Asia-Pacific
Economic Cooperation

2022/CTI/WKSP10/004
Session 2

Industry Relocation Measurements and Its Trends During and Post COVID-19 Pandemic

Submitted by: Chinese Academy of Sciences

APEC 2022
THAILAND

Workshop on Opportunities and Challenges for Global Value Chains During the COVID-19 Pandemic and Post-Pandemic Economic Recovery
13-14 October 2022

APEC Workshop on Opportunities and Challenges for GVCs during COVID-19 Pandemic and Post-Pandemic Economic Recovery

Industry relocation measurements and its trends during & post COVID-19 pandemic

Presenter: YANG Cuihong

Co-authors: GAO Xiang

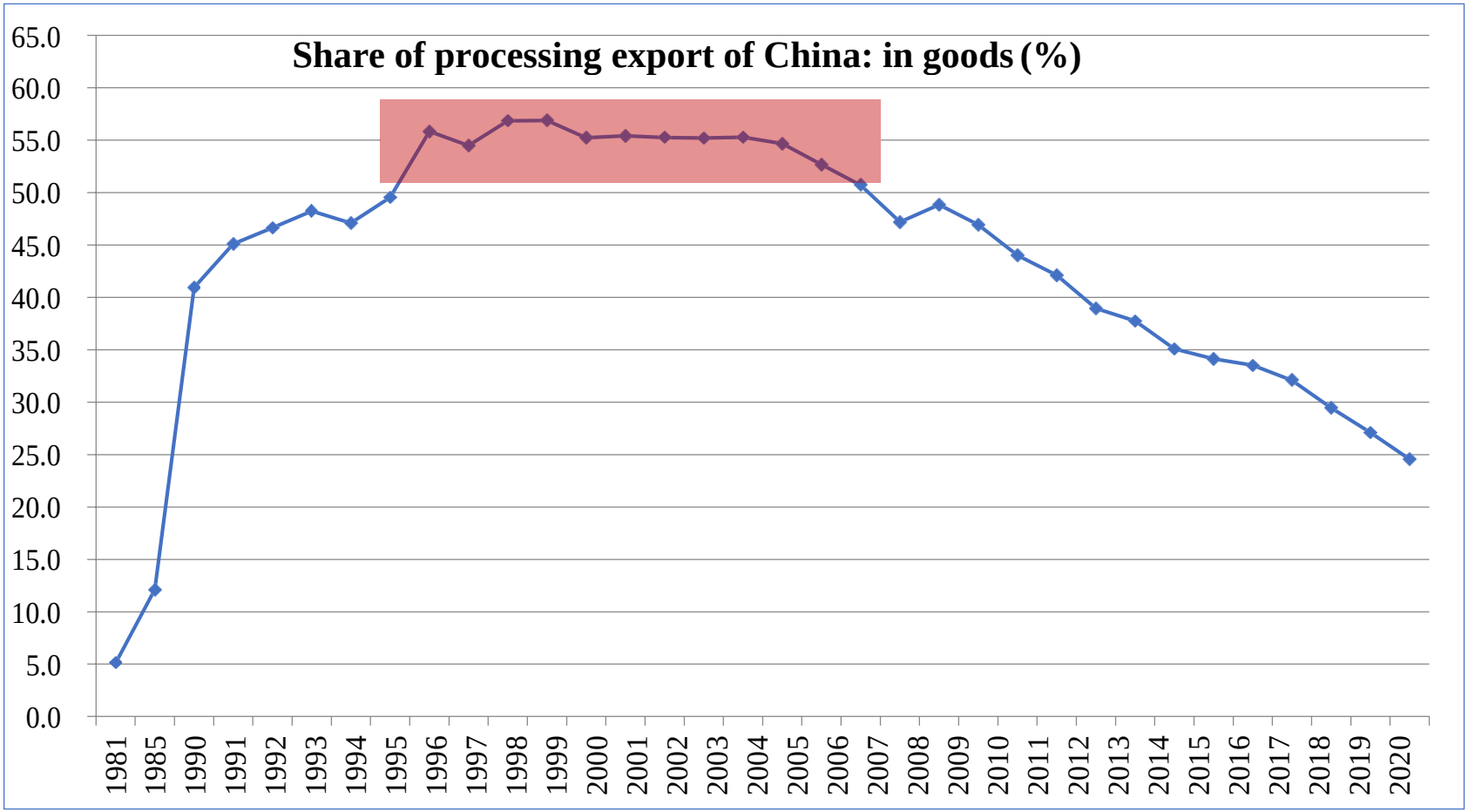
Academy of Mathematics and Systems Science, Chinese Academy of Sciences

Oct. 13, 2022

Outline

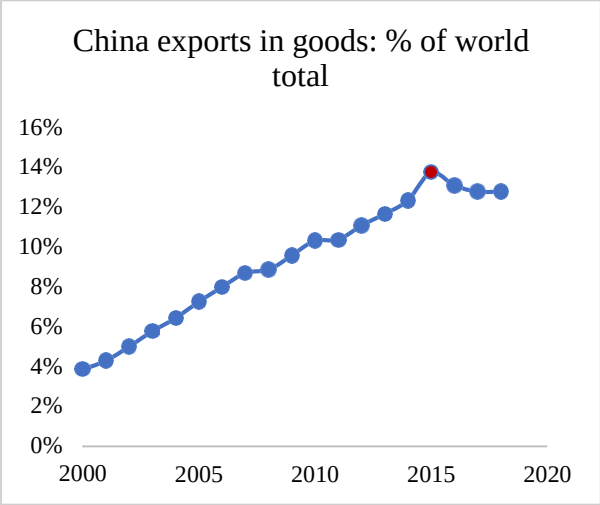
- **Starting from China's trade data**
- **Industry relocation measurements - WIOT based**
- **Industry relocation measurements by processing trade**
- **Discussion on future industry relocation and its impact on GVC**

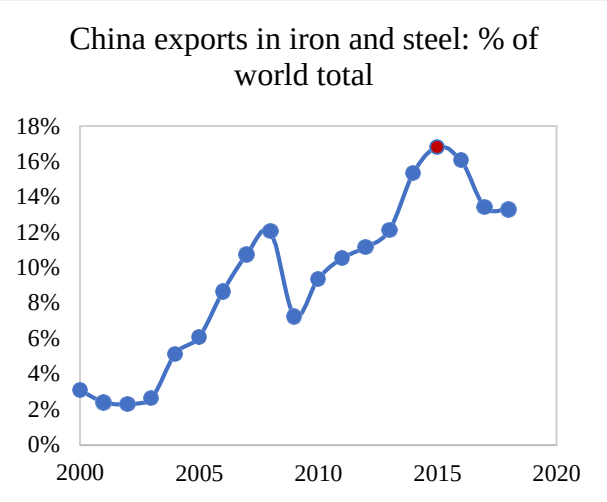
Starting point: China's trade data in goods

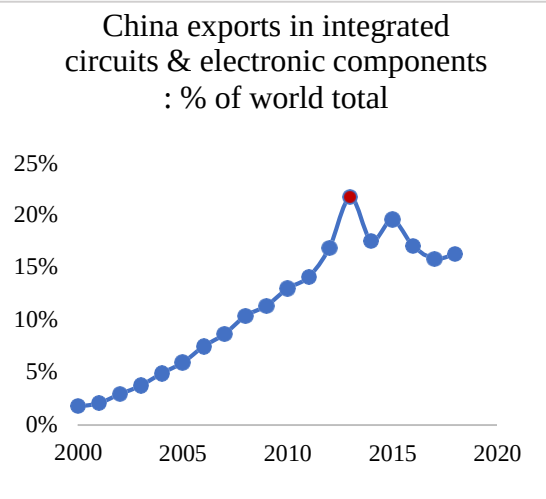


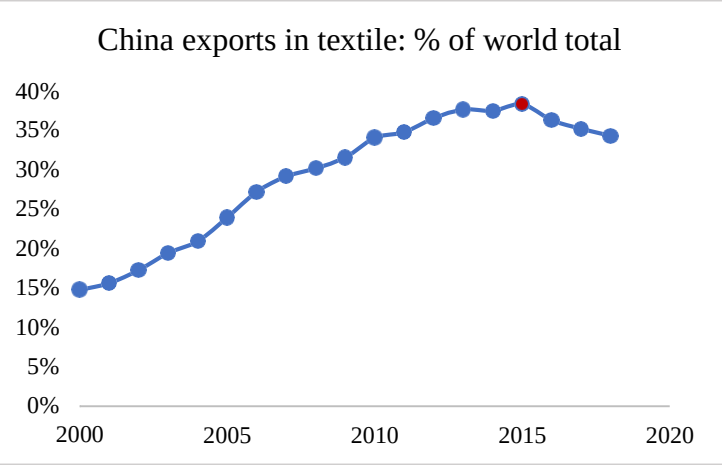
Source: Author's calculation based on China Customs Statistics

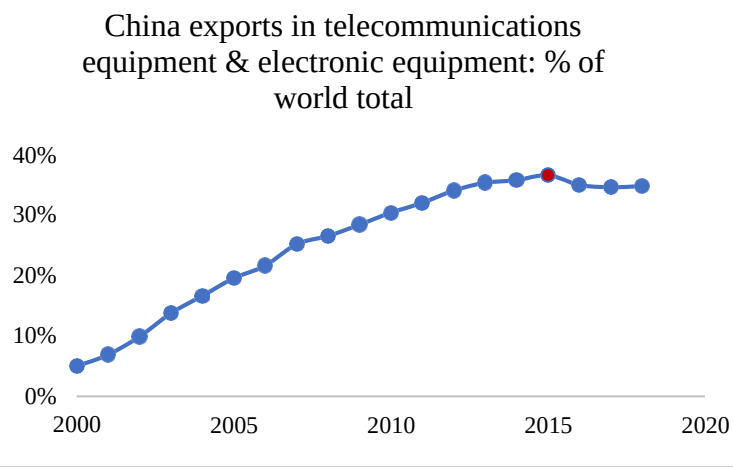
Shares of China trade in goods by industry: % of world total





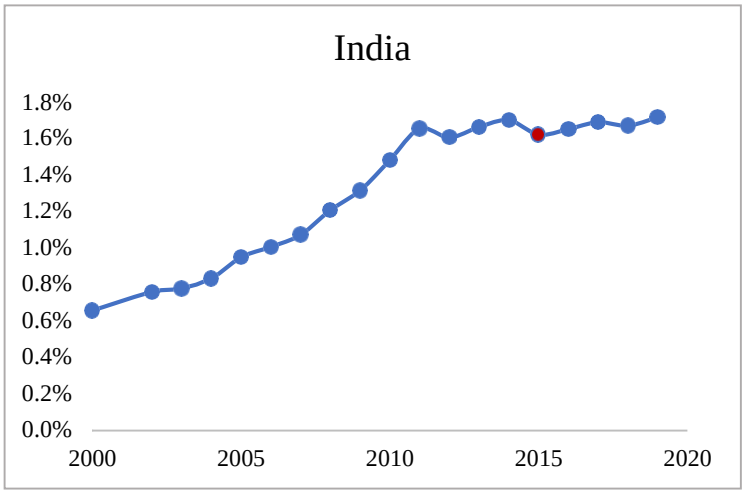


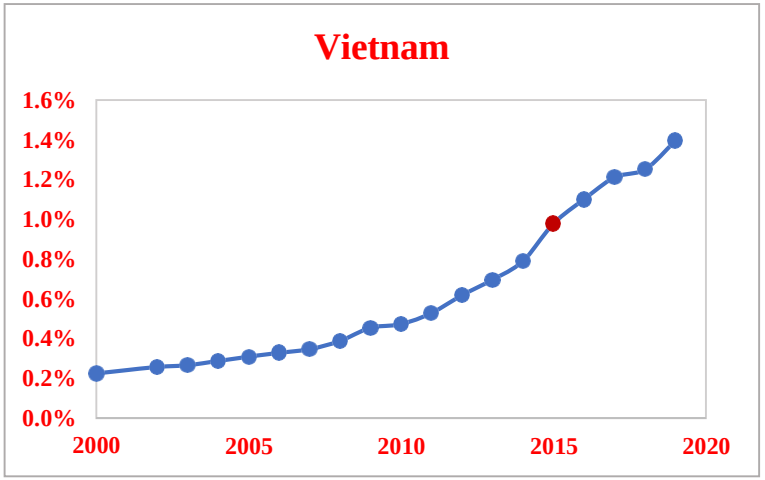


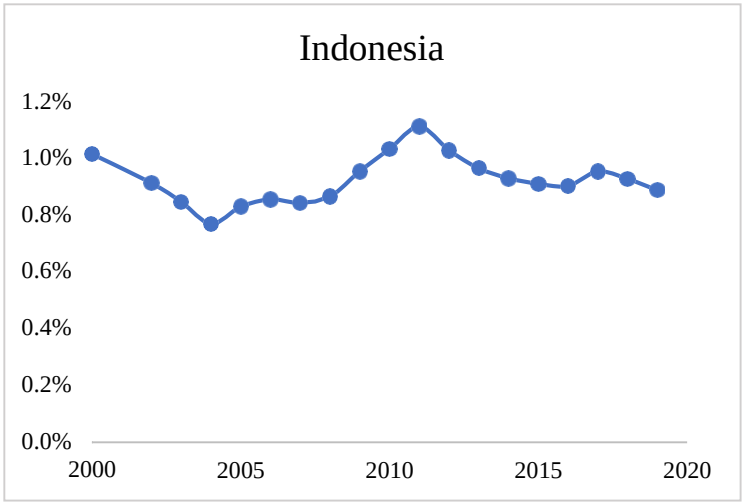


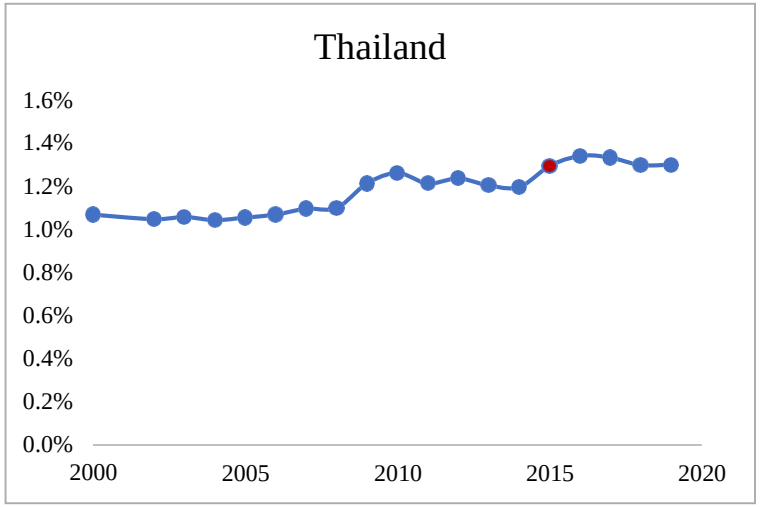
Source: Author's calculation based on WTO database, https://data.wto.org/

Other selected economies of exports in goods: % of world total



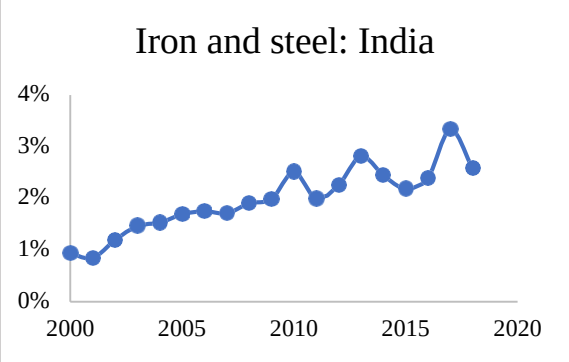


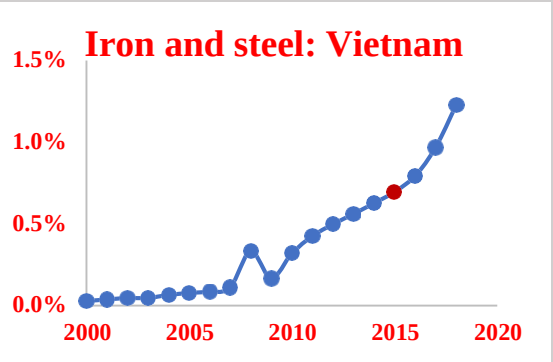


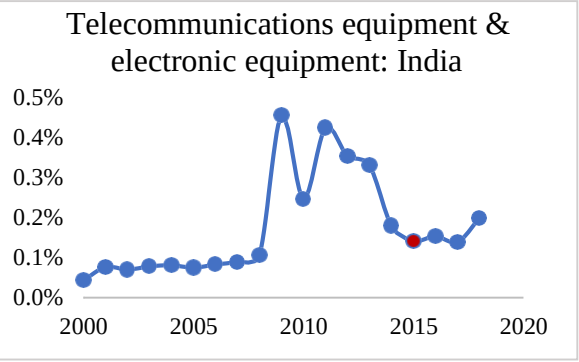


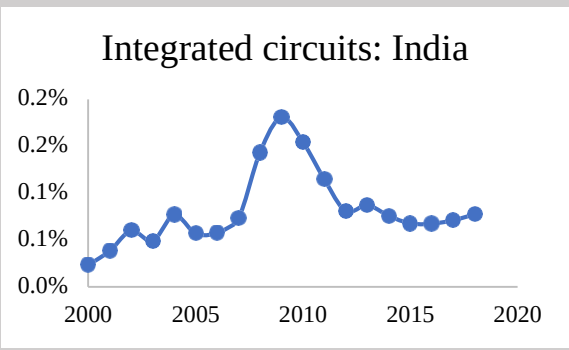
Source: Author's calculation based on WTO database, https://data.wto.org/

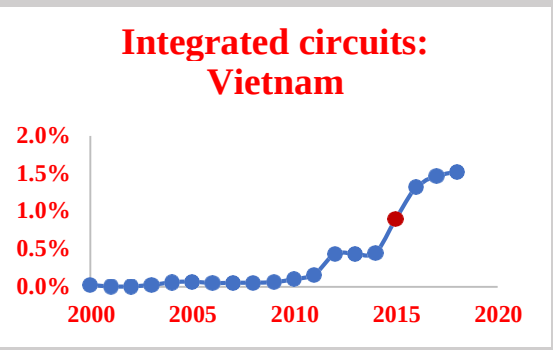
Other selected economies of exports in goods by industry: % of world total

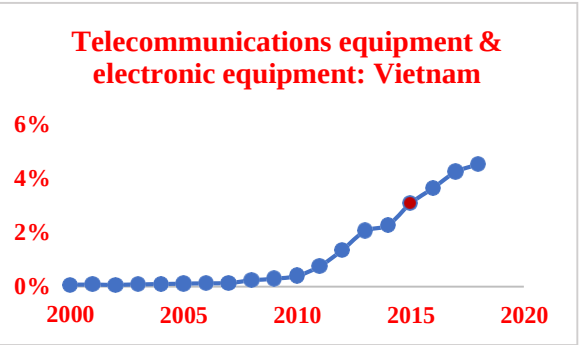


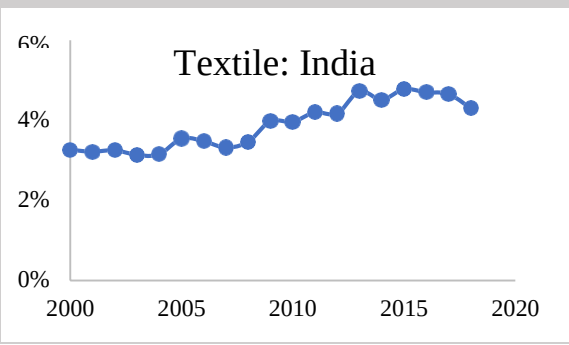


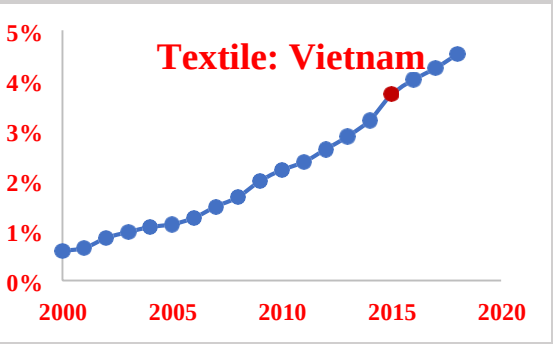












Source: Author's calculation based on WTO database, https://data.wto.org/

Outline

- Starting from China's trade data
- **Industry relocation measurements - WIOT based**
- Industry relocation measurements by processing trade
- Discussion on future industry relocation and its impact on GVC

Tab1e 1: World input-output table (WIOT)

Input \ Output		Intermediate use				Final use				Total output
		Economy 1	Economy 2	…	Economy n	Economy 1	Economy 2	…	Economy n	
Intermediate inputs	Economy 1									X^1
	Economy 2									X^2
	…									…
	Economy n									X^n
Value-added		V^1	V^2	…	V^n					
Total input		X^1	X^2		X^n					

WIOT based industry relocation model

- Industry Relocation **driven by Intermediate Inputs(m4m)**: relocated intermediate production of industry *i(e.g)* (in economy *r*) caused by changes of spatial supply-shares in the intermediates used by industry *j* (in economy *s*)
- Industry Relocation **driven by Final Products (f4f):** relocated final-product production of industry *i* (in economy r) caused by the changes of spatial supply-shares in industry *j*'s final products consumed in economy s.
- **indirect intermediate** industry relocation driven by **Final Products(f4m):** relocated intermediate production of industry *i* (in economy r) caused by changes of spatial supply-shares in industry *j*'s final products consumed in economy s

Tab1e 2: Simplified World Input-Output Table with Two Economies

		Intermediate use		Final use		Total output
		Economy ⬚	Economy ⬚	Economy ⬚	Economy ⬚	
Intermediate inputs	Economy ⬚	$Z_{\square\square}$	$Z_{\square\square}$	$\square_{\square\square}$	$\square_{\square\square}$	$x_{\square}$
	Economy ⬚	$Z_{\square\square}$	$Z_{\square\square}$	$\square_{\square\square}$	$\square_{\square\square}$	$x_{\square}$
Value-added		$v'_{\square}$	$v'_{\square}$	where ' denotes transpose of vector ***x*** and ***v***.		
Total input		$x'_{\square}$	$x'_{\square}$			

- The direct input coefficients form economy r to economy s as $A_{rs} = Z_{rs}\,\hat{x}_{s}^{-1}$
- The **global direct input coefficients**: $A = \begin{pmatrix} A_{rr} & A_{rs} \\ A_{sr} & A_{ss} \end{pmatrix}$;
- The column vector of **total final products for each economy**: $f = \begin{pmatrix} f_{rr} + f_{rs} \\ f_{sr} + f_{ss} \end{pmatrix}$

1. Gao X, Hewings GJD, Yang CH (2018). Measuring the Generalized Global Industry Relocation, *26th International Input-Output Conference*, June 25-29, 2018, Juiz de Fora, Brazil
2. Gao X, Hewings GJD, Yang CH (2022) Offshore, re-shore, re-offshore: what happened to global manufacturing location between 2007 and 2014? *Cambridge Journal of Regions, Economy and Society* 2022, 15, 183–206

WIOT based industry relocation model

$c_1^* = c_{1\square} + c_{1\square}$ denoting the intermediate inputs from the whole world for producing the final products f_1.

➢m4m: $R_{\square}1 = {}^{1}{}_{2N\times 2N} = \left[C_1 - \begin{pmatrix} C_1 \circ R_{0\square} \\ C_1 \circ R_{0\square} \end{pmatrix}\right]$

R: share of the **intermediates** supplied by each economy

➢f4f: $R_{\square}2=(\square\square^{2}) {}_{\square\square,\square\square} {}_{2N\times 2N} = (\square C_1 - {}_{0}) * ff_1$

Fc: share of the **final products** supplied by each economy

➢F4m: $R_{\square}=(\square\square^{3}) {}^{2N\times 2N} = ((I - A^{0})^{-1} - I) * (R_{\square}$

of which: $c_0 = ((I - A_0)^{-1} - {}^{1}$ c_0 and c_1: $2N \times 2N$ matrix that denotes the hypothetical (and real) intermediates supplied from industry *i*(e.g.) (in economy *r*) for producing the final products of industry *j*

		Intermediate use		Final use		Total output
		Economy □	Economy □	Economy □	Economy □	
Intermediate inputs	Economy □	$Z_{\square\square}$	$Z_{\square\square}$	$\square_{\square\square}$	$\square_{\square\square}$	$x_{\square}$
	Economy □	$Z_{\square\square}$	$Z_{\square\square}$	$\square_{\square\square}$	$\square_{\square\square}$	$x_{\square}$
Value-added		$V_{\square}'$	$V_{\square}'$	**A0 and A1 are direct input coefficients of start year and end year, respectively**		
Total input		$x_{\square}'$	$x_{\square}'$			

The analysis on industry relocation for selected economies

2000-2007: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	615978	35.90%	1	China	450196	54.10%	1	China	709849	68.20%
	2	ROW	192688	11.20%	2	ROW	122710	14.70%	2	ROW	99858	9.60%
	3	Russia	190209	11.10%	3	Germany	47235	5.70%	3	Germany	61042	5.90%
	4	Spain	109452	6.40%	4	Brazil	25504	3.10%	4	Brazil	30984	3.00%
	5	Germany	85398	5.00%	5	Ireland	21771	2.60%	5	Korea	20330	2.00%
Bottom	1	USA	-814182	47.40%	1	USA	-387647	46.60%	1	USA	-314119	51.10%
	2	Japan	-503247	29.30%	2	Japan	-168119	20.20%	2	Japan	-138941	22.60%
	3	UK	-149279	8.70%	3	UK	-79174	9.50%	3	UK	-45276	7.40%
	4	France	-89620	5.20%	4	France	-67871	8.20%	4	France	-43414	7.10%
	5	Turkey	-48957	2.90%	5	Chinese Taipei	-33801	4.10%	5	Italy	-13496	2.20%

88.7%

69.6%

80.2%

93.5%

88.6%

90.4%

1. **China** was the most representative economy for the global industry relocation-**in**.

2. The **typical developed economies** were the representative economies for the global industry relocation-**out**. In period 2000-2007, the most representative one was **the United States**; while in period 2007-2014, the most representative shifted to **Japan**.

The analysis on industry relocation for selected economies (cont. 1)

2007-2014: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	2322029	71.80%	1	China	439264	55.20%	1	China	754400	68.80%
	2	ROW	789102	24.40%	2	ROW	82301	10.30%	2	ROW	128057	11.70%
	3	Poland	34685	1.10%	3	India	67930	8.50%	3	India	56604	5.20%
	4	Romania	22013	0.70%	4	USA	40473	5.10%	4	Korea	41061	3.70%
	5	Switzerland	21187	0.70%	5	Switzerland	25221	3.20%	5	Switzerland	16801	1.50%
Bottom	1	Japan	-715180	22.10%	1	Japan	-222636	28.00%	1	Japan	-235134	35.40%
	2	USA	-430336	13.30%	2	France	-93068	11.70%	2	France	-68428	10.30%
	3	Germany	-347388	10.70%	3	UK	-83592	10.50%	3	Italy	-61995	9.30%
	4	France	-222549	6.90%	4	Germany	-75188	9.40%	4	UK	-53820	8.10%
	5	UK	-214311	6.60%	5	Italy	-55486	7.00%	5	Germany	-53659	8.10%

1. **China** was the most representative economy for the global industry relocation-**in**.
2. The **typical developed economies** were the representative economies for the global industry relocation-**out**. In period 2000-2007, the most representative one was **the United States**; while in period 2007-2014, the most representative shifted to **Japan**.

The analysis on industry relocation for selected economies (cont. 2)

2000-2007: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	615978	35.90%	1	China	450196	54.10%	1	China	709849	68.20%
	2	ROW	192688	11.20%	2	ROW	122710	14.70%	2	ROW	99858	9.60%
	3	Russia	190209	11.10%	3	Germany	47235	5.70%	3	Germany	61042	5.90%
	4	Spain	109452	6.40%	4	Brazil	25504	3.10%	4	Brazil	30984	3.00%
	5	Germany	85398	5.00%	5	Ireland	21771	2.60%	5	Korea	20330	2.00%
Bottom	1	USA	-814182	47.40%	1	USA	-387647	46.60%	1	USA	-314119	51.10%
	2	Japan	-503247	29.30%	2					Japan	-138941	22.60%
	3	UK	-149279	8.70%	3	India is not here				UK	-45276	7.40%
	4	France	-89620	5.20%	4					France	-43414	7.10%
	5	Turkey	-48957	2.90%	5	Chinese Taipei		-33801	5	Italy	-13496	2.20%

3. The industry relocation for **Germany and India** changed sharply in the period 2007-2014, Germany shifted from the top 5 of industry relocation-in to the top 5 of industry relocation-out. Meanwhile, India became the representative economy for industry relocation-in.

The analysis on industry relocation for selected economies (cont. 3)

2007-2014: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	2322029	71.80%	1	China	439264	55.20%	1	China	754400	68.80%
	2	ROW	789102	24.40%	2	ROW	82301	10.30%	2	ROW	128057	11.70%
	3	Poland	34685	1.10%	3	India	67930	8.50%	3	India	56604	5.20%
	4	Romania	22013	0.70%	4	USA	40473	5.10%	4	Korea	41061	3.70%
	5	Switzerland	21187	0.70%	5	Switzerland	25221	3.20%	5	Switzerland	16801	1.50%
Bottom	1	Japan	-715180	22.10%	1	Japan	-222636	28.00%	1	Japan	-235134	35.40%
	2	USA	-430336	13.30%	2	France	-93068	11.70%	2	France	-68428	10.30%
	3	Germany	-347388	10.70%	3	UK	-83592	10.50%	3	Italy	-61995	9.30%
	4	France	-222549	6.90%	4	Germany	-75188	9.40%	4	UK	-53820	8.10%
	5	UK	-214311	6.60%	5	Italy	-55486	7.00%	5	Germany	-53659	8.10%

3. The industry relocation for **Germany and India** changed sharply in the period 2007-2014, Germany shifted from the top 5 of industry relocation-in to the top 5 of industry relocation-out. Meanwhile, India became the representative economy for industry relocation-in.

The analysis on industry relocation for selected economies (cont. 4)

2000-2007: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	615978	35.90%	1	China	450196	54.10%	1	China	709849	68.20%
	2	ROW	192688	11.20%	2	ROW	122710	14.70%	2	ROW	99858	9.60%
	3	Russia	190209	11.10%	3	Germany	47235	5.70%	3	Germany	61042	5.90%
	4	Spain	109452	6.40%	4	Brazil	25504	3.10%	4	Brazil	30984	3.00%
	5	Germany	85398	5.00%	5	Ireland	21771	2.60%	5	Korea	20330	2.00%
Bottom	1	USA	-814182	47.40%	1	USA	-387647	46.60%	1	USA	-314119	51.10%
	2	Japan	-503247	29.30%	2	Japan	-168119	20.20%	2	Japan	-138941	22.60%
	3	UK	-149279	8.70%	3	UK	-79174	9.50%	3	UK	-45276	7.40%
	4	France	-89620	5.20%	4	France	-67871	8.20%	4	France	-43414	7.10%
	5	Turkey	-48957	2.90%	5	Chines Taipei	-33801	4.10%	5	Italy	-13496	2.20%

4. Small developing economies were also achieving the industry relocation-in from the typical developed economies.

The analysis on industry relocation for selected economies (cont. 5)

2007-2014: The top 5 and bottom 5 economies in terms of value of industry relocation, and their share in world total (Unit: Million US dollars)

	Industry relocation driven by intermediate inputs				Industry relocation driven by final products				Indirect intermediate industry relocation driven by final products			
	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share	Rankings	Economies	Value	Share
Top	1	China	2322029	71.80%	1	China	439264	55.20%	1	China	754400	68.80%
	2	ROW	789102	24.40%	2	ROW	82301	10.30%	2	ROW	128057	11.70%
	3	Poland	34685	1.10%	3	India	67930	8.50%	3	India	56604	5.20%
	4	Romania	22013	0.70%	4	USA	40473	5.10%	4	Korea	41061	3.70%
	5	Switzerland	21187	0.70%	5	Switzerland	25221	3.20%	5	Switzerland	16801	1.50%
Bottom	1	Japan	-715180	22.10%	1	Japan	-222636	28.00%	1	Japan	-235134	35.40%
	2	USA	-430336	13.30%	2	France	-93068	11.70%	2	France	-68428	10.30%
	3	Germany	-347388	10.70%	3	UK	-83592	10.50%	3	Italy	-61995	9.30%
	4	France	-222549	6.90%	4	Germany	-75188	9.40%	4	UK	-53820	8.10%
	5	UK	-214311	6.60%	5	Italy	-55486	7.00%	5	Germany	-53659	8.10%

4. Small developing economies were also achieving the industry relocation-in from the typical developed economies.

Outline

- Starting from China's trade data
- Industry relocation measurements - WIOT based
- **Industry relocation measurements by processing trade**
- Discussion on future industry relocation and its impact on GVC

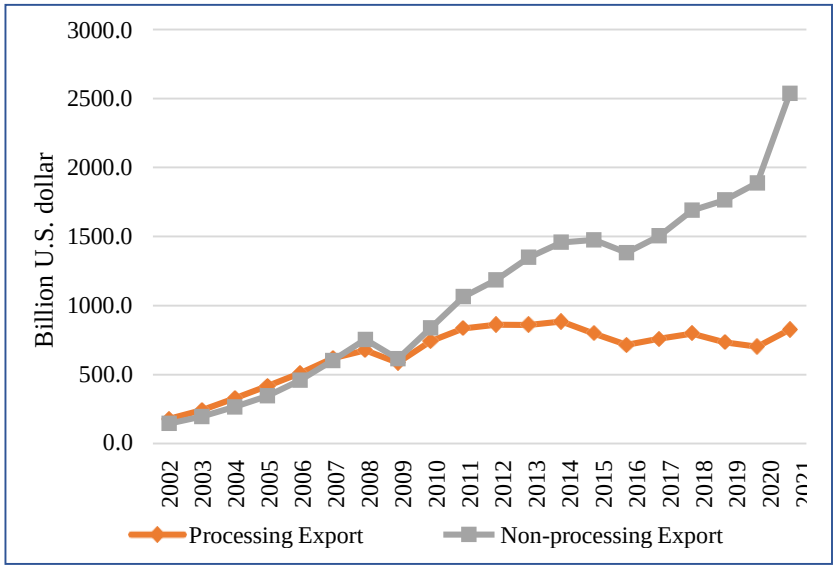
Industry relocation measurement: processing trade data

- WIOT-based industry relocation model could capture the industry relocation by industry and economy, while failed to capture its evolution in recent years due to time lag of world input-output tables
- In particular, in recent years the global industry relocation has been accelerated due to US-China trade friction as well as the COVID-19 pandemic. In particular in processing trade?
- **How about if we start from the industry relocation triggered by processing trade?**

★ Very sensitive to production cost; **more likely to relocate**

★ Heavily dependent on the international supply chain; highly sensitive to geopolitical and economic uncertainties; **easier to relocate**

★ **The international relocation of processing trade is the bellwether of global production relocation.**



Industry relocation measurement: processing trade data

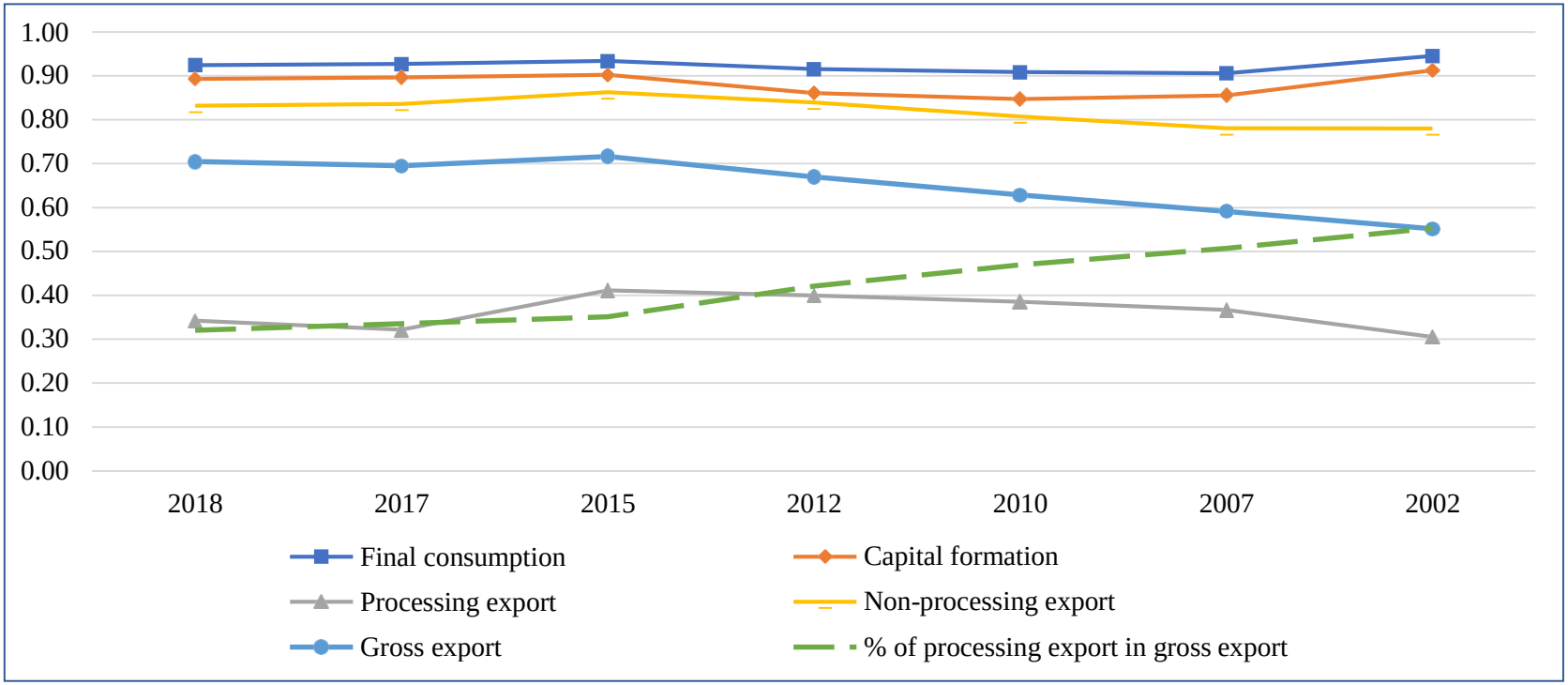
- The domestic value-added share (DVASH) of processing trade is lower than normal trade & domestic demand due to high dependency on imported intermediate inputs
- Hypothesis: if the DVASH of gross export (DVASHGE) continuingly decreases for a specific economy, then it means that such economy is the destination of processing trade relocation.

Our contribution on this issue:

- **Put forward an idea how to identify whether or not a certain economy is the host economy of processing trade based on the changes of DVASHGE, and**
- **An optimization method-based model for estimating the evolution of DVASHGE**
- **This model framework could overcome the difficulty in data availability, in particular the serious time lag of WIOT, the lack of processing trade data in many economies**

China	Gross exports (US$ 1000)	Exports in goods (US$ 1000)			Exports in service (US$ 1000)
		Gross	**Processing**	Normal	
2010	628	605	**387**	798	842
2011	637	617	**388**	796	845
2012	667	649	**400**	830	861
2013	678	660	**394**	830	863
2014	678	663	**393**	827	860
2015	711	695	**411**	848	897
2016	715	698	**408**	848	897
2017	676	656	**321**	824	892
2018	679	661	**321**	821	892
2019	692	674	**319**	821	888

China: The share of processing exports and the DVASH of exports and other final demands



- **DVASH of consumption and capital formation of domestic products, more constant than DVASHGE. Consumption: 0.91-0.95; capital formation: 0.85-0.91; gross exports: 0.55-0.72**
- **DVASHGE of a certain economy shows an opposite trends with its processing production intensity.**
  - With the increase of the share of processing exports in gross exports, the DVASHGE decreases

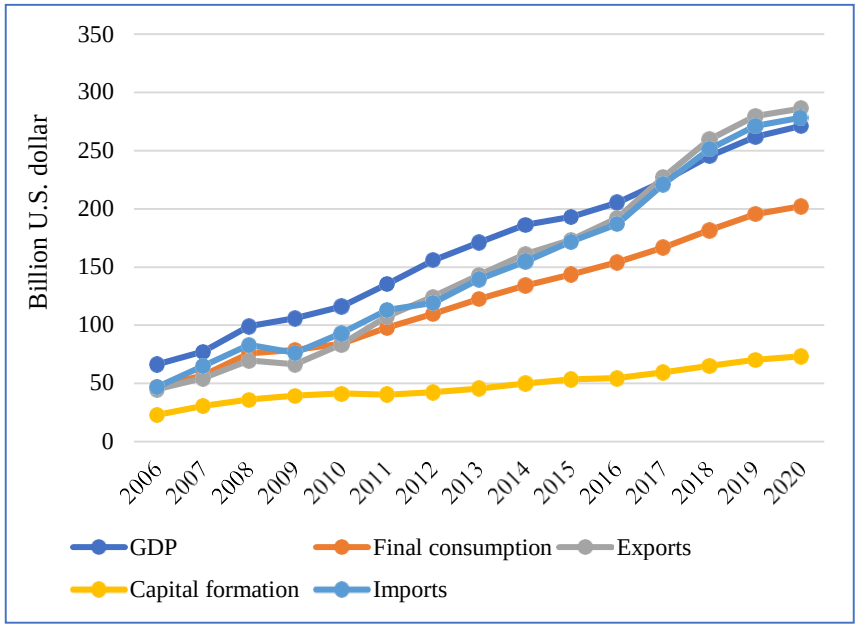
Selected economies and major data sources

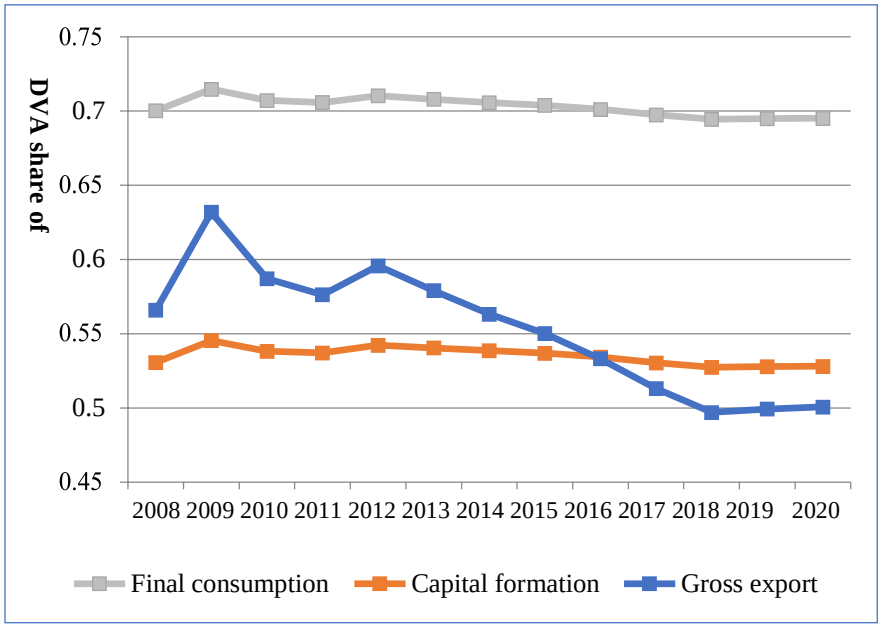
- **Selected economies:**
  - ★Asia: Bangladesh, Cambodia, India, Indonesia, Malaysia, Pakistan, Srilanka, Thailand, the Philippines, Vietnam
  - ★South America: Chile, Columbia, Mexico
  - ★East Europe: Bulgaria, Hungary , Romania
  - ★Middle East and Africa: Morocco, Tunisia, Turkey
- **Data source:**
  - ★Domestic accounting data (consumption, fixed capital formation, import and export: by the World Bank)
  - ★Imports of consumption goods and capital goods, UNcomtrade
  - ★initial values from WIOT and the IO tables of relevant economies(extracted from OECD ICIO, while for Bangladesh and Srilanka, from ADB) …
- **Years of data: 2008-2020**

Empirical results: DVASH per unit export

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bangladesh	0.65094	0.65365	0.67320	0.60003	0.57438	0.57909	0.57407	0.58723	0.62719	0.63374	0.56556	0.58054	0.62483
Bulgaria	0.58602	0.73007	0.67571	0.63038	0.59369	0.60074	0.60696	0.64122	0.67493	0.64397	0.64165	0.65613	0.71234
Cambodia	0.55166	0.64763	0.59235	0.56866	0.56298	0.56026	0.54968	0.55944	0.55309	0.58334	0.60074	0.62436	0.59490
Chile	0.75257	0.85951	0.85060	0.81499	0.82868	0.84471	0.84229	0.89174	0.92514	0.92624	0.90280	0.90420	0.92637
Columbia	0.84664	0.88591	0.88740	0.86168	0.85201	0.85063	0.83234	0.80668	0.80672	0.81773	0.80869	0.79458	0.80256
Hungary	0.57135	0.60614	0.56176	0.54402	0.54892	0.55675	0.54993	0.56429	0.57876	0.57334	0.57839	0.58335	0.59728
India	0.71511	0.71282	0.69810	0.64102	0.65801	0.68386	0.69426	0.77641	0.82647	0.80876	0.75107	0.76976	0.80410
Indonesia	0.77649	0.81933	0.83541	0.80603	0.77757	0.77697	0.75258	0.78147	0.81176	0.81193	0.80145	0.84532	0.85089
Malaysia	0.57788	0.60933	0.59638	0.59508	0.59905	0.59498	0.60306	0.62176	0.63821	0.61950	0.62138	0.63381	0.65281
Mexico	0.62600	0.65158	0.63362	0.61951	0.60292	0.60166	0.63244	0.61464	0.60422	0.61618	0.61351	0.63613	0.63933
Morocco	0.56189	0.67138	0.62576	0.54004	0.52227	0.54539	0.55526	0.62202	0.60777	0.59861	0.57785	0.59421	0.63378
Pakistan	0.74814	0.82644	0.82072	0.79610	0.75497	0.74546	0.78068	0.83750	0.87051	0.82471	0.75415	0.74953	0.82496
Philippines	0.64425	0.68453	0.66756	0.69738	0.66532	0.67188	0.66758	0.66409	0.64646	0.61701	0.57010	0.60144	0.64958
Romania	0.71110	0.76299	0.68350	0.64739	0.64870	0.67803	0.67983	0.68691	0.69228	0.67801	0.66245	0.67515	0.70483
Sri Lanka	0.57015	0.71193	0.75036	0.64366	0.65814	0.68802	0.68845	0.73111	0.71502	0.69931	0.67785	0.68266	0.72016
Thailand	0.57694	0.65616	0.61844	0.58243	0.59621	0.60592	0.61385	0.64059	0.66591	0.66613	0.66223	0.69548	0.72229
Tunisia	0.52293	0.61206	0.57187	0.52520	0.51797	0.49720	0.49064	0.51543	0.51608	0.47469	0.42858	0.44342	0.47498
Turkey	0.73905	0.78539	0.75472	0.70482	0.72384	0.71774	0.72556	0.75911	0.76461	0.69704	0.68792	0.70499	0.67345
Vietnam	0.56584	0.63180	0.58705	0.57612	0.59563	0.57897	0.56313	0.55006	0.53308	0.51304	0.49688	0.49916	0.50055

Vietnam: host economy of the processing production

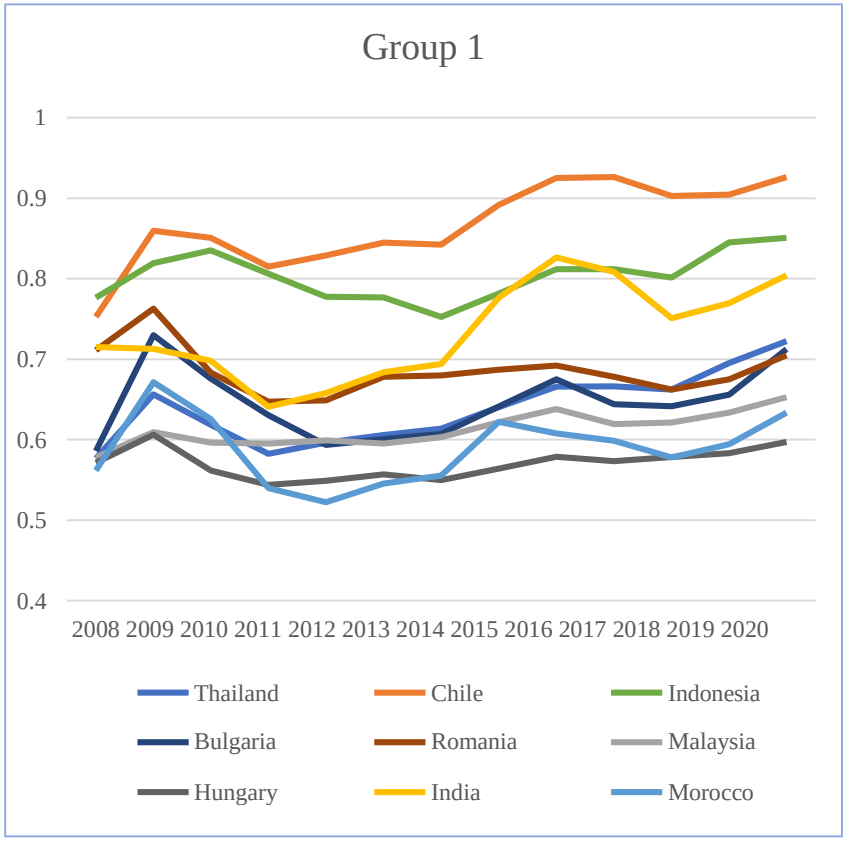


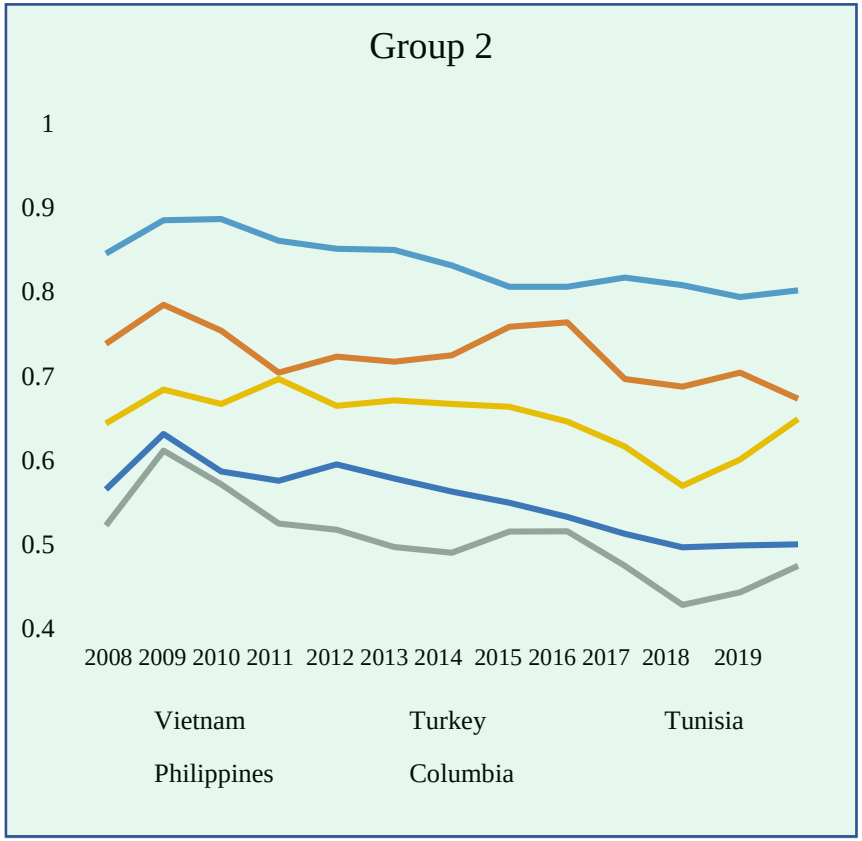


- The DVASHGE for Vietnam, on the whole, show a notable downward trend, from about 0.60 during 2009 and 2012 to 0.50 during 2018-2020.
  - The share of processing exports by Vietnam keeps growing in the past years and has become one of the major destinations of processing trade relocation-in

Other possible destinations?

DBSCAN clustering: group 2, besides Vietnam, Turkey, Tunisia, the Philippines, Columbia are also the destinations of the processing production.





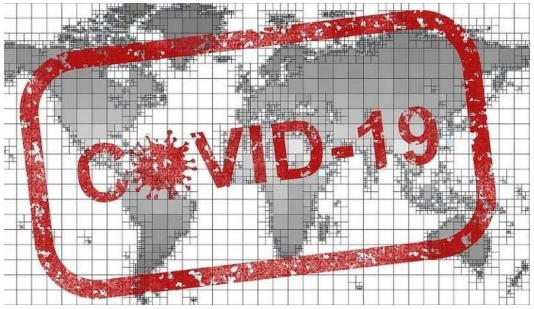
Outline

- Starting from China's trade data
- Industry relocation measurements - WIOT based
- Industry relocation measurements by processing trade
- **Discussion on future industry relocation and its impact on GVC**

Industry relocation: normal economic phenomena while may be accelerated by external shocks

Triggered by MNEs' optimized global production fragmentation

- **For example, labor-intensive industry (textile, shoemaking, etc.) in China, some MNES moved out of China or move some of their production lines due to the increasing labor cost, to other economies with lower labor cost, e.g.,** ECLAT TEXTILE CO (one of the major suppliers of Nike, withdraw 2016), CRYSTAL INTERNATIONAL (2014-2016, 43.9% in mainland China, to 34.3% of its total capacity), POU CHEN GROUP



- While in some technology-intensive industry (electronic equipment, automobile manufacturing) within China, some FIEs moved part of their capacity out of China due to US-China trade friction, COVID-19 may accelerate the process. For example, US companies including Apple, Microsoft, Google, Dell, HP; Japanese companies including Honda, Toyota, Sharp, Ricoh, Nintendo; S. Korean companies Samsung

COVID-19 is changing the fundamentals of industry relocation

- **Global production network has revealed their increasing vulnerability under the shock of COVID-19: global to regional?**

For example: the sudden production lockdown (though only in short time) in the first quarter of 2020 in China brought about the reflection of the MNEs about the fact of heavy dependence on supply chains of a certain economy, for example, China. In particular in the following industries:

- ★**Reshoring, or Near-shoring:** medical products, medical devices and healthcare industry, key technologies, domestic security related industry, may see more ‘de-sinicization’, reshoring to the home economies like the U.S, Europe, or near-shoring to their near economies
- ★**Dissemination of production and supply chains within China to more Asian economies**, as mentioned above, the relocation of labor intensive production activities. The RCEP agreement will accelerate the building of the ASEAN economic community, strengthening Asian production chain

COVID-19 is changing the fundamentals of industry relocation

- **The COVID-19 accelerate the rapid development of digital technologies and digital economy**

  ★Digital technologies and high-tech provide new engines for industry relocation, relevant high-tech industries may show a trend of inverse technology gradient clustering.

  ★The industry relocation pattern of conventional industries,. e.g., labor-intensive industries or production links, have to be changed with the intelligentization. It may lower the employment and income of the origin economy of industry transfer while without increasing that of the host economy as expected before.

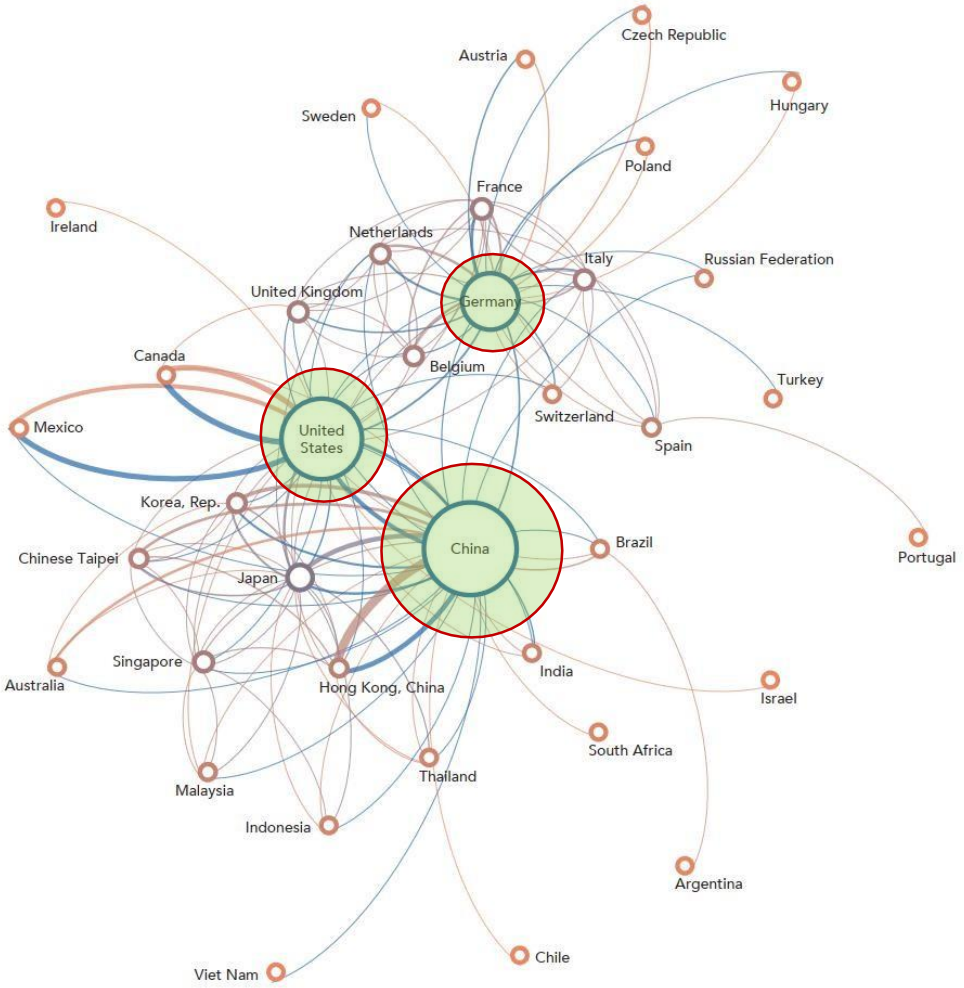
  ★More challenges for those economies at the middle and low end of global value chain to realize industrial upgrading due to their relatively weaker advantages in high-tech.

  ★With the intelligentization of production process, the enterprises may reduce the labor demands both at home & host economies, and tend to put their production lines closer to the consumers. This kind of relocation may lead to premature deindustrialization in developing economies.

Global production to regional production ⟹ Global Value Chain (GVC) to Regional Value Chain (RVC)

- Global production shrinks to regional production with great probability
- Global production chains / value chains may become shorter, forming global production hub, i.e., European hub (Germany as the center), American hub (US as the center), East Asian hub (China, Japan and S. Korea as centers)
- As shown in the right diagram, each bubble may enlarge, while the links between the three bubbles weaken
- More production links and hubs?

FIGURE 6 Trade in components shows three interrelated production hubs



Source: World Bank, IDE-JETRO, OECD, UIBE, WTO，The 2017 GVC development report: https://www.wto.org/english/res_e/publications_e/gvcd_report_17_e.htm

Thank you for your attention!

chyang@iss.ac.cn

gaoxiang@amss.ac.cn