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The FDI Network, Global Value Chain Participation and Economic Upgrading

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KEY MESSAGES

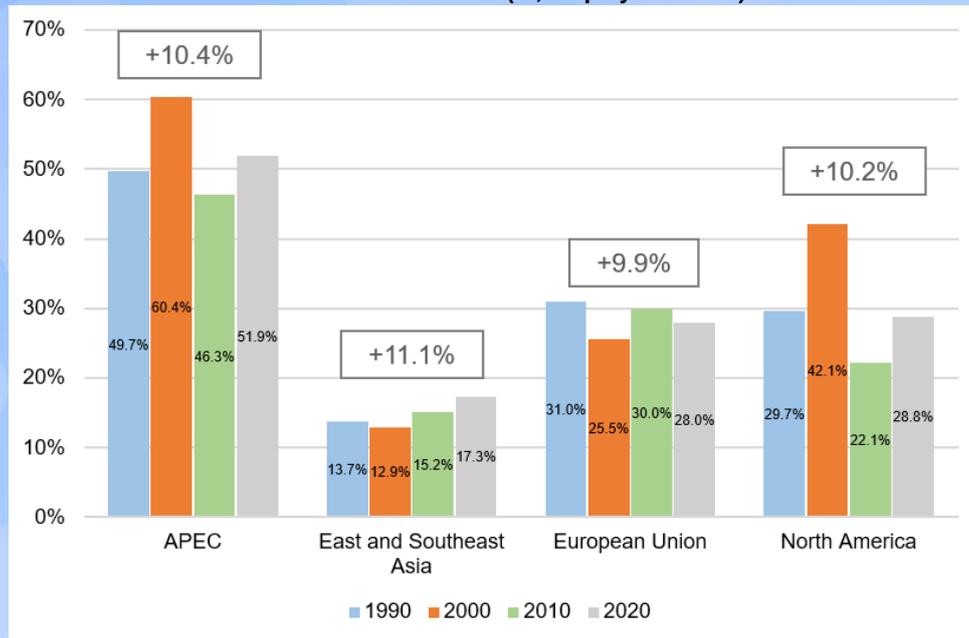
- Foreign direct investment (FDI) represents an important internationalisation pathway to global value chain (GVC) participation.
- The APEC economies as a group have dominated as FDI recipients. The accumulated FDI stock in the APEC region grew at an annual average of 10.4 percent between 1990 and 2020. As of 2020, APEC economies accounted for nearly 52 percent of the global inward FDI stock.
- Using a (social) network analysis approach, economies such as China; India; Italy; Korea; the Netherlands; Singapore; Spain; Thailand; the UK; and the US have consistently scored high on centrality in the global FDI network. Economies that hold a central position in the FDI network tend to also be hubs in the global trade network.
- GVC participation does seem to attract investment in many emerging economies, but the relationship is by no means a clear-cut one since investment is also highly dependent on broader regulatory and institutional frameworks.
- The case studies in this brief (China; Indonesia; Viet Nam) suggest that self-sufficiency levels in various economic sectors may influence GVC participation. For example, China's manufacturing and services sectors tend to be highly self-sufficient, that is, less dependent on international suppliers for materials or component parts. In contrast, Indonesia and Viet Nam lack self-sufficiency in advanced manufacturing industries and thus tend to be more integrated into GVCs in these sectors.
- GVC participation has provided new ways for developing economies to achieve industrialisation and economic upgrading. Economies have great incentives to move up the value chain since upstreamness (for example, by participating in activities such as product design and R&D) is generally associated with capturing a higher share of value-added along a GVC. The varying sectoral focuses and GVC upgrading experiences of China; Indonesia; and Viet Nam have important implications for other APEC developing economies.
- Some evidence suggests that firms that are more export-oriented and involved in the FDI network perform better in terms of sales, employment and productivity.

Foreign direct investment (FDI) represents one of the important internationalisation pathways to global value chain (GVC) participation.¹ Based on data from the United Nations Conference on Trade and Development (UNCTAD), GVC participation in

APEC has reached 50 percent, albeit still lower than the global level of around 56 percent. The East and Southeast Asia region, which is home to half of the APEC economies, is a key player in GVCs. The region accounts for 18.4 percent of the global

¹ C.Z. Qiang, Y. Liu and V. Steenbergen, "An Investment Perspective on Global Value Chains" (World Bank, 2021).

Figure 1. FDI inward stock by region (% of total world stock) and 1990–2020 CAGR (% , displayed in box)



CAGR=compound annual growth rate; FDI=foreign direct investment

Source: Calculated by author using data from: United Nations Conference on Trade and Development (UNCTAD), "World Investment Report," accessed 22 February 2022, <https://worldinvestmentreport.unctad.org/>

inward FDI stock and has been performing the role of the 'factory of the world' for more than two decades.

The discussions about the extent and desirability of developing economies attracting FDI and participating in GVCs have remained largely theoretical or are limited to individual cases. For this reason, this policy brief will focus on three East Asian developing economies – China; Indonesia; Viet Nam – with varying levels of GVC participation and upgrading (through increasing upstream activities).

This paper will also highlight the economic benefits of participating in GVCs and FDI, and explore the relationship between GVC participation and FDI. By doing so, it aims to offer a starting point for policymakers to assess their economies' engagement and consider relevant policy options.

This paper will start with an analysis of bilateral FDI networks using the (social) network analysis framework, and, in particular, centrality measures. A network analysis framework examines the topological properties of complex economic relationships.²

² G.D. Masi and G. Ricchiuti, "A Network Analysis of Foreign Direct Investments" (2018),

An analysis of the economic structures of China; Indonesia; and Viet Nam will follow, to understand their industrial base and economic diversity. Skyline analysis will be employed to provide insights into their domestic self-sufficiency in production capacity as well as their industrial structure. The paper will go on to explore trends in GVC participation and positioning in the textile, electronics and automobile sectors for the three economies.

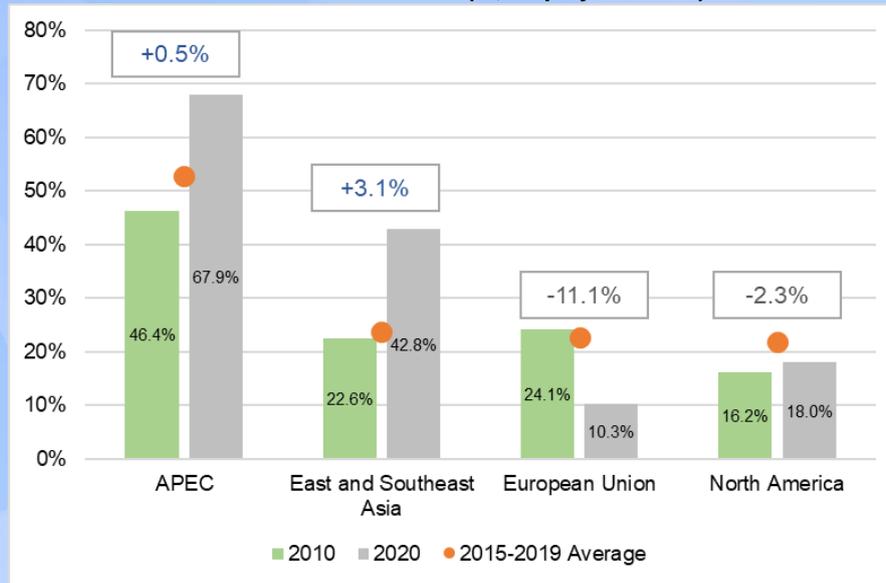
The paper ends with a brief analysis of the impact on sales, employment and productivity from GVCs and FDI.

APEC and East and Southeast Asia as FDI Destinations

The APEC economies as a group have consistently been the main recipients of FDI. By year 2000, APEC's share of the global inward FDI stock had peaked at more than 60 percent before decreasing to nearly 52 percent as of 2020 (Figure 1). The accumulated FDI stock in the APEC region grew at an annual average of 10.4 percent between 1990 and 2020.

https://siecon3-607788.c.cdn77.org/sites/siecon.org/files/media_wysiwyg/demasi-ricchiuti-136.pdf

Figure 2. FDI inflows by region (% of total world inflows) and 2010–2020 CAGR (%), displayed in box)



CAGR=compound annual growth rate; FDI=foreign direct investment

Source: Calculated by author using data from: UNCTAD, “World Investment Report,” accessed 22 February 2022, <https://worldinvestmentreport.unctad.org/>

The East and Southeast Asia region, home to more than half of the APEC members, is becoming an increasingly attractive destination for foreign investment. While regions like the European Union (EU) and North America³ have seen their shares marginally shrinking, the East and Southeast Asia region’s share of world total inward FDI stock has grown from 13.7 percent in 1990 to 17.3 percent in 2020. The region posted a compound annual growth rate (CAGR) of 11.1 percent in total value of inward FDI stock over the 30-year period, higher than the APEC region, the EU and North America.

The rise of the APEC region, and particularly the East and Southeast Asia region, as FDI hosts can be better observed from an FDI inflow perspective. APEC economies hosted nearly 68 percent of the world’s total FDI inflows in 2020, compared to less than 50 percent in 2010. Although the accumulated stock of FDI in regions like North America and the EU still predominates, the East and Southeast Asia region is catching up quickly. The region is in fact one of the biggest recipients of investment in 2020, making up nearly 43 percent of global FDI inflows (Figure 2).

³ In this brief, North America includes the United States and Canada.

⁴ In this brief, the ‘East and Southeast Asia region’ refers to East Asia (China; Democratic People’s Republic of Korea; Republic of Korea; Macao, China; Mongolia; Chinese Taipei) and Southeast Asia (Brunei Darussalam; Cambodia;

The five-year average inflow data covering 2015–2019 show that, even prior to the COVID-19 pandemic, figures for the East and Southeast Asia region had exceeded those of North America and also the EU.⁴ China alone accounted for 7.9 percent of total average FDI inflows during 2015–2019, outdone only by the US. The Southeast Asian economies together made up another 8.1 percent, with Singapore; Indonesia; and Viet Nam being the top recipients in the region. This indicates that more and more investments are heading to the East and Southeast Asia region.

Analysis of FDI Network

Methodology

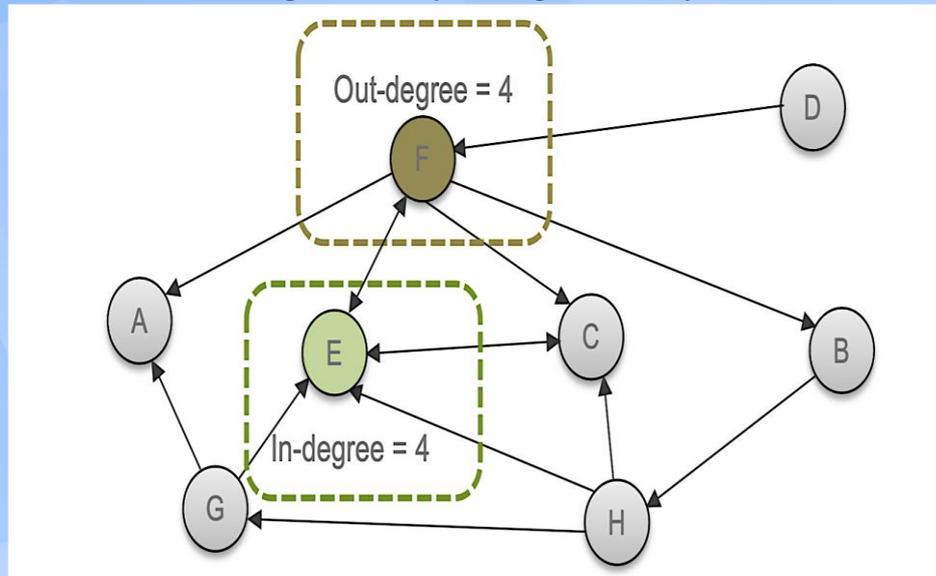
We adopt a (social) network analysis approach to explore patterns of bilateral FDI and support a better understanding of the connection between FDI and GVC participation.

This approach helps to identify the hubs in the FDI network, that is, the nodes in the network with high centrality (in the analysis here, each node represents an economy).⁵

Indonesia; Laos; Malaysia; Myanmar; the Philippines; Singapore; Thailand; Timor-Leste; Viet Nam).

⁵ L.M. Bolivar, C. Casanueva and I. Castro, “Global Foreign Direct Investment: A Network Perspective,” *International Business Review* 28, no. 4 (2019): 696–712, <https://doi.org/10.1016/j.ibusrev.2019.01.007>

Figure 3. Example of degree centrality



Source: M. Angst and L. Brandenberger, "A Step by Step Guide to Computing Centrality Measures in Statnet," Figure 4.2, accessed 7 May 2022, https://brandenberger.github.io/sna_primer/centrality.html

The centrality measures used to analyse and discuss the bilateral FDI networks are degree centrality, betweenness centrality, closeness centrality and eigenvector centrality.

- **Degree centrality:** This provides information on the number of bilateral investment linkages that an economy has. The more linkages an economy has, the more connected and thus 'central' it is. Since bilateral FDI networks are direction-dependent, that is, each investment is made by a home economy (source) to a host economy (recipient), the degree centrality can be decomposed into in-degree and out-degree. In-degree refers to the number of connections that point toward a node (inward flow of investment into an economy) and out-degree refers to the number of connections that stem from that node (outward flow of investment from an economy) (Figure 3).
- **Betweenness centrality:** This is 'the number of shortest paths among all other nodes that pass through this node'.⁶ The more often a node mediates paths between other nodes, the more central it is. In Figure 3, node F has the highest degree of betweenness centrality, while node D has a zero score (since node D does not bridge any network relations).

- **Closeness centrality:** This is how central a node is as measured by its distance to all other nodes in the network. The node with the shortest distances to the rest of the nodes is the most central. In Figure 3, node F has the highest closeness centrality in the network.
- **Eigenvector centrality:** This measures the influence of a node based on its connections to important (high-scoring) nodes. The highest eigenvector centrality score in the example network in Figure 3 rests with node E.

Data

For the bilateral FDI network analysis, we use inward direct investment position (stock) data for 2020 from the Coordinated Direct Investment Survey (CDIS) by the International Monetary Fund (IMF).⁷ This is the most comprehensive and up-to-date dataset available, covering 129 reporting (host) economies and 246 partner (home) economies, with data up to 2020.⁸

We analyse FDI stock data rather than flow data to address intermittent fluctuations in FDI flows due to disruptive events such as the COVID-19 pandemic. The use of stock data also recognises that GVC

⁶ T.U. Grund, "Nwcommands: Network Analysis Using Stata" (manuscript, 28 July 2015), <https://nwcommands.wordpress.com/tutorials-and-slides/>

⁷ International Monetary Fund (IMF), "IMF eLibrary Data: Coordinated Direct Investment Survey(CDIS)," updated 12

August 2021, <https://data.imf.org/?sk=40313609-F037-48C1-84B1-E1F1CE54D6D5&slid=1410469360660>

⁸ Reporting economies are those that report their inward FDI in the CDIS database. Partner economies are those cited by the reporting economies as the sources of investment.

Table 1. Descriptive statistics for centrality measures, FDI (stock) network 2020

	N	Mean	Std. Dev.	Min	Max	Median	p75
In-degree	230	25.85	34.48	0	150	0	126
Out-degree	230	25.85	26.57	1	108	15	100
Betweenness	230	96.26	295.29	0	2247.44	0	1391.43
Closeness	230	0.53	0.08	0.34	0.79	0.52	0.74
Eigenvector	230	0.05	0.04	0.00	0.15	0.04	0.14

N=number of economies in the network.

Source: Calculated by author using Stata.

Table 2. Centrality measures for 20 economies with highest centrality scores (based on betweenness centrality measures), FDI (stock) network 2020

Economy	In-degree	Betweenness	Closeness	Eigenvector	Rank In-degree	Rank Betweenness	Rank Closeness	Rank Eigenvector
Netherlands	142	2247.44	0.78	0.15	3	1	2	1
China	150	2002.36	0.79	0.15	1	2	1	2
UK	97	1396.34	0.74	0.14	11	3	5	3
Mauritius	149	1391.43	0.76	0.13	2	4	3	10
Italy	126	1356.58	0.74	0.14	4	5	4	4
Belgium	86	1093.83	0.68	0.12	16	6	11	17
USA	86	1091.65	0.70	0.14	16	7	6	6
Singapore	112	1012.89	0.70	0.13	7	8	6	7
Spain	98	708.04	0.69	0.13	10	9	9	11
India	107	705.59	0.70	0.13	9	10	8	12
Korea	95	658.59	0.68	0.13	12	11	14	13
Thailand	122	647.12	0.68	0.12	5	12	10	16
France	72	546.14	0.68	0.13	29	13	14	9
Cyprus	80	480.49	0.65	0.12	20	14	19	22
Russia	110	478.98	0.67	0.13	8	15	16	14
Luxembourg	75	443.65	0.68	0.13	24	16	13	8
South Africa	77	428.69	0.63	0.10	21	17	24	38
Germany	73	392.60	0.68	0.14	28	18	12	5
Portugal	61	319.69	0.59	0.09	36	19	47	49
Nigeria	76	269.33	0.61	0.09	23	20	36	53

Source: Calculated by author using Stata.

participation generally develops over time as investments accumulate.

Using the CDIS data, a network of 5,946 investment links between 230 economies is identified.⁹ The total of all the bilateral FDI values in this network covers 98.7 percent of the world's total inward FDI stock in 2020 presented in the original CDIS dataset, which provides confidence that the network is representative of the overall FDI data.

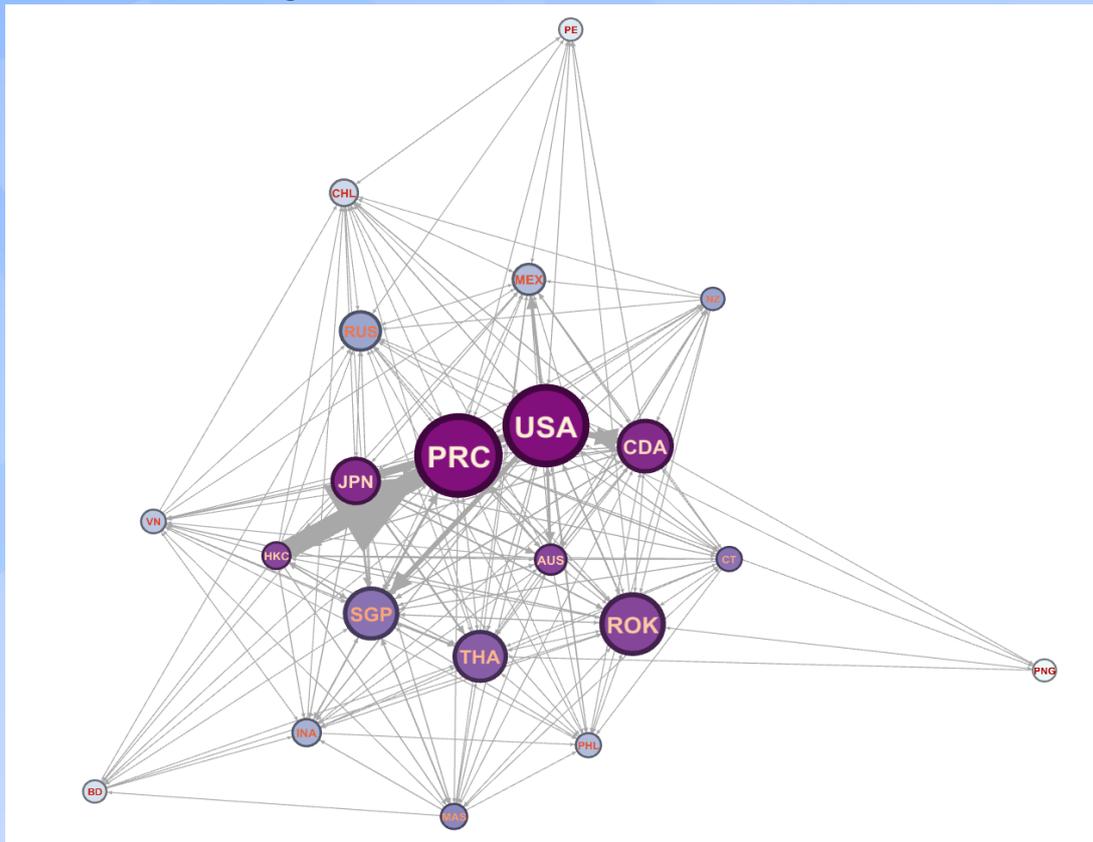
⁹ The CDIS does not have any data on inward FDI stock for four APEC economies, namely, Papua New Guinea; Peru; Chinese Taipei; and Viet Nam (Peru is among the 129 reporting economies, but has not reported any data). The data for these four economies are thus mirrored from their outward FDI stock data. Confidential (undisclosed by the reporting economy) or missing data are dropped. Small bilateral FDI stock valued under USD 1 million is also not included, following Bolívar et al., "Global Foreign Direct Investment."

Analysis

The centrality measures for the network are then calculated using Stata. A summary of the results is found in Table 1. The statistical analysis shows that each economy in the network has 25.85 inward and 25.85 outward investment links on average. It should be noted, however, that the distributions of the degree centrality measures are skewed by data unavailability.¹⁰ The betweenness centrality measure also has a skewed distribution with large

¹⁰ Of the 230 economies in the network, 117 do not have any inward investment (in-degree) reported. The reason for this is that there are only 129 reporting economies in the IMF's CDIS data, therefore those that are non-reporting only have outward investment data (out-degree). Data unavailability underestimates the out-degree centrality measures of some economies.

Figure 4. FDI network for 21 APEC economies, 2020



APEC economies: AUS=Australia; BD=Brunei Darussalam; CDA=Canada; CHL=Chile; PRC=China; HKC=Hong Kong, China; INA= Indonesia; JPN=Japan; ROK=Korea; MAS=Malaysia; MEX=Mexico; NZ=New Zealand; PNG=Papua New Guinea; PE=Peru; PHL=the Philippines; RUS=Russia; SGP=Singapore; CT=Chinese Taipei; THA=Thailand; USA=United States; VN=Viet Nam.

Note: The size of the circles ('nodes') reflects the betweenness centrality scores; the shades of the nodes reflect the closeness centrality scores (nodes with higher closeness centrality scores are in darker purple); the density of the lines ('edges') reflect the bilateral FDI flow (FDI stock values). Economies with higher betweenness centrality scores (bigger node sizes) tend to also have higher closeness centrality scores.

Source: APEC Policy Support Unit (PSU) analysis using Gephi software.

standard deviation. Among the five centrality measures, closeness centrality displays the least skewed distribution.

The top 20 economies based on their betweenness centrality scores in 2020 can be found in Table 2. China; India; Italy; Korea; the Netherlands; Singapore; Spain; Thailand; the UK; and the US consistently top the rankings, indicating that these economies hold central or hub positions in the FDI network. China leads the pack in terms of in-degree centrality with inward investment from 150 other economies. China is also the most 'central' economy in terms of closeness, i.e., it has the shortest network distances to the rest of the economies.

Toward the West, the Netherlands ranks highest in both betweenness centrality and eigenvector

centrality, implying that it plays an important transit or bridging role within the network and is connected to many important economies (or hubs). Six of the 20 most central economies are APEC economies: China; Korea; Russia; Singapore; Thailand and the US.

A simplified FDI network of the 21 APEC economies is shown in Figure 4 and a summary of their centrality measures is presented in Table 3. Among the APEC economies, China; the US; Singapore; Korea; and Thailand (in order of rank) remain in the top five in terms of both betweenness and closeness centrality. Indonesia and Viet Nam, which have secured increasingly large flows of investment in recent years, and are respectively the 8th and 9th biggest recipients of FDI inflows in APEC during 2018–2020, have maintained a rather modest degree of centrality.

Table 3. Centrality measures for APEC economies, FDI (stock) network, 2020

Economy	In-degree	Between-ness	Closeness	Eigenvector	Rank In-degree	Rank Between-ness	Rank Closeness	Rank Eigenvector
Australia	38	63.04	0.61	0.11	68	45	36	36
Brunei Darussalam	8	0.12	0.50	0.03	108	112	142	129
Canada	54	264.10	0.65	0.12	45	21	18	19
Chile	46	31.04	0.56	0.07	60	60	71	72
China	150	2002.36	0.79	0.15	1	2	1	2
Hong Kong, China	19	76.10	0.61	0.11	96	39	31	35
Indonesia	55	44.76	0.59	0.09	44	53	53	56
Japan	30	65.29	0.61	0.11	85	43	34	32
Korea	95	658.59	0.68	0.13	12	11	14	13
Malaysia	19	12.54	0.57	0.08	96	78	62	62
Mexico	92	210.92	0.63	0.11	13	25	22	28
New Zealand	18	5.88	0.55	0.06	100	93	83	83
Papua New Guinea	8	4.22	0.50	0.02	108	99	143	154
Peru	33	17.96	0.54	0.06	82	69	96	90
The Philippines	40	15.63	0.56	0.08	64	73	68	63
Russia	110	478.98	0.67	0.13	8	15	16	14
Singapore	112	1012.89	0.70	0.13	7	8	6	7
Chinese Taipei	28	35.91	0.56	0.08	87	58	71	68
Thailand	122	647.12	0.68	0.12	5	12	10	16
USA	86	1091.65	0.70	0.14	16	7	6	6
Viet Nam	36	19.07	0.55	0.07	73	66	79	75

Source: Calculated by author using Stata.

Table 4. Top five global value chain trades, 2015 and 1990, APEC (USD million)

Sector	2015			1990		
	Gross export	GVC trades	GVC share	Gross export	GVC trades	GVC share
5	561,319	195,607	34.85	74,683	23,276	31.17
8	673,999	367,113	54.47	77,508	33,727	43.51
9	2,458,088	1,202,446	48.92	413,052	168,951	40.90
10	639,049	241,381	37.77	134,915	39,368	29.18
21	675,775	206,637	30.58	102,874	24,811	24.12

Under sectors: 5=textiles and wearing apparel; 8=metal products; 9=electrical and machinery; 10=transport equipment; 21=financial intermediation and business activities.

Source: Calculated by author; data from F. Belotti, A. Borin and M. Mancini, "icio: Global Value Chains (GVC) and Value-added Trade Analysis in Stata," 2021, <http://www.tradeconomics.com/icio/>

GVC Trades in APEC

As noted earlier, GVC participation in APEC has reached 50 percent, compared to the global level of around 56 percent.

At the sectoral level, the five largest GVC trades (excluding petroleum and mining) occur in: textiles and wearing apparel; metal products; electrical and machinery; transport equipment; and financial

Table 5. Correlation of centrality measures: Trade and FDI networks

Centrality measures	Coefficient of correlation	
	Total trade and FDI	GVC trade and FDI
Betweenness	0.6857	0.7053
Closeness	0.8031	0.8039
Eigenvector	0.7736	0.7885

Source: Calculated by author using Stata.

intermediation and business activities. These sectors are also the five commodities with the largest gross export values. Among these sectors, metal products; electrical and machinery; and transport equipment demonstrate higher GVC participation rates (GVC share) than the rest. These sectors, with the exception of textiles, are considered to be mid- to high-tech sectors. Table 4 provides the value of GVC trades for each of the five products.

To explore the link between the FDI network and the trade network, we calculate the correlation between FDI centrality and trade centrality (Table 5). The two centrality measures (FDI and trade) show high correlation coefficients, ranging from 0.69 to 0.8. This could mean that economies that hold a central position in the FDI network will have a tendency to also be hubs in the global trade network. GVC participation does seem to attract investment in many emerging economies, but the relationship is by no means clear-cut since investment is highly dependent on broader regulatory and institutional frameworks.¹¹ Adarov, for example, suggests that while FDI centrality has contributed to the GVC centrality of economies, FDI centrality is more determined by statutory restrictions on FDI and tax offshore regulations.¹²

Case Studies: China; Indonesia; Viet Nam

As discussed, the developing economies of the East and Southeast Asia region have become popular FDI destinations in recent decades. This section zooms into three developing economies – China; Indonesia; Viet Nam – to explore their domestic economic structures and GVC participation patterns.

We chose China; Indonesia; and Viet Nam for three reasons. First, all three economies have adopted the export-oriented development model. They welcome FDI inflows to participate in GVCs and the wider international division of labour. Second, China; Indonesia; and Viet Nam differ substantially in economic size, and illustrate very different models of GVC participation. Third, the three economies began to participate in GVCs in different time periods and thus demonstrate varying patterns in GVC upgrading, serving as a significant reference for latecomers.

We started with a close look at their sectoral economic structures. Several representative manufacturing sectors – textiles, electronics and automobiles – were chosen to observe their GVC participation rates and positions. These sectors were also the main recipients of greenfield investment in manufacturing in 2019.¹³

Box 1. About the Ray skyline maps in Figures 5–7

The Ray skyline map generating tool is used to analyse an economy's self-sufficiency and industrial structure.

The pattern of a skyline (highlighted with a red line) is determined by the shape of all 44 tower buildings (sectors). Each of the towers represents one particular sector in the economy.

For simplicity, we first consider the shape of a single tower. The width of the building is determined by the output share of the industry in the domestic economy. The bigger the share in total output a sector has, the fatter the corresponding tower. The height of the building represents the self-sufficiency and import ratios.

There are two floors to each building: the top floor represents the amount of domestic output saved or displaced by imports (dark grey), while the bottom floor indicates the self-sufficiency level (light grey).

If a sector is self-sufficient, (i.e., able to fulfil all of the induced demand through its own domestic production), then the bottom floor is as high or taller than the 100 percent self-sufficiency line.

Conversely, if the domestic production capacity of a sector cannot meet domestic demand, and the sector has to import products from overseas, the bottom floor of the building would be below the 100 percent self-sufficiency line.

All 44 tower buildings (sectors) together make up the landscape of an economy's skyline chart. The contour of a skyline chart is an intuitive way to reveal the self-sufficiency level and sectoral structure of the economy.

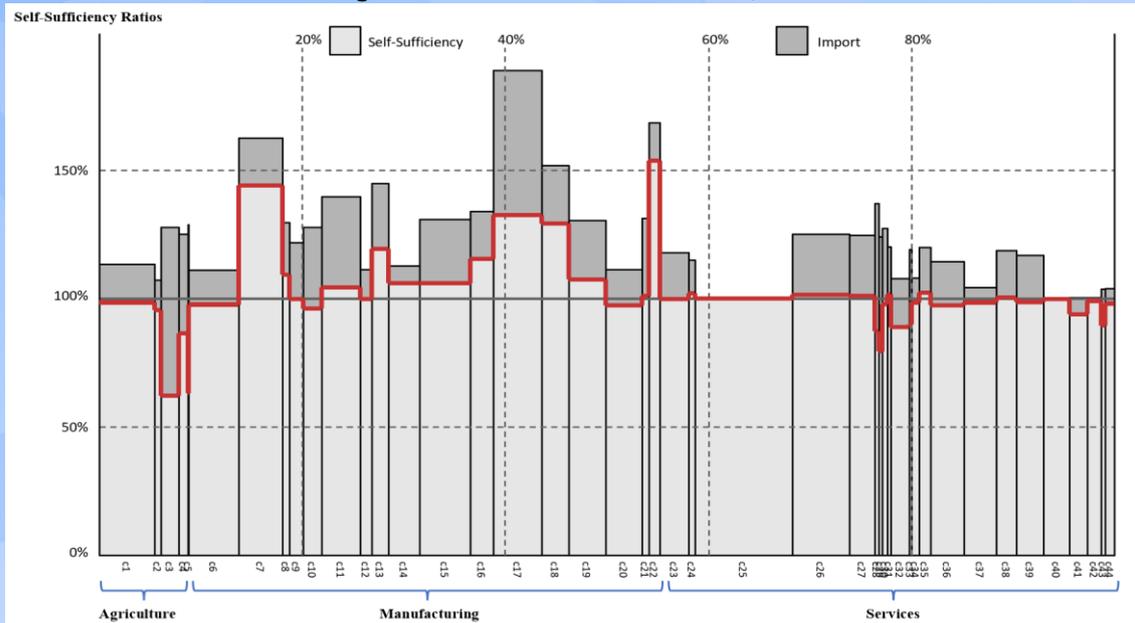
Source: Adapted from World Trade Organization (WTO) and IDE-JETRO, *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks* (WTO and IDE-JETRO, 2011), <https://www.wto-ilibrary.org/content/books/9789287045478>

¹¹ A. Ignatenko, F. Raei and B. Mircheva, "Global Value Chains: What Are the Benefits and Why Do Countries Participate?" (Working Paper WP/19/18, IMF, 2019), <https://www.annaignatenko.com/wp1918.pdf>.

¹² A. Adarov, "Interactions between Global Value Chains and Foreign Direct Investment: A Network Approach" (Working Paper 204, wiiw, 2021), <https://wiiw.ac.at/interactions-between-global-value-chains-and-foreign-direct-investment-a-network-approach-p-5876.html>

¹³ Manufacturing (excluding petroleum), electronics and automotive are the two largest contributors in 2019, with 15 percent of the greenfield FDI projects flowing to automotive and 13 percent to electronics. Textiles contributes around 6 percent and is also a major source of employment in the domestic economy. See: United Nations Conference on Trade and Development (UNCTAD), "World Investment Report," accessed 22 February 2022, <https://unctad.org/topic/investment/world-investment-report>

Figure 5. Sectoral structure of China, 2018



Source: Author's compilation using data from the OECD Input-Output Tables and Ray skyline map generating tool.

Sectoral economic structures

Using the Ray skyline map generating tool¹⁴ and data from the Input-Output Tables by the Organisation for Economic Co-operation and Development (OECD),¹⁵ we described the sectoral economic structures of China; Indonesia; and Viet Nam (Figures 5, 6 and 7). The names of each of the sectors (c1–c44) can be found in the Annex.

The skyline charts of the three economies share two significant similarities. First, their skylines (highlighted in red) are not flat. There is sizeable overproduction in several manufacturing sectors (indicated by the 'skyscrapers' being far higher than the 100 percent self-sufficiency line) and some under-production in other sectors (shown by the 'slumps' to below the 100 percent self-sufficiency line). For instance, the three economies all demonstrate a skyscraper in c7 (textiles), and by contrast, a slump in c20 (automobiles).

These skyscrapers and slumps are closely related to the nature of their export-driven development model. These economies specialise in and have built internationally competitive production capacity in key manufacturing sectors. At the same time, however, they lack self-sufficiency in sectors where they are heavily dependent on international suppliers.

Second, the sectoral structures of all three economies are generally dominated by manufacturing rather than agriculture or services. Regional production networks in their manufacturing sectors have provided an environment conducive to rapid industrial growth and the transformation of initially predominantly agricultural societies into modern industrial economies.

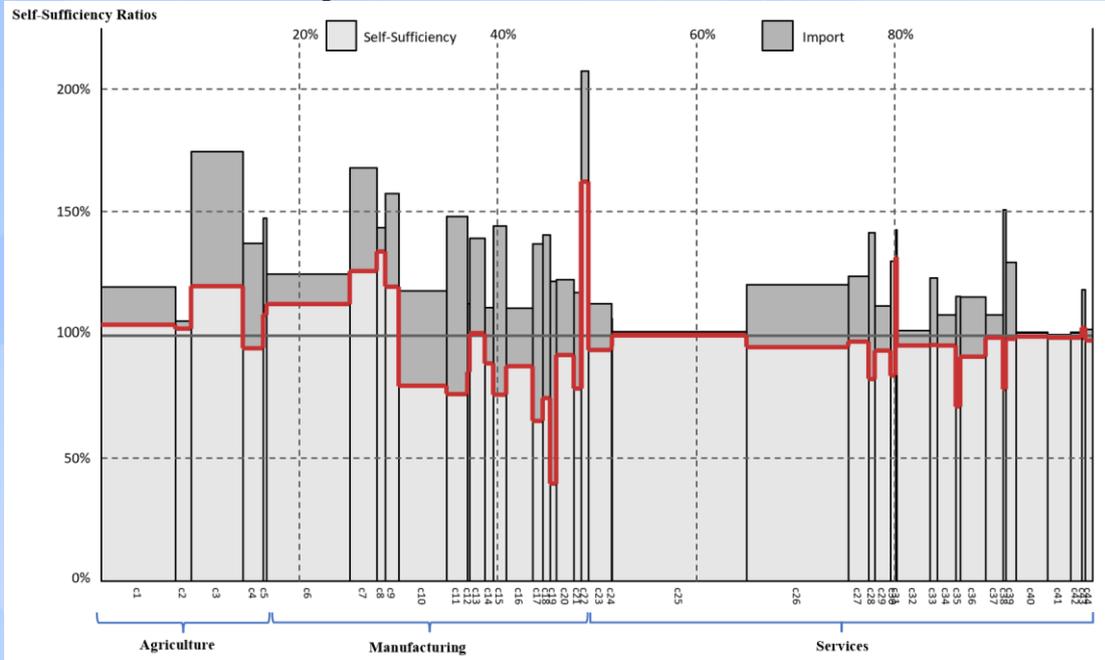
¹⁴ The skyline tool was developed by Uda. See: K. Uda, “スカイライン分析と分析用ツール『Ray』の紹介” [Skyline Analysis and Introduction to Skyline Map Generating Tool 'Ray'], *産業連関 [Input-Output Analysis]* 11, no. 2 (2003): 63–76, <http://doi.org/10.11107/papaios.11.63>; World Trade Organization (WTO) and IDE-JETRO, *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade*

in Tasks (WTO and IDE-JETRO, 2011), <https://www.wto-ilibrary.org/content/books/9789287045478>. An English explanation of the skyline methodology is provided in: Ministry of Economy, Trade and Industry, Japan, “White Paper on International Economy and Trade 2011,” 2011, <https://www.meti.go.jp/english/report/data/glT2011maine.html>.
¹⁵ OECD Input-Output Tables, accessed 18 February 2022, <https://www.oecd.org/sti/ind/input-outputtables.htm>

Along with the similarities, there are also distinct differences. China's industrial profiles in manufacturing and services are comprehensive: there is huge overproduction (exceeding self-sufficiency) in manufacturing, and very little over- or underproduction in services (even though there is

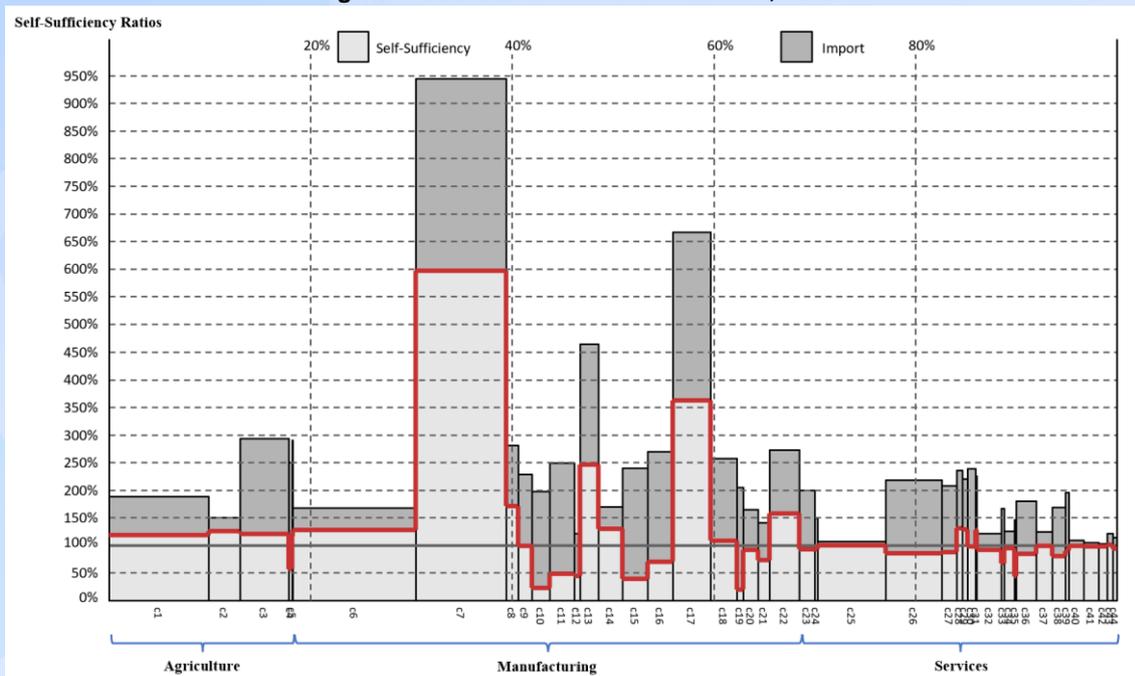
underproduction in agriculture). For instance, China's chart has two tall skyscrapers in textiles (c7) and electronic equipment (c17), indicating its strong production capacity and global competitiveness in these two manufacturing sectors.

Figure 6. Sectoral structure of Indonesia, 2018



Source: Author's compilation using the Ray skyline map generating tool and data from the OECD Input-Output Tables.

Figure 7. Sectoral structure of Viet Nam, 2018



Source: Author's compilation using the Ray skyline map generating tool and data from the OECD Input-Output Tables.

Comparatively, Indonesia’s economy appears less globalised and less competitive. On the one hand, Indonesia has been blessed with extensive endowment of commercialisable natural resources. Its economic structure portrays a strong oil and gas sector (see Figure 6, skyline for c3, which represents mining and quarrying, energy producing products), which may create vulnerability to fluctuations in the price of oil. Indeed, in times of low oil prices, the government had implemented major trade liberalisation reforms, recognising the urgency of diversifying its export base.¹⁶

Still, Indonesia seems to continue to have a rather weak profile in the overall manufacturing sectors. As Figure 6 shows, most of the advanced manufacturing industries show relatively low self-sufficiency. Where Indonesia is strong is in traditional industries such as food products (c6), textiles (c7), wood (c8) and paper products (c9).

Compared to China and Indonesia, Viet Nam has an unparalleled level of specialisation in textiles (see skyline of c7, Figure 7), with a self-sufficiency

ratio of over 550 percent. Viet Nam’s textile industry has developed strongly and played an essential role in the growth of the domestic economy.

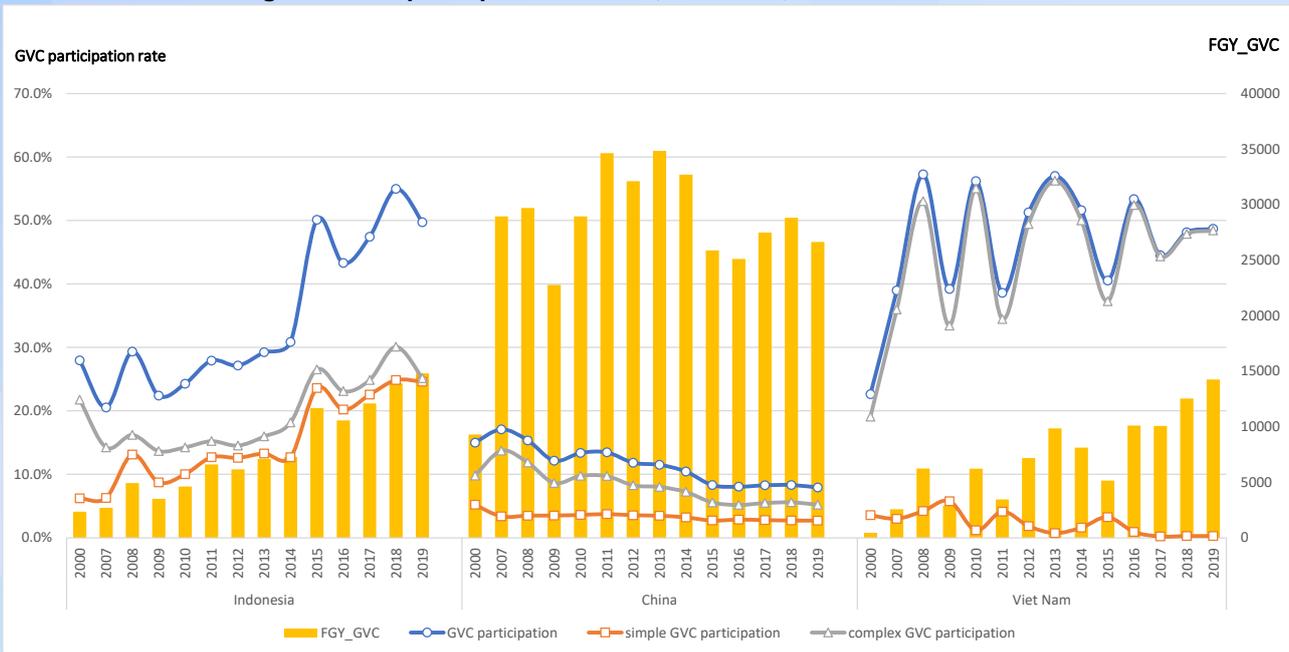
In sum, China; Indonesia; and Viet Nam have significant manufacturing activities, particularly in sectors such as textiles and electronics. Next, we explore their GVC participation rates in selected manufacturing sectors and the dynamics over time.

GVC participation in textiles, electronics and automobiles

In this section, we use backward GVC participation rates to measure the share of intermediate imports (including domestic and foreign value-added) in an economy’s final products.¹⁷ For example, if Viet Nam imports cloth from China for the production of final products such as T-shirts, then China is said to be engaging in backward GVC participation.

The backward GVC participation rate can be split into two categories: simple and complex. The simple GVC participation rate measures the level of cross-economy production sharing activities, i.e.,

Figure 8. GVC participation of China; Indonesia; and Viet Nam – textiles



Note: FGY_GVC refers to the absolute volume of GVC production activities, measured in million USD.

Source: Author’s compilation using the UIBE GVC indicator database, accessed 19 January 2022, http://rigvc.uibe.edu.cn/english/D_E/database_database/index.htm

¹⁶ D. Vanzetti, G. McGuire and Prabowo, “Trade Policy at the Crossroads: The Indonesian Story” (Policy Issues in International Trade and Commodities Study Series 28, UNCTAD, 2005), https://unctad.org/system/files/official-document/itcdtab29_en.pdf

¹⁷ See Z. Wang et al., “Measures of Participation in Global Value Chains and Global Business Cycles” (Working Paper 23222, NBER, 2017).

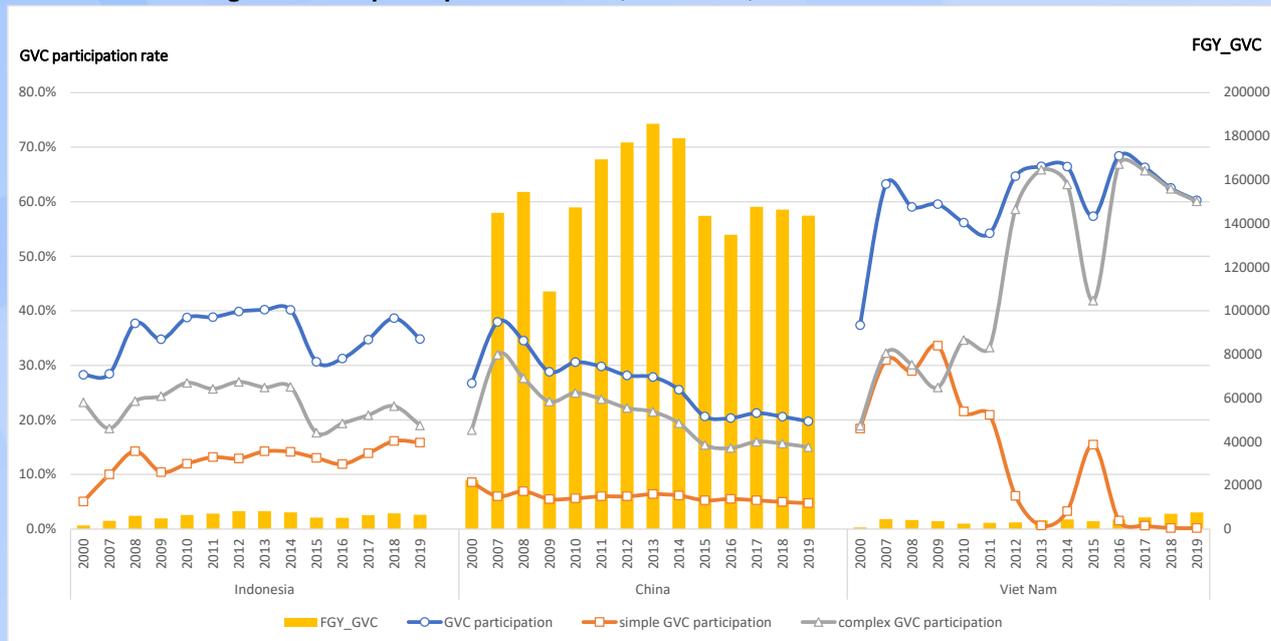
the value-added embodied in intermediate goods exports that are directly absorbed by the importer. The complex GVC participation rate measures the level of complex cross-economy production sharing activities, that is, activities involving at least two border crossings.

Figures 8, 9, and 10 compare the GVC participation rates (total, simple and complex) of China;

Indonesia; and Viet Nam in the textile, electronic and automobile sectors.

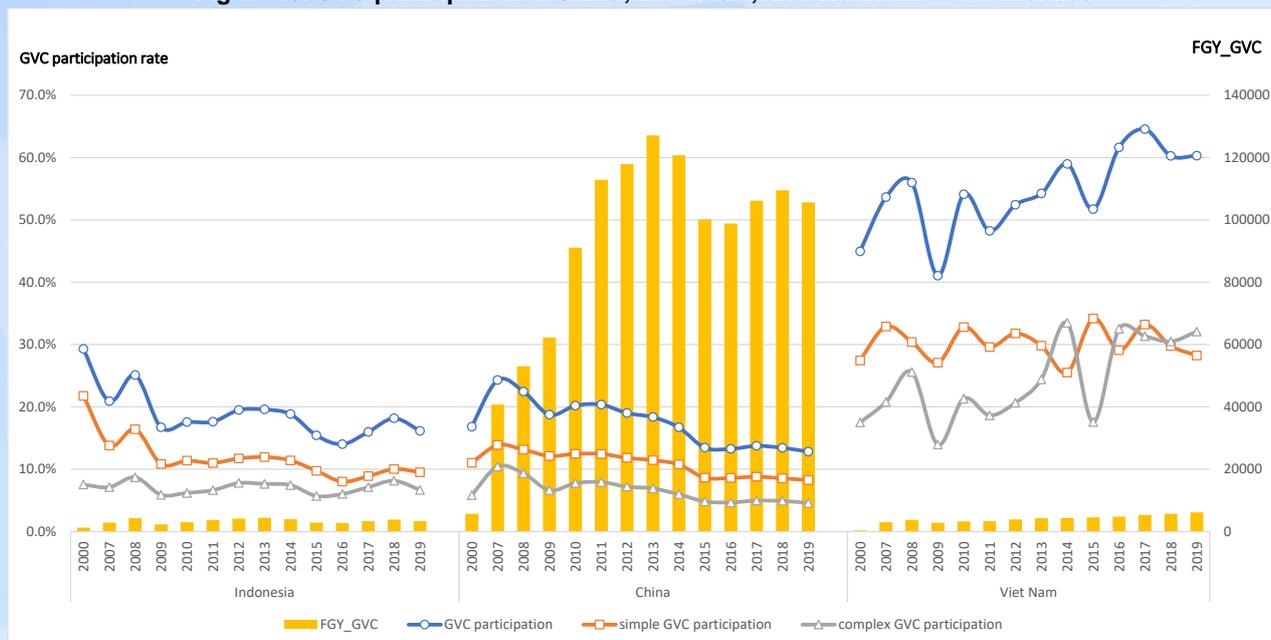
In the textile sector, with an almost 140 percent self-sufficiency ratio, China demonstrates the lowest level of GVC participation, probably due to its comprehensive manufacturing structure. In contrast, both Indonesia and Viet Nam have much higher GVC participation rates. While Indonesia's

Figure 9. GVC participation of China; Indonesia; and Viet Nam – electronics



Source: Author's compilation using the UIBE GVC indicator database, accessed 19 January 2022, http://rigvc.uibe.edu.cn/english/D_E/database_database/index.htm

Figure 10. GVC participation of China; Indonesia; and Viet Nam – automobiles



Source: Author's compilation using the UIBE GVC indicator database, accessed 19 January 2022, http://rigvc.uibe.edu.cn/english/D_E/database_database/index.htm

simple GVC participation is very similar to its complex GVC participation, Viet Nam is much more active in complex GVC participation.

In the electronics sector, China and Indonesia have very similar levels of total, simple and complex GVC participation. The nominal value of China's electronics industry is far beyond the other two economies, pointing to its important role as a global hub. In comparison, Viet Nam is the most active GVC participant.

It is worth noting that, before 2008, Viet Nam was involved in both simple and complex production activities. But, after 2008, its simple GVC participation rate significantly dropped while its complex GVC participation rate rose sharply. This drastic change indicates the evolving role of Viet Nam in the GVC of electronics.

In the automobile sector, China and Indonesia have relatively low levels of total, simple and complex GVC participation, while Viet Nam has a very high GVC participation rate that is supported by an increasing GVC trade.

Variations in economic size and self-sufficiency levels may have influenced GVC participation in the three economies. Due to its size and its self-sufficiency in production capacity, China may have had a lower GVC participation rate compared to many other economies. As Indonesia's manufacturing profile is less comprehensive, it needs to be more integrated into global production networks. Viet Nam is well integrated with global production networks. Its high GVC participation rate matches to a great extent its heavy dependence on global sourcing. Further research is required to better comprehend these phenomena.

GVC upgrading in textiles, electronics and automobiles

GVC participation has provided new ways for developing economies to achieve industrialisation and economic upgrading. According to UNCTAD, GVCs can be an important avenue for developing economies to build productive capacity, including through technology dissemination and skill

building, thus opening up opportunities for longer-term industrial upgrading.¹⁸

GVCs tend to add more value upstream, in activities such as product design, R&D and the production of advanced parts and components, as well as downstream, through activities such as marketing and branding.¹⁹ In other words, having a GVC position nearer to the beginning of the production process may have the advantage of securing higher value-added shares as well as improving technological sophistication.

Developing economies in East Asia have been particularly enthusiastic about the upgrading prospects of integrating into GVCs. For instance, advanced economies in the region are generally located upstream in high-tech manufacturing, whereas the region's emerging market economies are generally located downstream. This echoes the development discourse on the 'East Asian Miracle'.

Most of the developing economies of East Asia started with specialising in labour-intensive manufacturing assembly operations, before gradually moving up the value chain (such as material and parts procurement, R&D) to achieve industrial upgrading.

To measure upgrading within the GVCs of China; Indonesia; and Viet Nam, we adopt the GVC positioning index. The index, proposed by Wang et al., measures relative 'upstreamness', accounting for both forward and backward linkage-based production length measures.²⁰ The higher the value of the index, the relatively more upstream is the economic sector.

Analysing changes in the index over time provides insights into the evolution of each economy's role and position along a particular production chain, as shown in Table 6.

We first examine the textile sector. The GVC position indexes of all three economies for this sector are relatively low compared to other sectors, indicating that their positions remain relatively downstream. This tallies with the reality that the developing economies of China and Southeast Asia have developed internationally competitive

¹⁸ UNCTAD, "Global Value Chains and Development: Investment and Value-added Trade in the Global Economy" (UNCTAD, 2013), https://unctad.org/system/files/official-document/diae2013d1_en.pdf

¹⁹ Organisation for Economic Co-operation and Development (OECD), "Interconnected Economies: Benefiting from Global Value Chains" (Meeting of the OECD Council at Ministerial

Level, Paris, 29–30 May 2013), [https://www.oecd.org/mcm/C-MIN\(2013\)15-ENG.pdf](https://www.oecd.org/mcm/C-MIN(2013)15-ENG.pdf)

²⁰ Z. Wang et al., "Characterizing Global Value Chains: Production Length and Upstreamness" (Working Paper 23261, NBER, 2017).

Table 6. The GVC positions of China; Indonesia; and Viet Nam in GVC – textiles, electronics and automobiles

Year	Textiles			Electronics			Automobiles		
	China	Indonesia	Viet Nam	China	Indonesia	Viet Nam	China	Indonesia	Viet Nam
2000	0.78	0.78	0.81	0.85	0.84	1.07	0.95	0.90	1.23
2007	0.73	0.76	0.78	0.84	0.85	0.87	0.84	0.86	0.74
2008	0.75	0.75	0.83	0.84	0.85	0.87	0.81	0.85	0.73
2009	0.79	0.76	0.82	0.82	0.85	0.93	0.85	0.87	0.72
2010	0.75	0.75	0.82	0.82	0.85	0.87	0.84	0.88	0.81
2011	0.74	0.76	0.81	0.82	0.86	0.86	0.82	0.90	0.78
2012	0.76	0.75	0.80	0.82	0.83	0.87	0.81	0.86	0.78
2013	0.76	0.74	0.76	0.83	0.84	0.88	0.82	0.86	0.76
2014	0.73	0.73	0.75	0.81	0.83	0.89	0.81	0.80	0.78
2015	0.77	0.78	0.79	0.84	0.85	0.88	0.82	0.85	0.77
2016	0.77	0.77	0.77	0.85	0.84	0.91	0.81	0.80	0.78
2017	0.77	0.80	0.73	0.85	0.85	0.90	0.81	0.81	0.81
2018	0.77	0.85	0.80	0.86	0.82	0.88	0.87	0.83	0.79
2019	0.71	0.88	0.80	0.89	0.84	0.89	0.76	0.86	0.76
2020	0.70	0.86	0.79	0.90	0.84	0.86	0.72	0.83	0.77

Source: Author's compilation using the GVC positioning index and data from Asian Development Bank Multiregional Input-Output (ADB-MRIO) Tables, accessed 1 March 2022, <https://mrio.adbx.online/>

manufacturing capabilities by specialising in low-cost final assembly work.

In the electronics sector, the GVC position index of China increased mildly from 0.85 to 0.90, indicating some upstream movement. Indonesia's index figures remain largely unchanged at around 0.84, indicating limited progress in GVC upgrading. Viet Nam's pattern is more dynamic, with its GVC position index decreasing from 1.07 to 0.86. This lines up with Viet Nam emerging as an important electronics assembler.

In the automobile sector, the past two decades have witnessed a significant fall in the GVC positioning indexes of all three economies. This indicates that all three economies moved downstream. The automobile sector occupies a significant portion in all three economies due to its extensive upstream and downstream linkages to a broad range of sectors. But, compared with light industries (textiles and electronics), the automobile sector is more difficult to develop because its international competitiveness is heavily influenced by technological capability. Given the difficulties of upgrading, moving downstream is probably a more practical way for these developing economies to develop industrial production and capacity.

Overall, the evolving GVC positions of China; Indonesia; and Viet Nam demonstrate their varying performance in economic upgrading. Sectoral patterns also show substantial differences. The textile and electronics sectors saw more dynamic changes, while the automobile sector was more technology-intensive and therefore more path-dependent.

A further contribution to research on upstreaming comes from Ignatenko et al., who suggest that a better indicator is to track the share of high-tech exports in value-added exports over time.²¹ They further argue that while finance and business services are typically upstream and high-valued activities, the situation is less clear with manufacturing. For example, with the acquisition of IBM's personal computer (PC) division, Lenovo was able to develop its R&D capabilities, including the ThinkPad brand.²² IBM on its part evolved from a manufacturer of PCs to a provider of technology and consulting services. Another example is that of Li Fung, an intermediary for consumer goods based in Hong Kong, China, which converted from a supply chain management firm to a marketing and branding firm after acquiring product development services.²³ Hence, the upgrading path could be

²¹ Ignatenko et al., "Global Value Chains: What Are the Benefits and Why Do Countries Participate?"

²² OECD, "Interconnected Economies."

²³ OECD, "Interconnected Economies."

Table 7. Firms' performance, based on their exporter and ownership type

Firm type	Real annual sales growth (%)			Annual employment growth (%)			Real annual labour productivity growth (%)		
	PRC	INA	VN	PRC	INA	VN	PRC	INA	VN
Direct exports*	5.2	0.9	6.5	9.4	4.3	8.1	-3.6	-2.9	-2.6
Non-exporter	5.4	-0.5	-1.6	9	0.3	5.3	-3.3	-0.6	-6.2
Domestic	5.3	-0.5	-1.1	9	0.5	5.5	-3.4	-0.9	-6
Foreign ownership**	8.6	3.5	6	10.5	0.6	6.7	-1.7	3.5	-0.8

PRC=China (data for 2012); INA=Indonesia (data for 2015); VN=Viet Nam (data for 2015)

Note: * Direct exports are 10% or more of sales; ** 10% or more foreign ownership.

Source: World Bank Enterprise Surveys, accessed 22 February 2022, <https://www.enterprisesurveys.org/en/enterprisesurveys>

achieved through upstream as well as downstream activities.

Performance of Firms

In this section, we will look at the performance of firms, disaggregated by their exporting and FDI characteristics using data from the World Bank Enterprise Survey (Table 7). In Indonesia, firms with 10 percent or more foreign ownership performed strongly in terms of annual sales and productivity growth. Further, export-oriented firms have significantly higher employment growth compared to non-exporter and domestic firms.

In Viet Nam, firms that are more involved in exports and have 10 percent or more foreign ownership performed strongly in sales and employment. Similar results are observed in China. FDI- and export-oriented firms performed relatively better in employment and sales growth compared to their domestic and non-exporter counterparts (albeit with weaker impact). It is worth emphasising that the productivity impact of firms with foreign ownership is strongest in Indonesia, with these FDI-linked firms experiencing a 3.5 percent real annual productivity growth.

Conclusion

APEC is home to global trade and investment hubs. This brings opportunities for firms to reap the benefits of GVCs and FDI. The three economies discussed in this policy brief have significant levels of GVC participation, with differing levels of development and domestic economic structure. Due to its size and its self-sufficiency in production capacity, China may have had a lower GVC participation rate while Viet Nam is well integrated into global production networks. The nature of their participation and position in GVCs is also different, which also has an influence on the trajectory of their development. For example, moving downstream, (rather than moving up) could be a more practical

way for developing economies to develop industrial production and capacity. As discussed earlier, the automobile sector is more difficult to develop because its international competitiveness is heavily influenced by technological capability.

Also, some evidence suggests that firms that are more export-oriented and involved in the FDI network will have better performance in terms of sales, employment and productivity. Moreover, FDI plays an important role since such investment brings together the capital, skills, know-how and innovation needed to win the competition in the global market – though there may be concerns over 'hollowing out' risks for the domestic industry.

The majority of FDIs are carried out by multinational enterprises through mergers and acquisitions (M&As) and greenfield investments. These multinational enterprises often supplement their exports by producing through their subsidiaries abroad, resulting in an increasing contribution to world trade. FDI involvement in the domestic production of the host economy creates the basis of global production networks: local firms act as suppliers and at times build strategic alliances with multinational enterprises. Increased interactions with multinational enterprises may also increase the likelihood of domestic firms becoming direct exporters. The role of FDI in the growth of GVCs highlight the importance of FDI to developing economies as they pursue export-oriented development strategies.

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Annex. The sectoral categorisations of the OECD Input-Output Tables

Agriculture		Services	
c1	Agriculture, hunting, forestry	c23	Electricity, gas, steam and air conditioning supply
c2	Fishing and aquaculture	c24	Water supply; sewerage, waste management and remediation activities
c3	Mining and quarrying, energy producing products	c25	Construction
c4	Mining and quarrying, non-energy producing products	c26	Wholesale and retail trade; repair of motor vehicles
c5	Mining support service activities	c27	Land transport and transport via pipelines
Manufacturing		c28	Water transport
c6	Food products, beverages and tobacco	c29	Air transport
c7	Textiles, textile products, leather and footwear	c30	Warehousing and support activities for transportation
c8	Wood and products of wood and cork	c31	Postal and courier activities
c9	Paper products and printing	c32	Accommodation and food service activities
c10	Coke and refined petroleum products	c33	Publishing, audiovisual and broadcasting activities
c11	Chemical and chemical products	c34	Telecommunications
c12	Pharmaceuticals, medicinal chemical and botanical products	c35	IT and other information services
c13	Rubber and plastics products	c36	Financial and insurance activities
c14	Other non-metallic mineral products	c37	Real estate activities
c15	Basic metals	c38	Professional, scientific and technical activities
c16	Fabricated metal products	c39	Administrative and support services
c17	Computer, electronic and optical equipment	c40	Public administration and defence; compulsory social security
c18	Electrical equipment	c41	Education
c19	Machinery and equipment, nec	c42	Human health and social work activities
c20	Motor vehicles, trailers and semi-trailers	c43	Arts, entertainment and recreation
c21	Other transport equipment	c44	Other service activities
c22	Manufacturing nec; repair and installation of machinery and equipment		

Source: OECD Input-Output Tables, accessed 18 February 2022, <https://www.oecd.org/sti/ind/input-outputtables.htm>