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & e_{GN} \end{bmatrix}$$

By setting up a matrix E with gross exports by country-sector on the main diagonal, and zeros elsewhere, we can calculate T matrix. Here, own country's contribution to exports will be DVA, foreign country's contribution will be FVA and exports to foreign country as inputs which will further go out as export of foreign country will be DVX



Source: UNCTAD (2013).

4. GVC Participation and Position

Forward and Backward Linkage

Backward linkages or Upstream Participation: is created between a purchasing industry and a supplying industry. Internationally, it can be understood as the linkages between an importing country and an exporting country. In other words, the industries in the importing country import intermediate products to be used in its exports.

It is calculated by adding the foreign value added in the county's exports **(FVA)**

Forward linkages or **downstream participation**: is created between a supplying industry and a purchasing industry that uses the supplier's output as input. Internationally, it can be understood as the linkages between an exporting economy and an importing economy whose industries use the exports (supply) as inputs to generate output for exports. In other words, the industries of the exporting country provide inputs into exports of the industries in the importing country

It is calculated by the domestic value added embedded in exports of other counties **(DVX)**

Source: ARTNeT Working paper 150/2015

GVC Position and Participation

- The two GVC indicators reveal if the countries with a larger position index are relatively more upstream, i.e., they contribute more value added to other countries exports than other countries contribute to theirs.

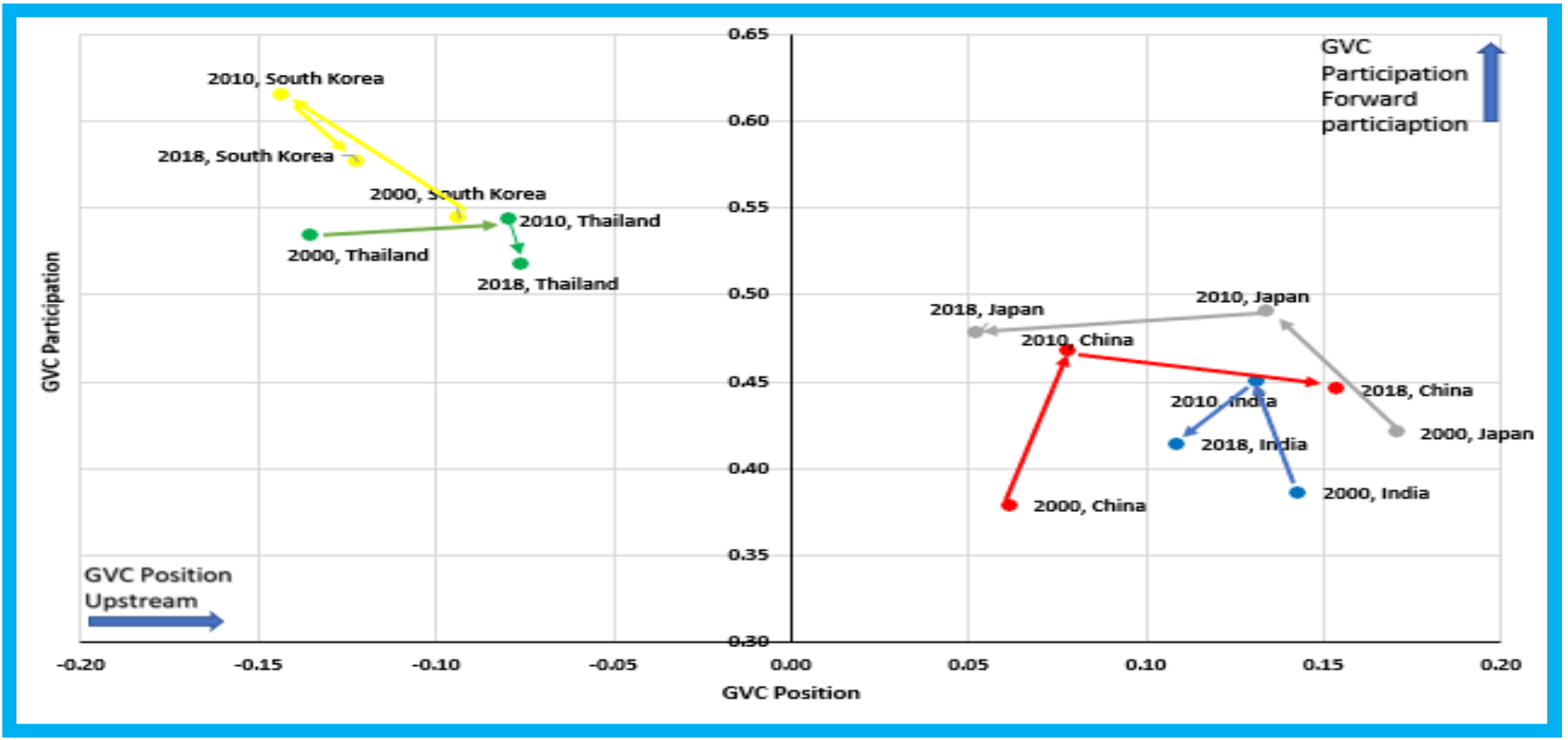
- Of course, two countries can have identical values of the GVC position index in a sector while having very different degrees of participation in GVCs. Therefore, the position index should be used in conjunction with the participation index, which summarizes the importance of the global supply chain for that country.

- GVC position reflects the number of production stages that the output of that industry has to go through before it reaches the final consumers.

$$GVC_{Participation} = \frac{FVA + DVX}{Gross\ Exports}$$

$$\text{GVC Position} = ln\left(1 + \frac{DVX}{Gross\ Exports}\right) - ln\left(1 + \frac{FVA}{Gross\ Exports}\right)$$

GVC Position and Participation



Source-EORA database

- In comparison to China, India has lower GVC participation and position.
- Typical of most emerging and large economies, India has higher domestic value added (DVA) in gross exports, but this has been a huge deterrent for enterprises moving up the value chain in India as producers find it cheap to work with local content while concentrating on the local market. Thus, leading to lowest manufacturing share in gross exports among the Asian countries.

- Japan and S.Korea have transitioned from lower GVC participation to a higher participation over the years, their position has turned downstream.
- Thailand, has high backward and forward participation leading to a high total participation, but the value-added content in the exports has started to increase as is depicted in terms of GVC position.
- China is an example of both higher participation and position. It's growing domestic content in exports is due the firms gradually replacing imported inputs with domestic products (Kee & Tang, 2016), leading to moving up in the value chain.

Currently Available Database

GVC/Trade in Value Added database

UNCTAD EORA Database: based on National Supply-Use and IO tables and IO tables from Eurostat, IDE-JETRO and OECD, having 189 countries and "Rest of the World", having 26 sectors.

✓ OECD- TiVA database: based on national IO tables, having 64 countries and 34 industries

World Input Output database (WIOD) published by consortium of 11 institutions based on national supply use table covering 43 countries and 56 industries

RIVA Value Chain adviser published by UNESCAP and FEALAC covering 72 economies and 38 sectors

Multi-Regional Input Output Tables

Asian Development Bank, multi-regional input-output tables (ADB-MRIO)
IDE Jetro, Asian International Input-Output Tables (AIIOTs)
Eora multi-region IO database
EXIOPOL
OECD/WTO Input Output Database

Thank You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