

Global and Regional Value Chain Landscape in Asia

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Structure of the Chapter

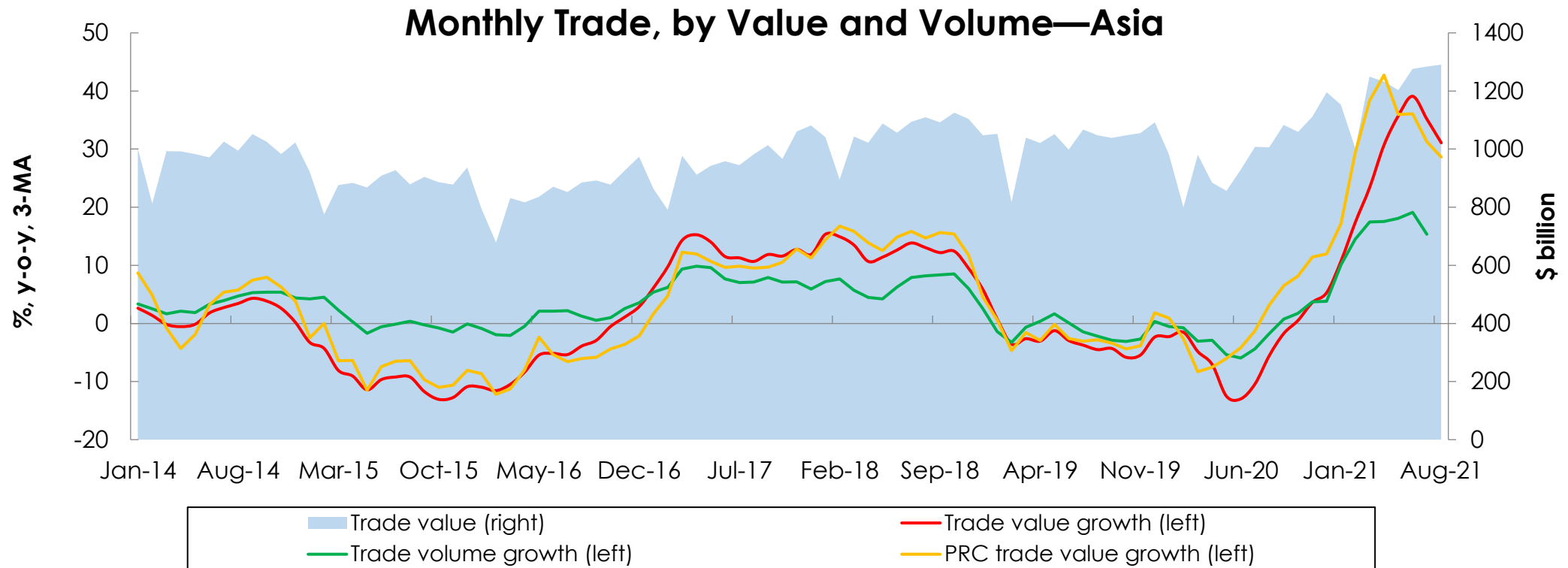
- Recent Trends in Trade Growth
- Progress in GVC and RVC
- Impact of Reshoring
- Challenges in the Semiconductor Supply Chains



Recent Trends in Trade Growth



Asia's merchandise trade recovered faster than expected in 2020 and during the first half of 2021



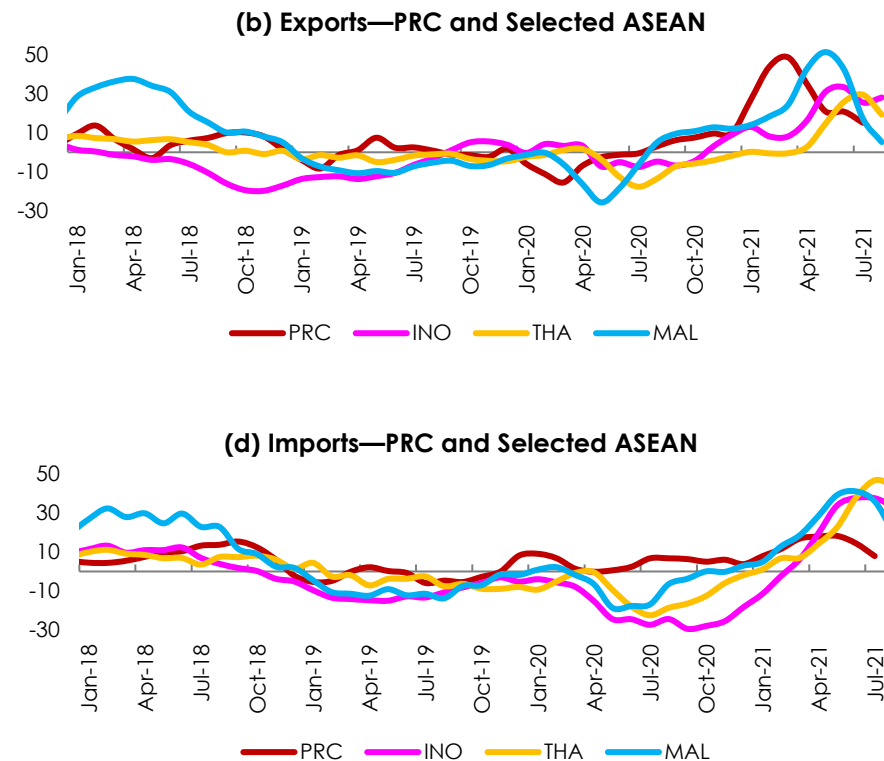
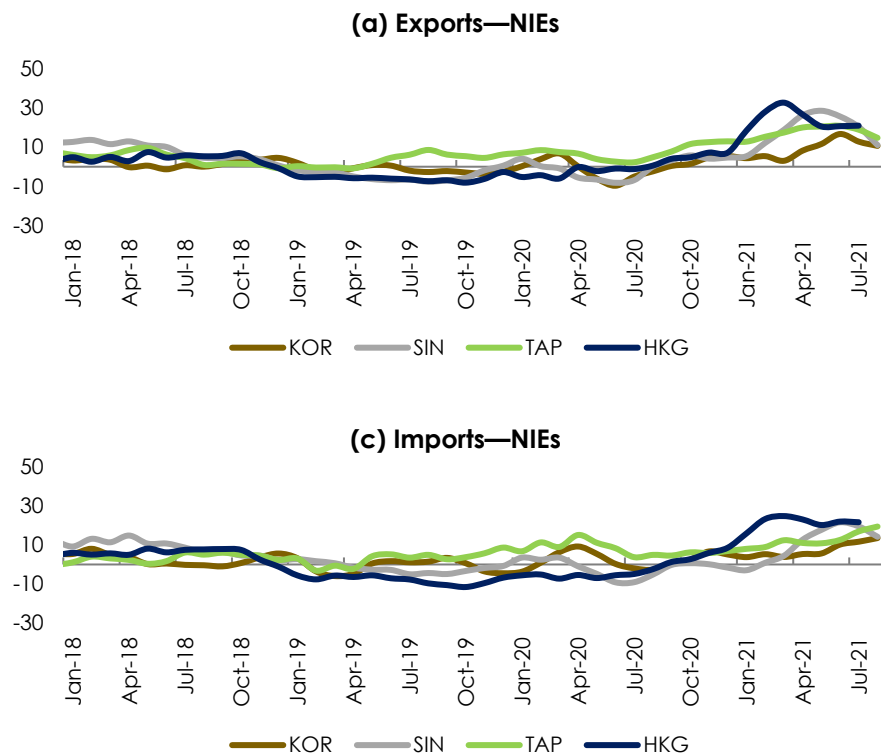
y-o-y = year-on-year, mo = month, MA = moving average

Notes: Trade volume growth rates were computed using volume indexes. For each period and trade flow type (i.e., imports and exports), available data include indexes for Japan and the People's Republic of China, and aggregate indices for selected Asian countries, namely, (i) Advanced economies excluding Japan, which include Hong Kong, China; ; the Republic of Korea; Singapore; and Taipei, China; and (ii) Emerging economies excluding PRC, which include India; Indonesia; Malaysia; Pakistan; the Philippines; Thailand; and Viet Nam. To come up with an index for Asia, trade values were used as weights for the computations. On the other hand, trade value levels and growth rates were computed by aggregating import and export values of the same Asian economies.

Sources: ADB calculations using data from CEIC; and CPB Netherlands Bureau for Economic Policy Analysis. World Trade Monitor. <https://www.cpb.nl/en/world-trade-monitor-july-2021> (accessed October 2021).

The timing of trade recovery has been varied among Asian economies

Monthly Trade Volume Growth – NIEs, PRC, and Selected ASEAN (% , y-o-y)



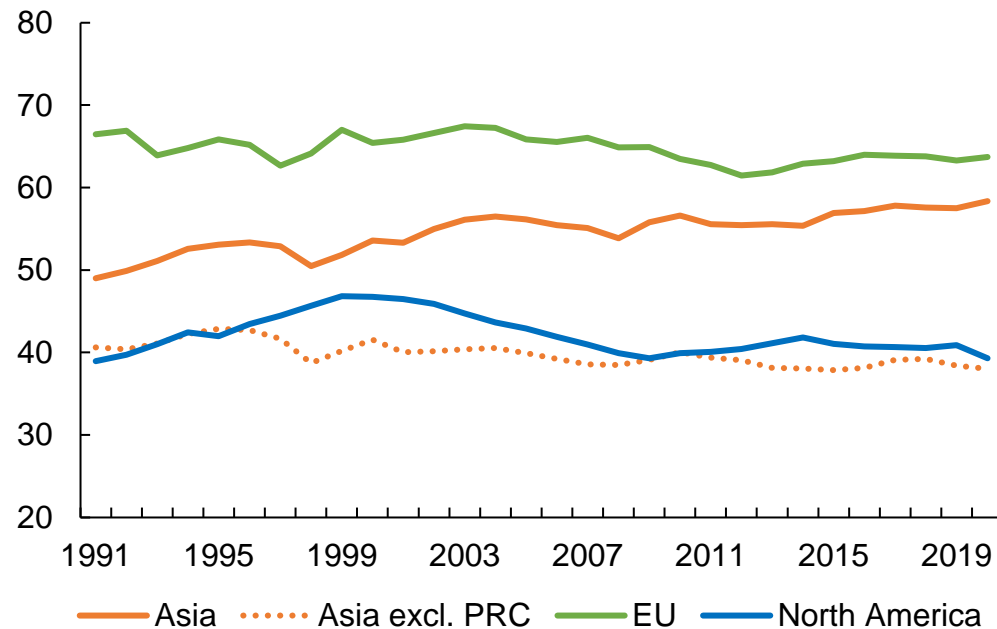
y-o-y = year-on-year.

Notes: Latest data is July 2021 for all economies, except HKG and PRC (June 2021). Data for the PRC refers to the export and import volume index from CPB Netherlands Bureau for Economic Policy Analysis. For the rest, export and import volume is computed by deflating export and import values by their corresponding price indexes.

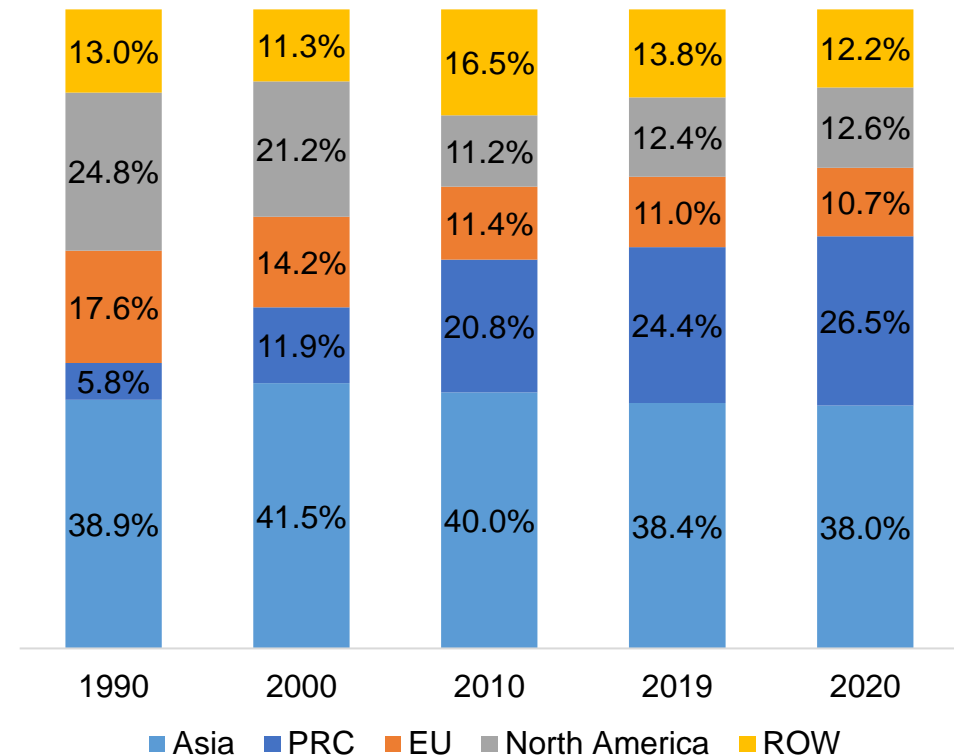
Source: ADB calculations using data from CPB Netherlands Bureau for Economic Policy Analysis. World Trade Monitor. <https://www.cpb.nl/en/world-trade-monitor-july-2021>; and Haver Analytics (accessed October 2021).

Asia intraregional ties grew stronger mainly from trade linkages with PRC

Intraregional Trade Shares—Asia, European Union, and North America (%)



Asia (ex. PRC)'s trade share with Other Economies



EU = European Union, PRC = People's Republic of China.

Notes: Values expressed as percentage of the region's total merchandise trade (sum of exports and imports). EU refers to the aggregate of 28 members including UK. North America covers Canada, Mexico, and the United States. As of 1 February 2020, the UK has withdrawn from the EU. During the transition period that ended on 31 December 2020, the EU law, remained applicable to and in the UK, with a few limited exceptions. Thus, for 2020, the information on the EU unless otherwise specified, continues to cover the UK.

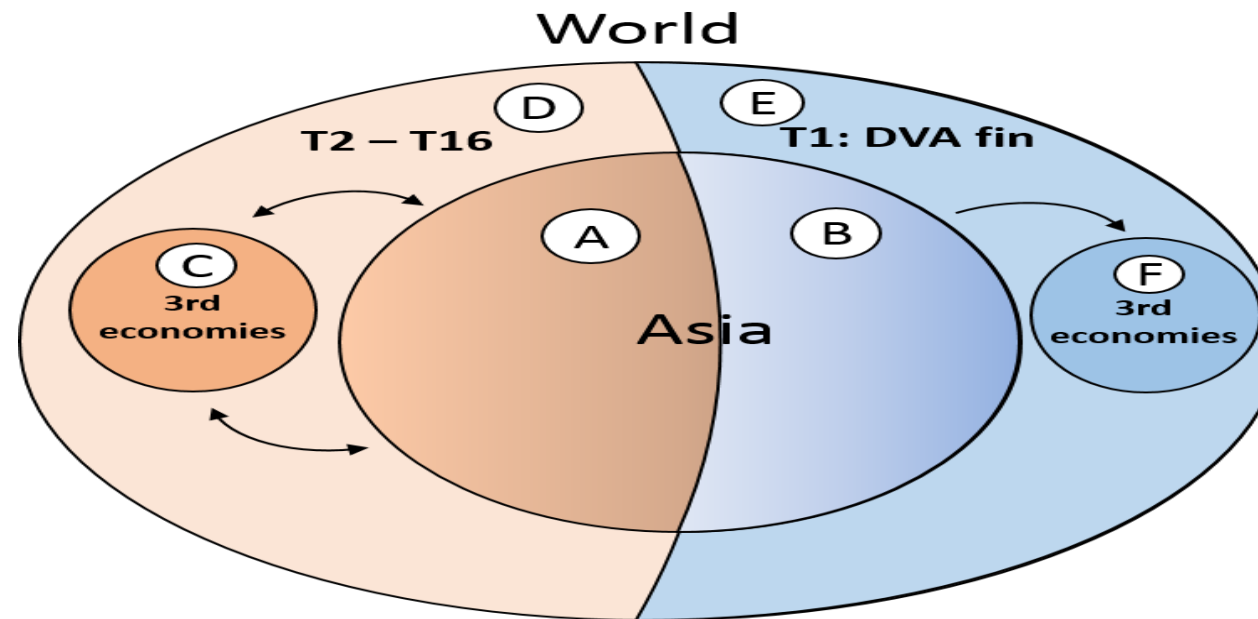
Source: ADB calculations using data from International Monetary Fund. Direction of Trade Statistics. <https://www.imf.org/en/Data> (accessed October 2021).

Progress in GVC and RVC in Asia



Analytical Framework

GVC and RVC Participation—Asia and World



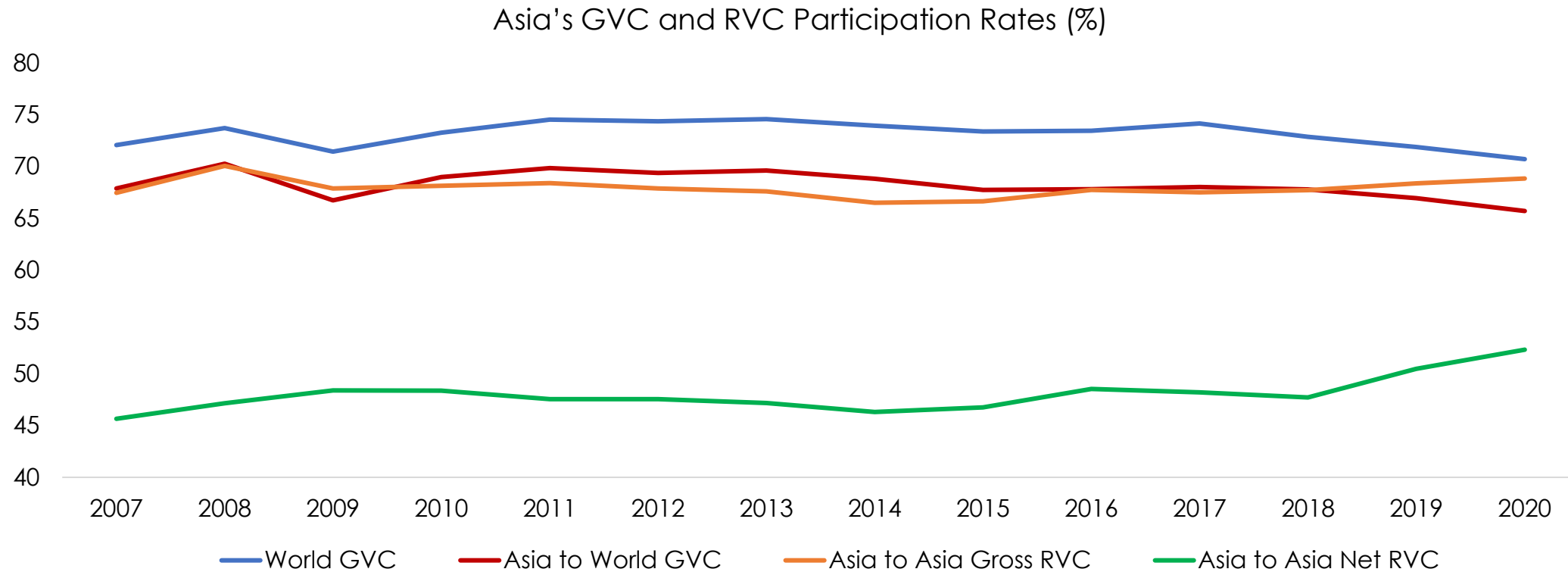
(1)	World to World GVC	=	$\frac{A+C+D}{A+B+C+D+E+F}$
(2)	Asia to World GVC	=	$\frac{A+C}{A+B+C+F}$
(3)	Asia to Asia Gross RVC	=	$\frac{A}{A+B}$
(4)	Asia to Asia Net RVC	=	$\frac{A}{A+B+C}$

GVC = global value chain, RVC = regional value chain.

Note: Preliminary estimates. The GVC participation rate is the share of gross exports that involves production in at least two countries using cross-border production networks. The RVC participation rate, on the other hand, is the same as that of GVC, except that it only involves countries of the same region. Both complex GVC and RVC participation includes only part of the gross exports that have crossed borders twice or more.

Sources: ADB calculations using data from 2010–2017 ADB Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2014).

Asia's global value chain linkages shrank while regional value chain ties deepened in 2020

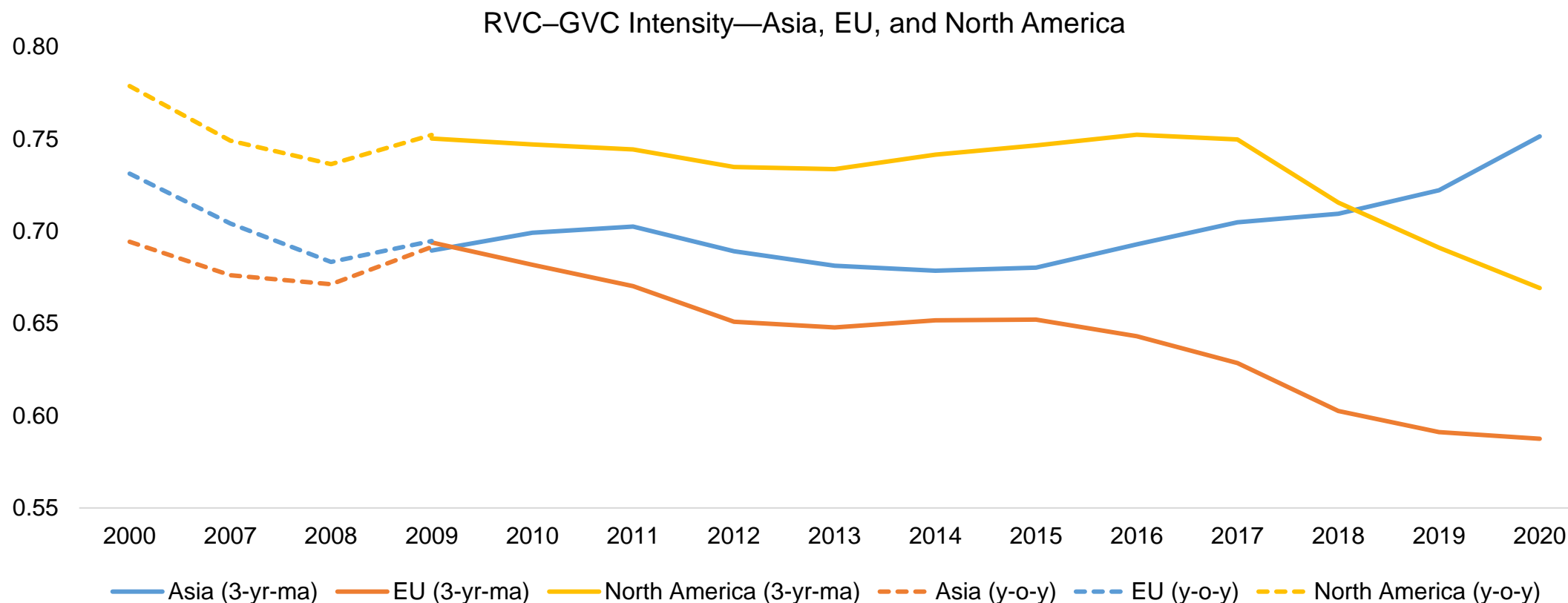


GVC = global value chain, RVC = regional value chain, y-o-y = year-on-year.

Notes: The GVC participation rate is the share of gross exports that involves production in at least two countries using cross-border production networks. The RVC participation rate, on the other hand, is the same as that of GVC, except that it only involves countries of the same region.

Sources: ADB calculations using data from ADB. Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2013, revised 2018).

Widening the gap with EU and NA

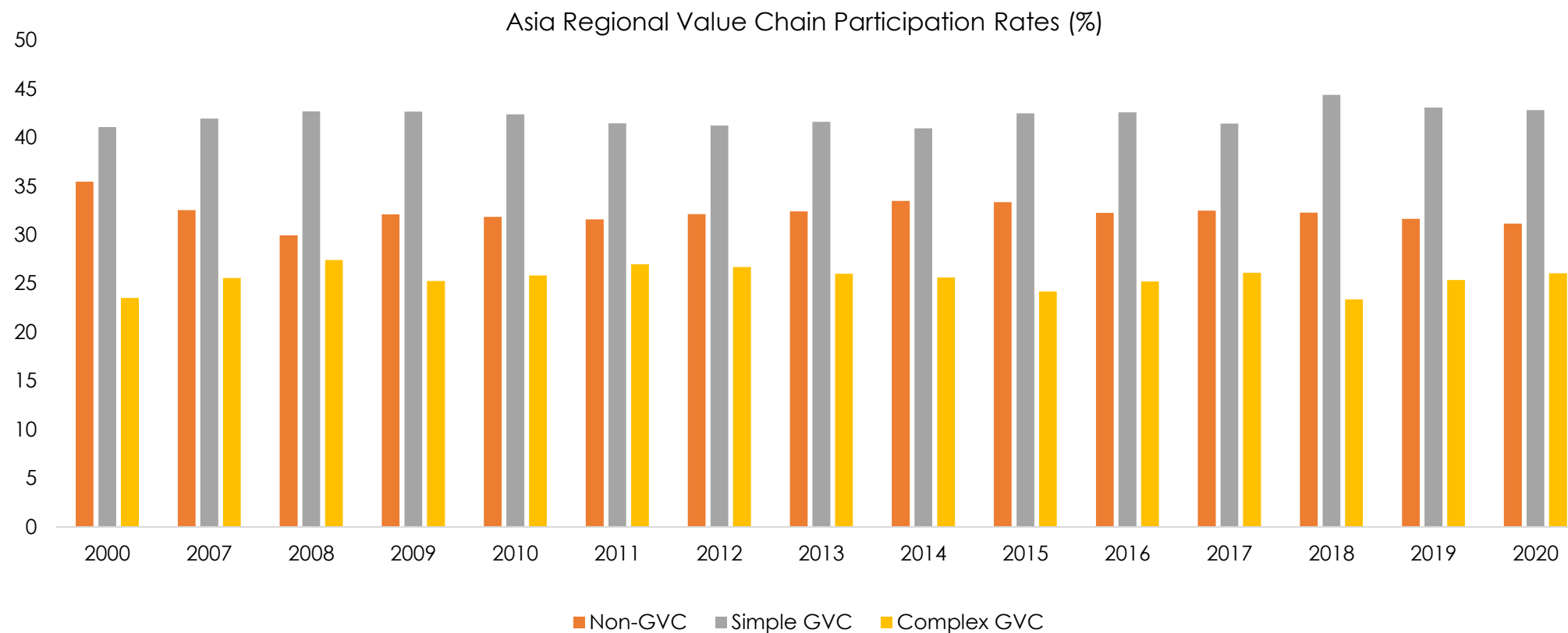


3-yr-ma = 3-year moving average, EU = European Union, GVC = global value chain, RVC = regional value chain, y-o-y = year-on-year.

Note: Notes: RVC–GVC intensity is the ratio of RVC participation and GVC participation rates. The EU refers to the aggregate of 28 members including the United Kingdom. North America consists of United States, Canada, and Mexico.

Sources: ADB calculations using data from ADB Multi-Regional Input-Output Tables (version 2021); and methodology by Wang, Wei, and Zhu (2013, revised 2018).

Asia's recent deepening RVC is more driven by rising complex value chain linkages



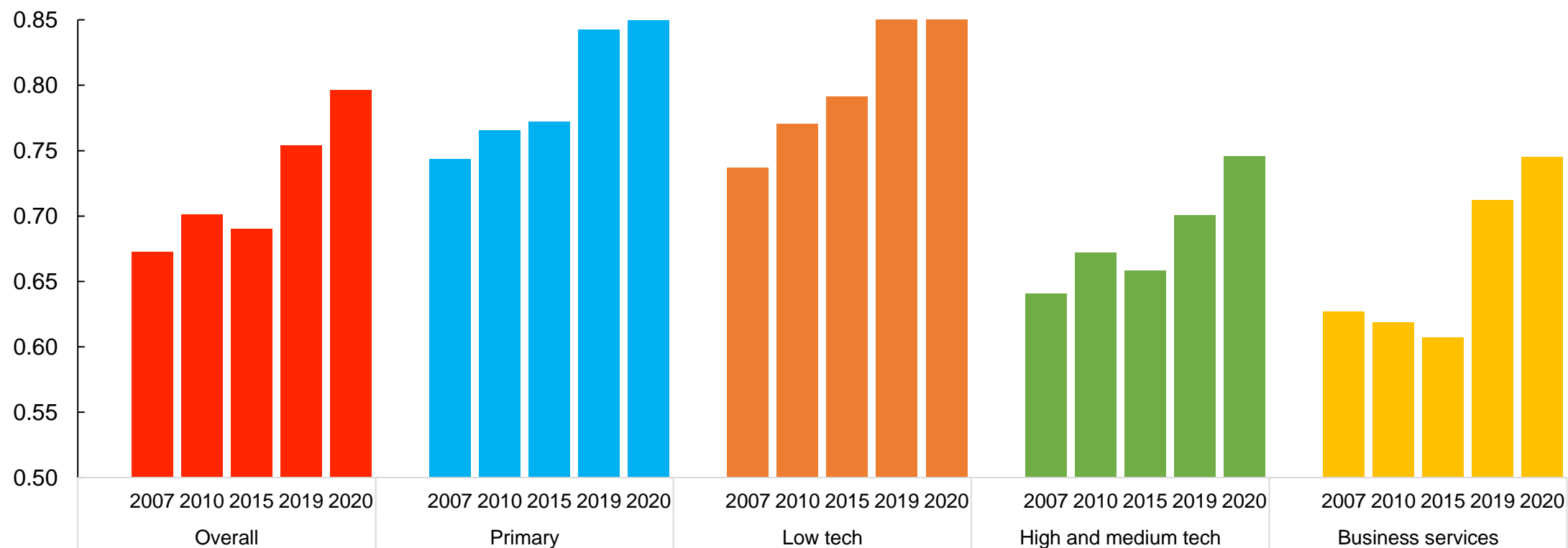
GVC = global value chains; RVC = regional value chains

Notes: Gross RVC participation is the share of Asia's intraregional value chain exports to its intraregional gross exports but excluding all non-Asian third economies in gross exports. Non-GVC refers to final goods exports. Simple GVCs are intermediate goods exports that cross borders only once or absorbed by the direct importer economy. Complex GVCs are intermediate exports that cross borders at least twice.

Sources: ADB calculations using data from ADB, Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2013, revised 2018).

Also more pronounced in high to medium technology and business services sectors

RVC-GVC Intensity – Major Sectors in Asia

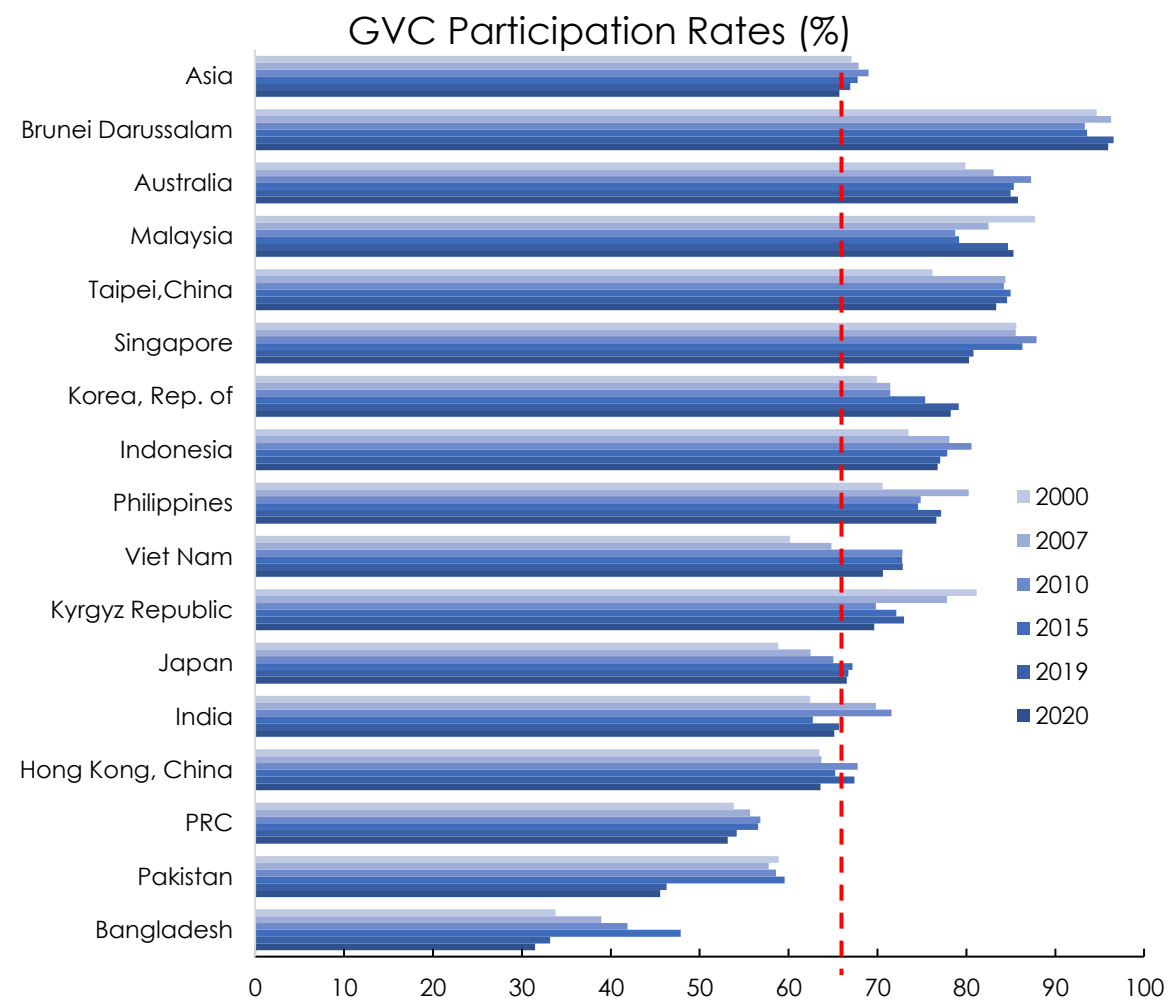
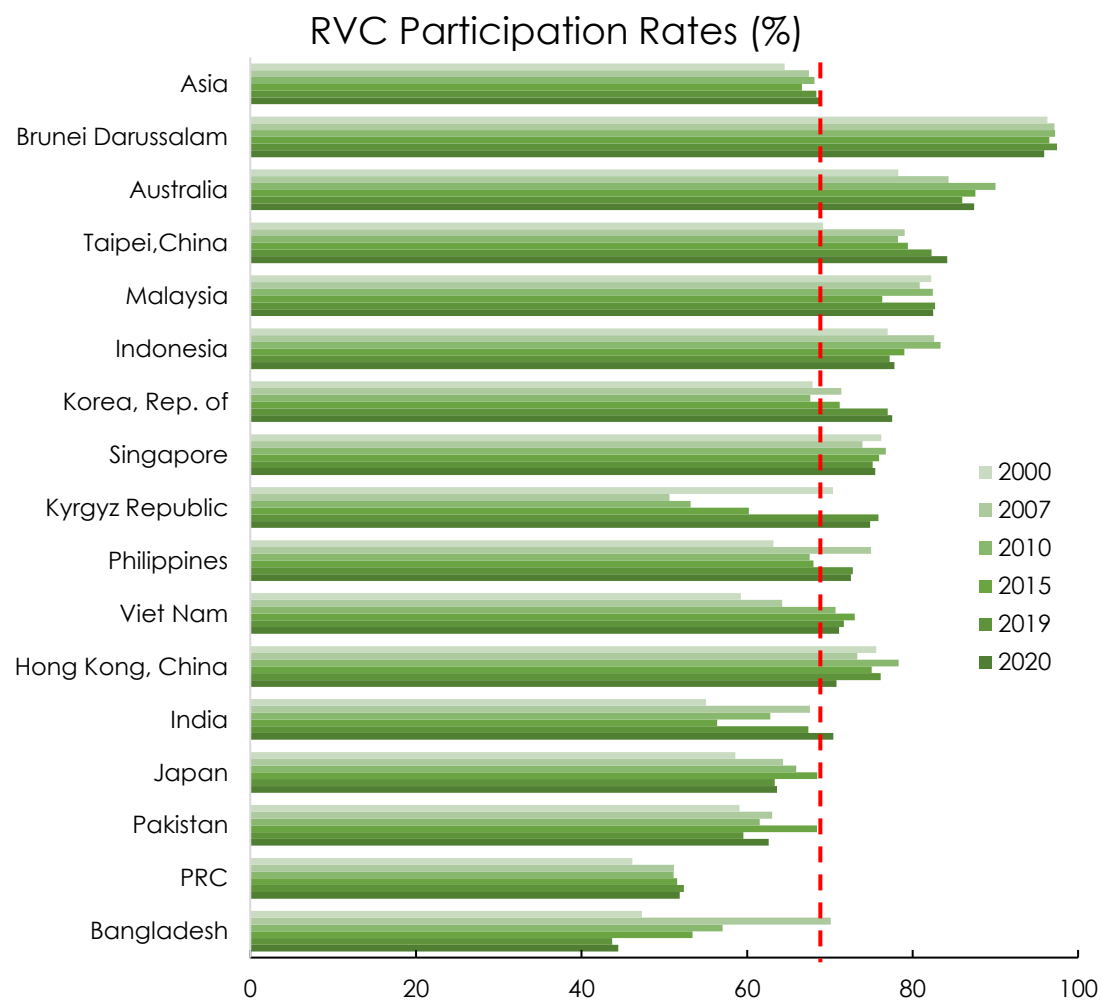


GVC = global value chain, RVC = regional value chain.

Notes: Sectoral classification is based on ADB (2015). Business services includes personal and public services.

Sources: ADB calculations using data from ADB Multi-Regional Input-Output Tables (version 2021); and methodology by Wang, Wei, and Zhu (2013, revised 2018).

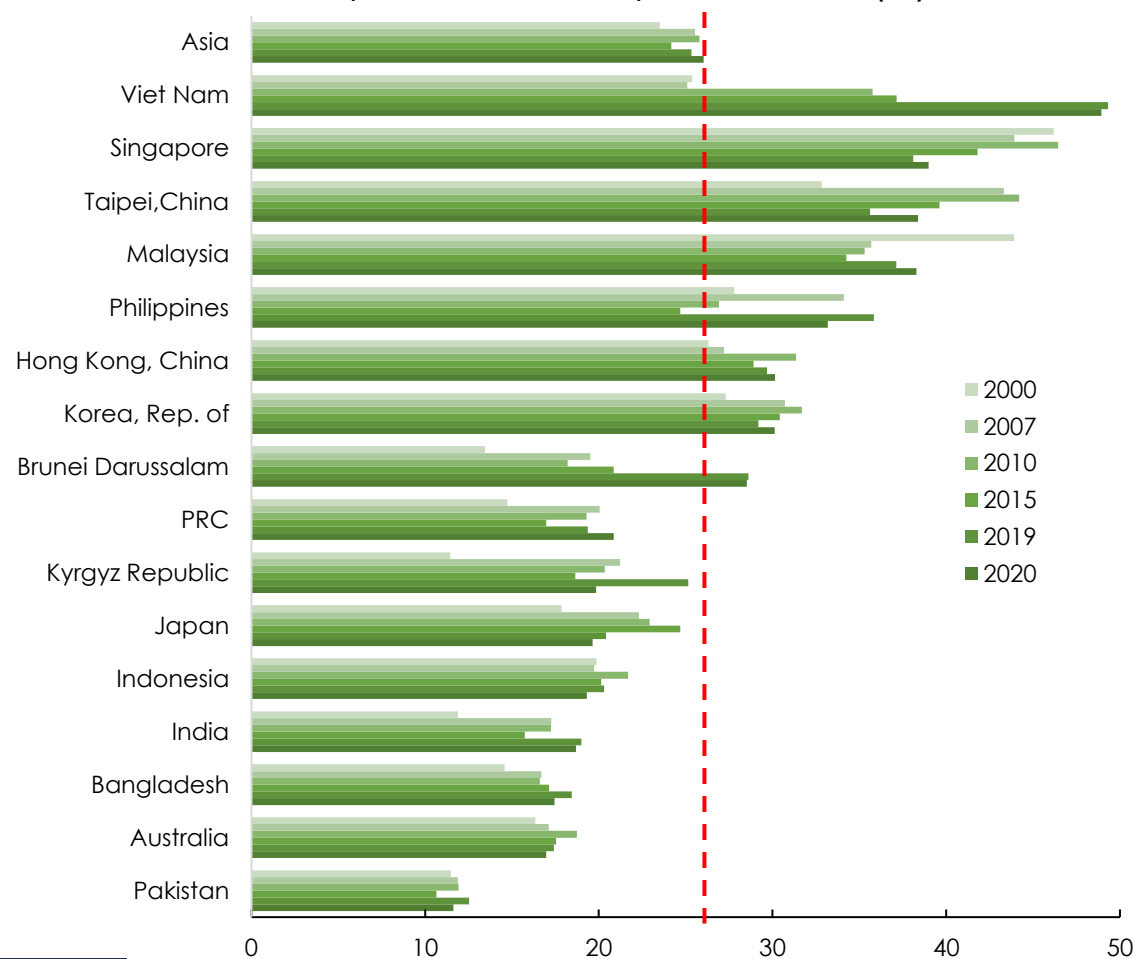
Heterogeneity across countries



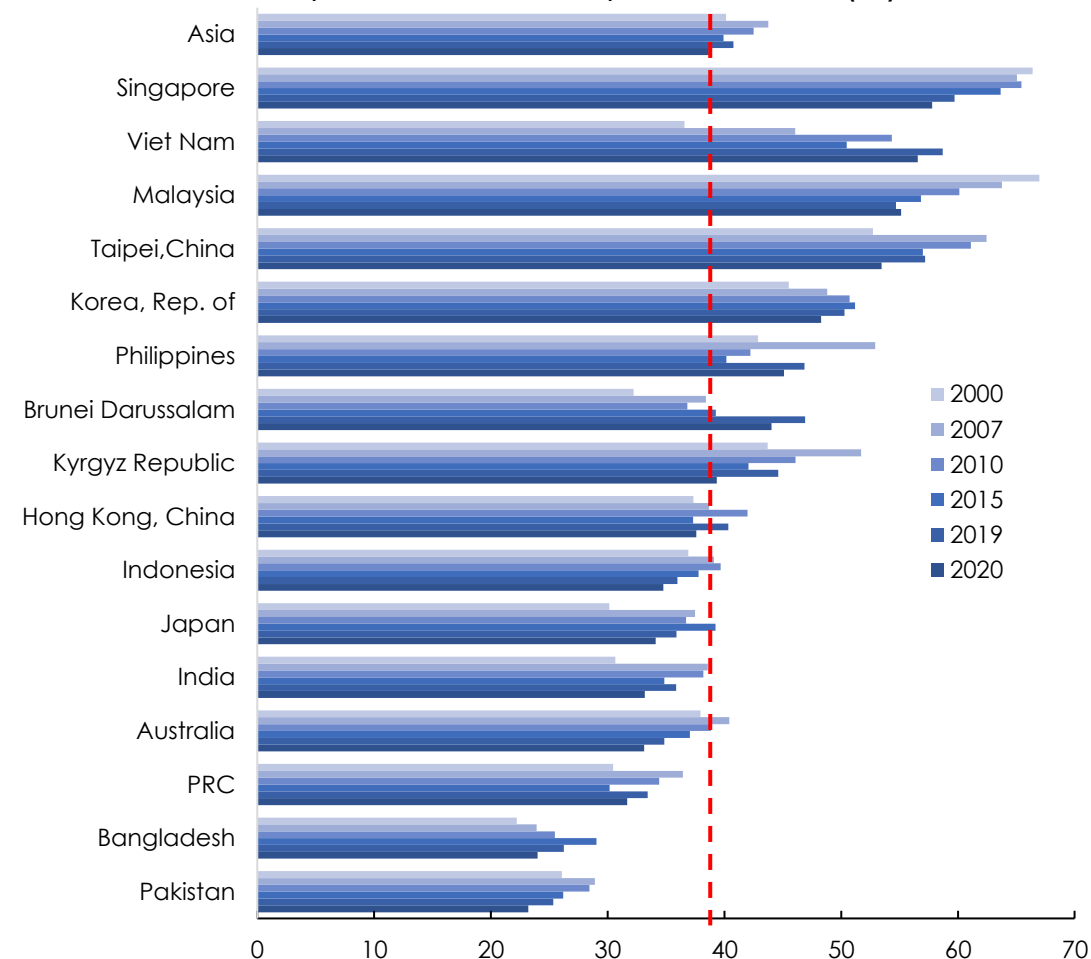
GVC = global value chain, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China, RVC = regional value chain.
Sources: ADB calculations using data from ADB Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2013, revised 018).

Heterogeneity across countries

Complex RVC Participation Rates (%)



Complex GVC Participation Rates (%)



GVC = global value chain, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China, RVC = regional value chain.

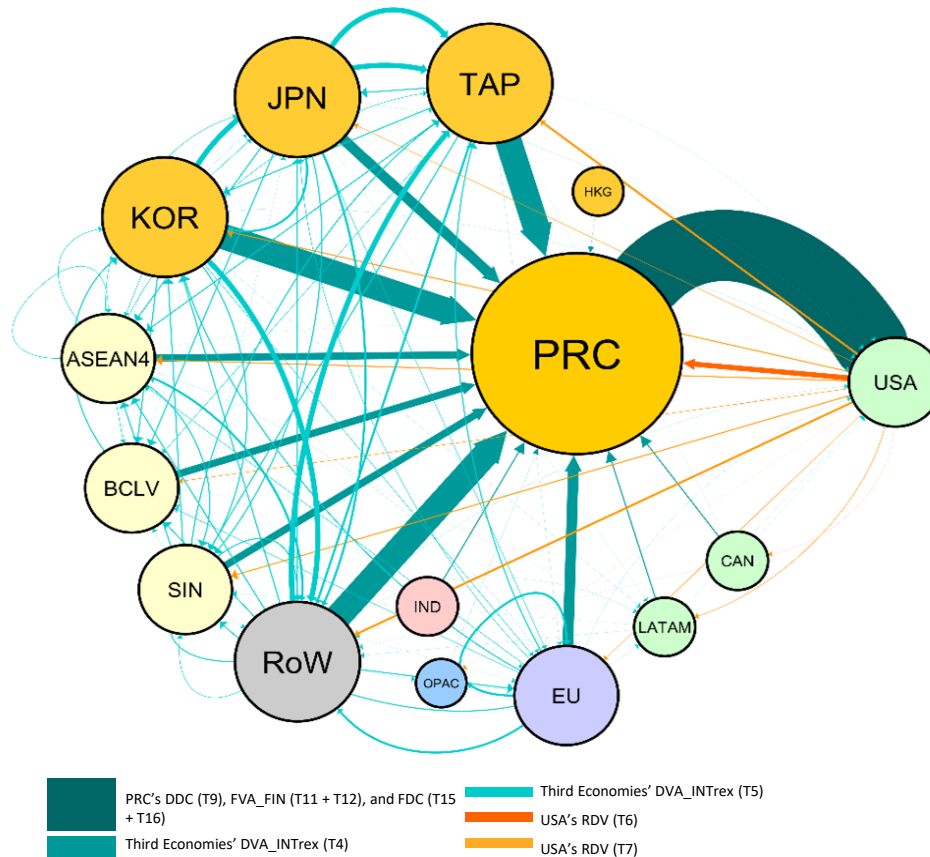
of the gross exports for which the production entails border-crossing twice or more. Countries are ordered by 2020 values from highest to lowest. Vertical line represents the value for Asia for 2020.

Sources: ADB calculation using data from ADB Multi-Regional Input-Output Tables and methodology by Wang, Wei, and Zhu (2013, revised 2018).

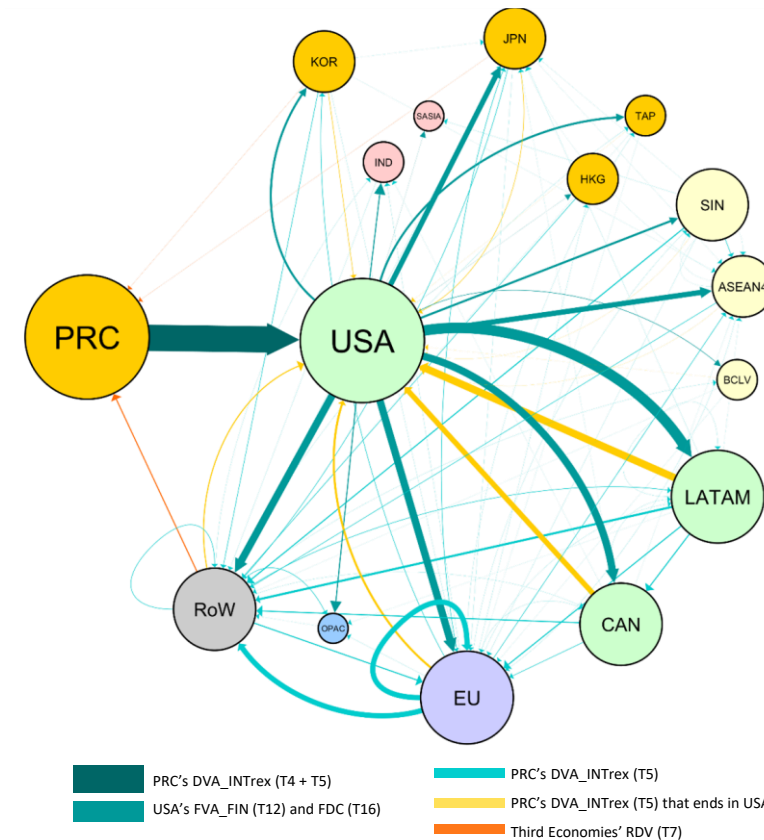
Backward and forward spillover through GVC

Electrical and Optical Equipment

a: Backward Linkages: PRC's final goods exports to US



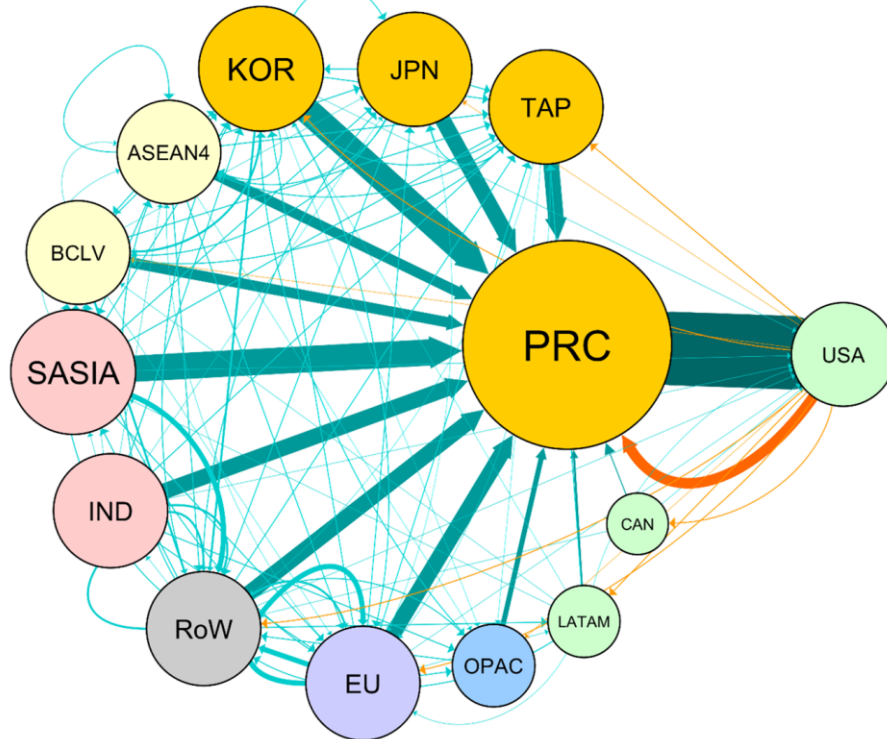
b: Forward Linkages: PRC's intermediate goods exports to US



Backward and forward spillover through GVC

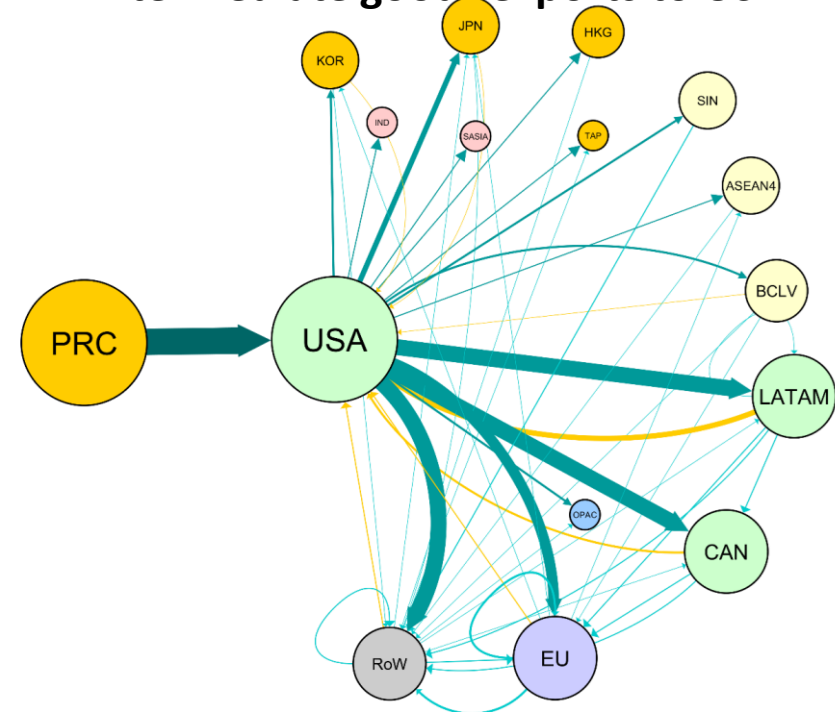
Textile and Textile Products

a: Backward Linkages: PRC's final goods exports to US



█ PRC's DDC (T9), FVA_FIN (T11 + T12), and FDC (T15 + T16)
█ Third Economies' DVA_INTrex (T4)
█ USA's RDV (T6)
█ USA's RDV (T7)
█ Third Economies' DVA_INTrex (T5)

b: Forward Linkages: PRC's intermediate goods exports to US



█ PRC's DVA_INTrex (T4 + T5)
█ USA's FVA_FIN (T12) and FDC (T16)
█ PRC's DVA_INTrex (T5)
█ PRC's DVA_INTrex (T5) that ends in USA

Sources: ADB calculations using data from 2010–2017 ADB Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2014).

Dynamic evolution of economy level contribution to GVC

Year	Contribution to World GVC (%)					Contribution to World Complex GVC (%)				
	People's Republic of China	Japan	Republic of Korea	USA	EU+UK	People's Republic of China	Japan	Republic of Korea	USA	EU+UK
2000	4.7	10.2	4.6	21.2	35.0	4.9	10.3	5.7	21.1	41.6
2010	12.5	7.3	5.0	14.5	33.7	13.1	7.4	6.4	13.3	41.2
2015	14.9	6.0	5.9	15.5	33.5	14.4	6.2	7.6	14.7	42.9
2019	14.3	5.8	5.2	16.3	35.4	12.4	5.3	5.9	15.0	45.2
2020	16.6	5.6	5.3	15.6	35.4	14.7	5.0	6.0	14.3	45.8

GVC = global value chain.

Notes: Economy-level contribution is calculated as the difference of GVC or complex GVC between the world and a counterfactual world without that economy.

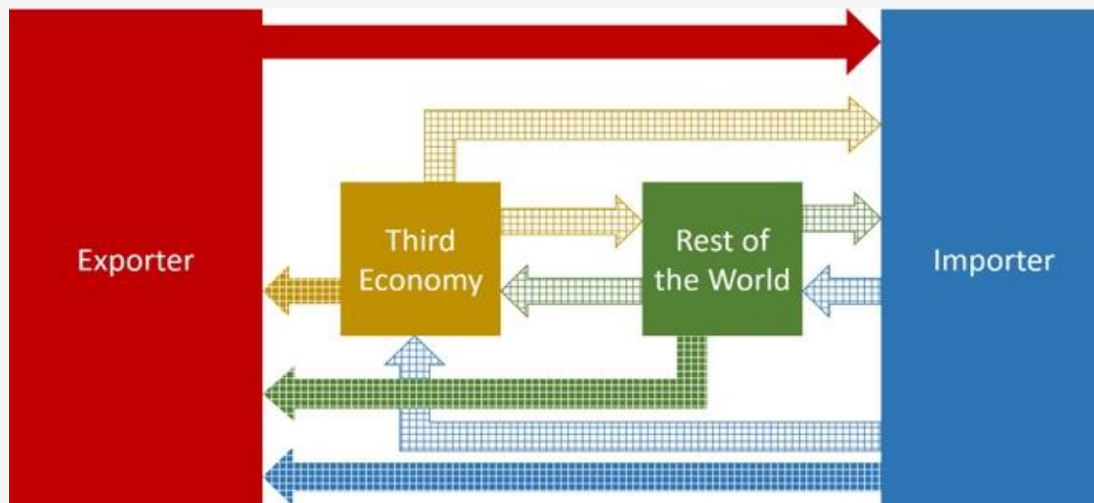
Sources: ADB calculations using data from ADB Multi-Regional Input-Output Tables (version 2021); and methodology by Wang, Wei, and Zhu (2013, revised 2018).

Impact of Reshoring



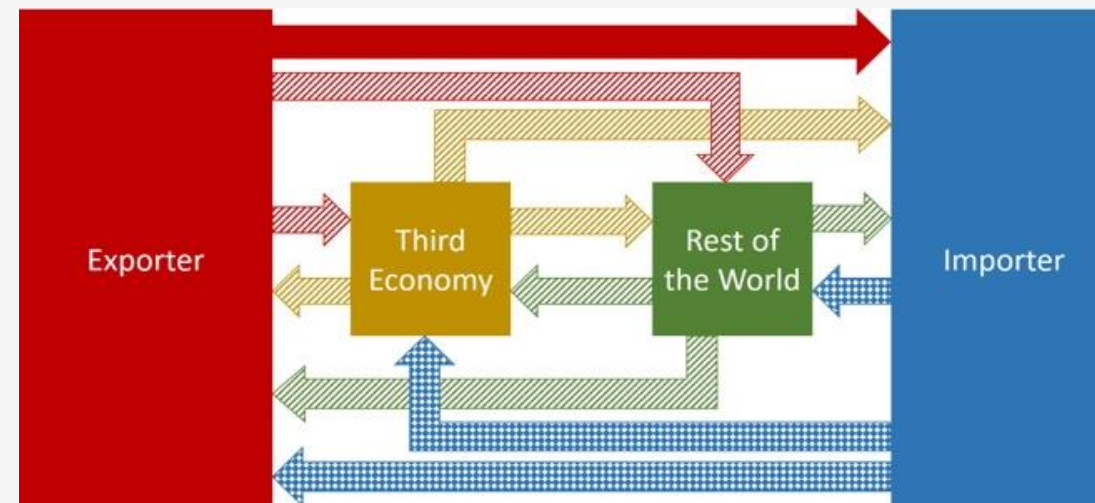
Snapshot of value chain linkages

Backward Global Value Chain Linkages



- ← Exporter's exports using supply from foreign economies
- ← Importer's direct supply to the exporter
- ← Third economy's direct supply to the exporter
- ← Rest of the World's direct supply to the exporter
- ← Importer's indirect supply to the exporter
- ← Third economy's indirect supply to the exporter
- ← Rest of the World's indirect supply to the exporter

Forward Global Value Chain Linkages



- ← Exporter's export of goods to the importer, which can be processed further
- ← Exporter's exports using supply from the importer, which originated from the exporter
- ← Importer's exports using supply from the exporter
- ← Third economy's exports using supply from the importer, which originated from the exporter
- ← Rest of the World's exports using supply from the importer, which originated from the exporter

Notes: Indirect supply refers to the exported intermediate goods that goes through further processing by a middle country before reaching its destination. Direct supply refers to the exported intermediate goods which go straight to its destination.
Source: ADB staff.

Estimation of impact of reshoring on exports

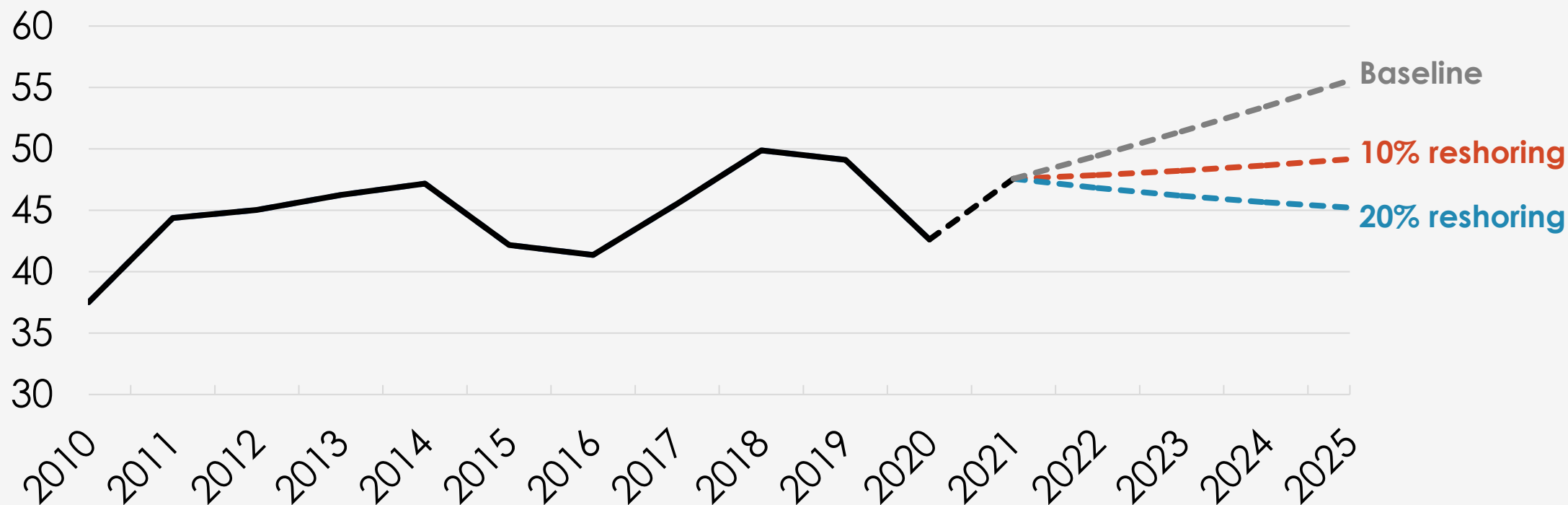
Simulation Results: % Change in Exports Due to Reshoring

Region	100% Substitution Rate			50% Substitution Rate			30% Substitution Rate		
	10% Reshoring	20% Reshoring	40% Reshoring	10% Reshoring	20% Reshoring	40% Reshoring	10% Reshoring	20% Reshoring	40% Reshoring
Asia and the Pacific	-8.79	-14.64	-29.29	-12.30	-20.50	-41.01	-13.71	-22.85	-45.70
Central Asia	-15.60	-26.01	-52.01	-17.68	-29.47	-58.94	-18.51	-30.85	-61.70
East Asia	-8.56	-14.26	-28.53	-11.80	-19.66	-39.32	-13.09	-21.82	-43.64
South Asia	-8.36	-13.93	-27.86	-11.24	-18.74	-37.48	-12.40	-20.66	-41.32
Southeast Asia	-8.31	-13.85	-27.71	-13.31	-22.19	-44.37	-15.31	-25.52	-51.04
The Pacific and Oceania	-13.17	-21.95	-43.90	-15.08	-25.13	-50.26	-15.84	-26.40	-52.81
European Union	-8.14	-13.56	-27.12	-13.82	-23.03	-46.07	-16.09	-26.82	-53.64
Latin America	-8.89	-14.81	-29.62	-14.12	-23.54	-47.08	-16.22	-27.03	-54.06
North America	-11.11	-18.51	-37.02	-14.08	-23.47	-46.93	-15.27	-25.45	-50.89
Rest of the World	-8.96	-14.94	-29.88	-13.50	-22.51	-45.01	-15.32	-25.53	-51.06
World	-8.92	-14.86	-29.72	-13.34	-22.24	-44.48	-15.11	-25.19	-50.38

ADB Notes: Reshoring rate refers to the share of imported intermediate goods and outsourced production that the main exporter will cut-off. Substitution rate refers to the capacity of local manufacturers to produce enough intermediate goods to compensate for the cut-off of imported intermediate goods and outsourced production. Sources: ADB calculations using data from ADB. Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2014)

Estimated impact of supply chain reshoring on trade

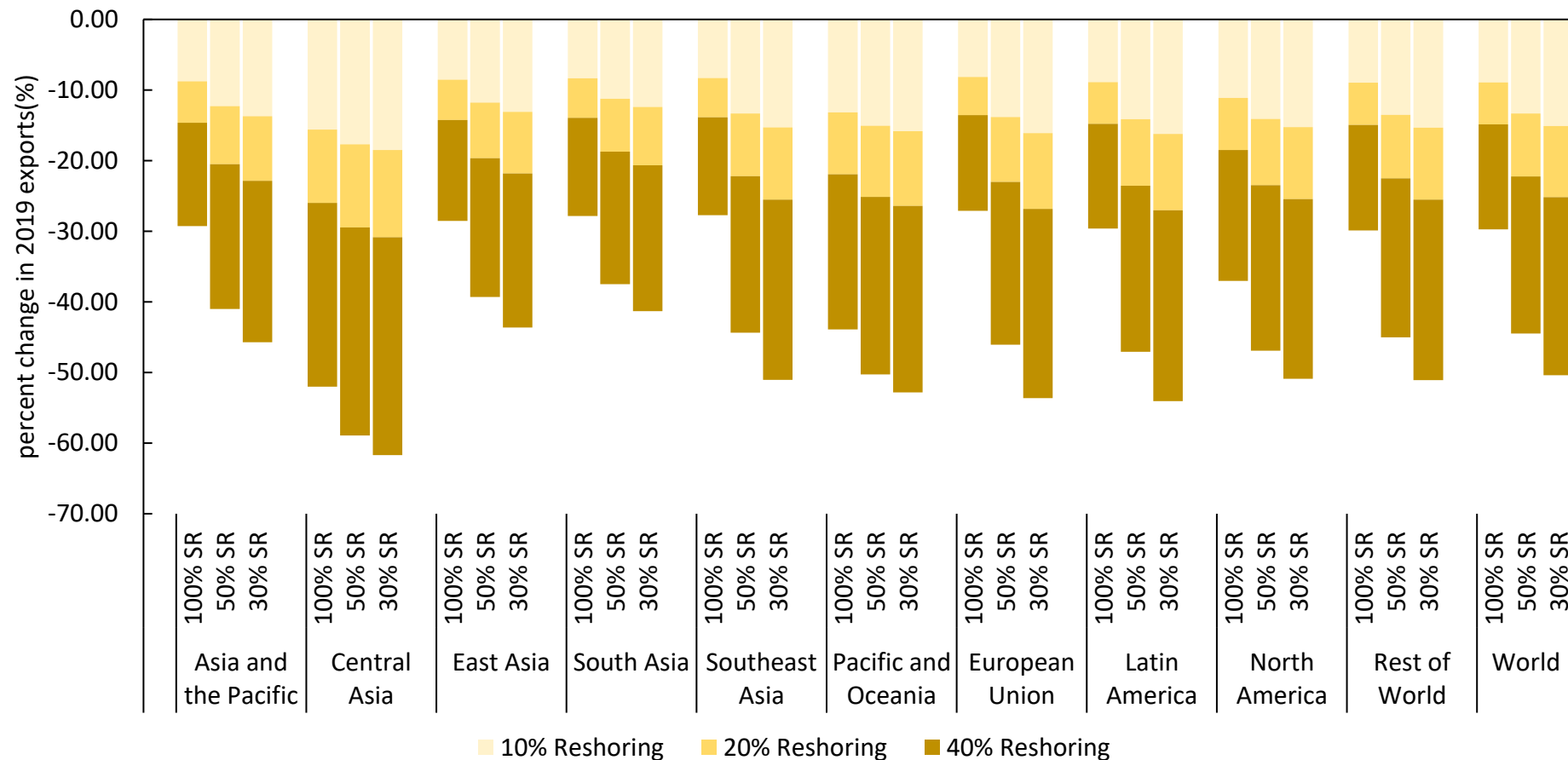
World trade in goods and services (\$ trillion)



Notes: Based on assumption of 50% substitution rate, which means that 50% of reshored capacity is replaced by domestic production. Reshoring rate (10% and 20%) refers to the share of imported intermediate goods for further processing for exports and outsourced production that the main exporter will cut-off. IMF World Economic Outlook October 2020 forecasts were used to estimate world trade in goods and services for 2020 and 2021 and average trade growth in 2010-2021 for the baseline 2022-2025 period.

Sources: ADB calculations using data from ADB. Multi-Regional Input-Output Tables based on methodology by Wang, Wei, and Zhu (2014); International Monetary Fund. World Economic Outlook April 2019 and October 2020 Databases; and World Bank. World Development Indicators.

Impact of Reshoring on Exports



SR = substitution rate.

Notes: Reshoring rate refers to the share of imported intermediate goods and outsourced production that the main exporter will cut-off. Substitution rate refers to the capacity of local manufacturers to produce enough intermediate goods to compensate for the cut-off of imported intermediate goods and outsourced production. North America refers to Canada and the United States; Latin America refers to Brazil and Mexico; Pacific and Oceania refers to Fiji and Australia.

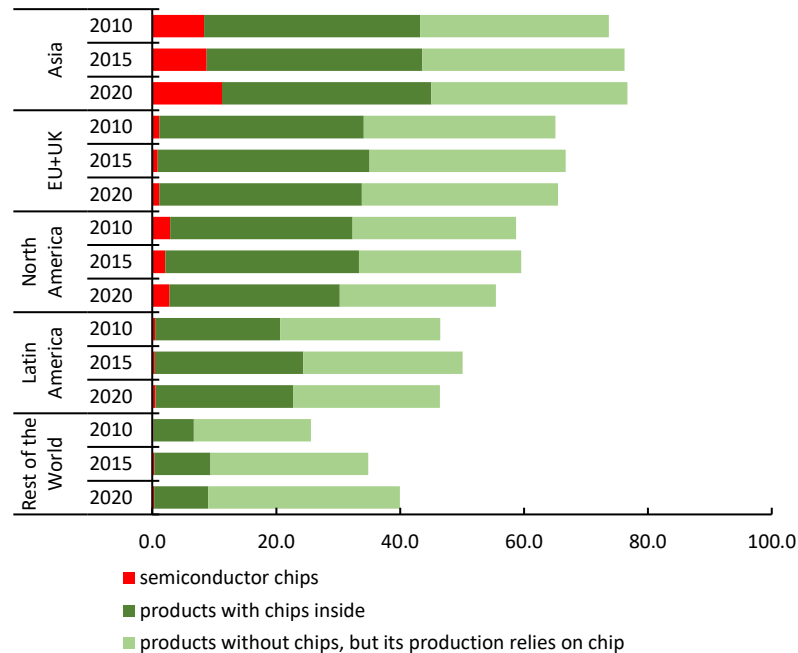
Sources: ADB calculations using data from ADB. Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2013).

Challenges in the Semiconductor Supply Chains

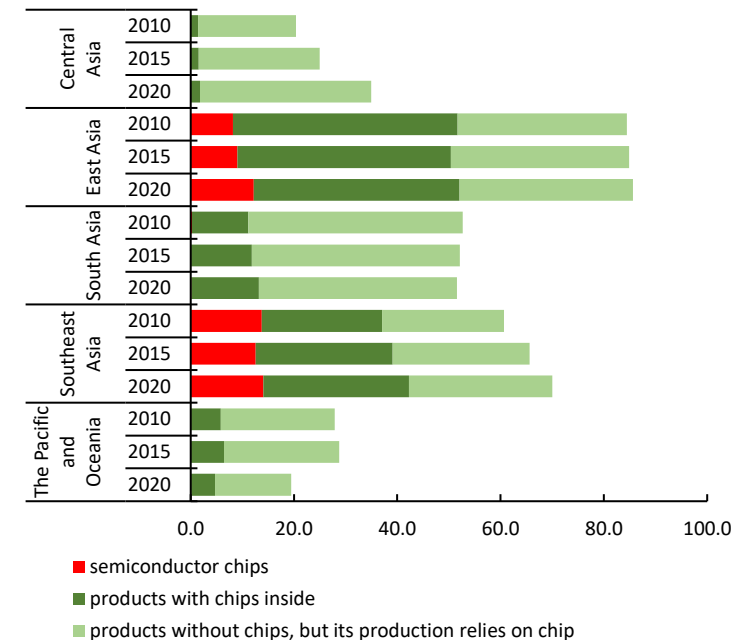


Asia's trade has the highest reliance on semiconductors for merchandise goods trade

a. Export shares by regions (%)



b. Export shares by Asian subregions (%)

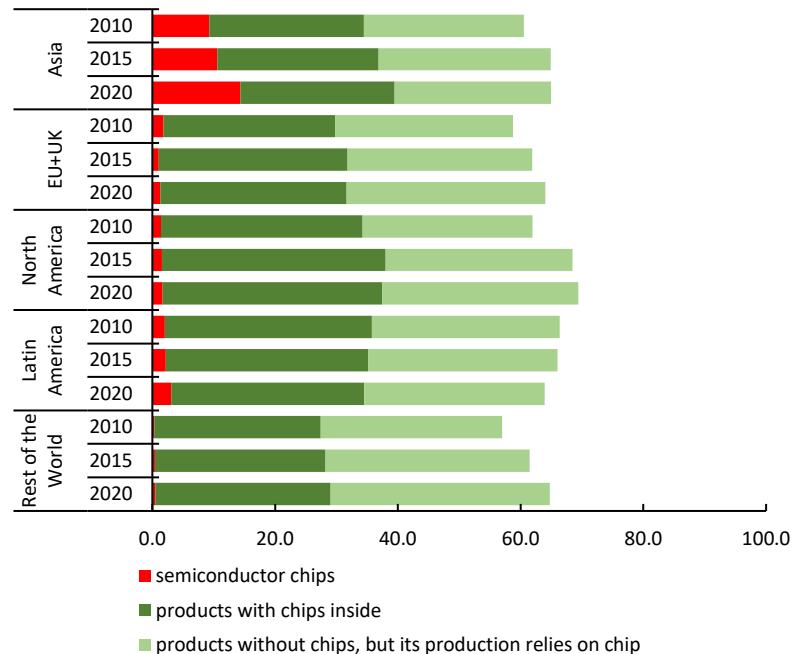


Notes: Red bars represent the share of semiconductor devices and electronic integrated circuits in total exports or imports. Both light green and dark green represents the share of exported products under industries that spend at least 1% of its value-added production on semiconductor chips. These industries were classified by Goldman Sachs. The light green bars are exports which do not have chips inside its products, but its production such as machineries relies on chips. The dark green bars are exports which have chips inside its products.

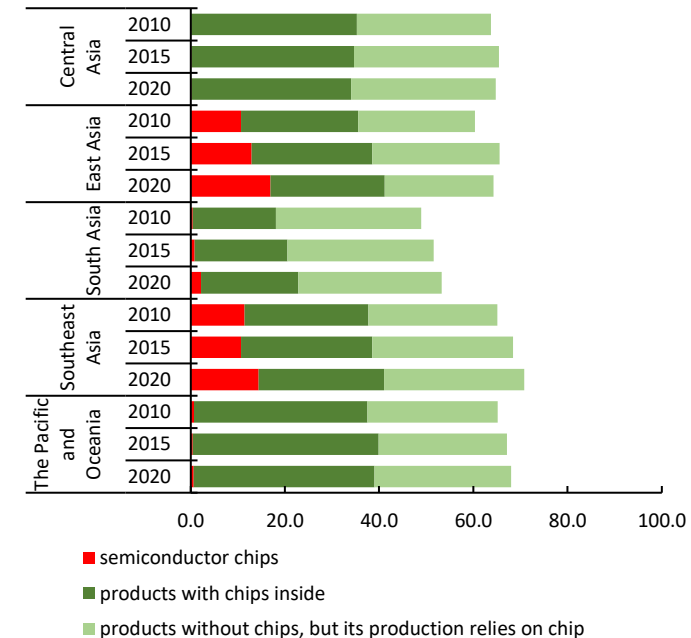
Source: ADB calculations using data from United Nations. Commodity Trade Database. <https://comtrade.un.org> (accessed 16 July 2021).

Asia's trade has the highest reliance on semiconductors for merchandise goods trade

a. Import shares by regions (%)



b. Import shares by Asian subregions (%)

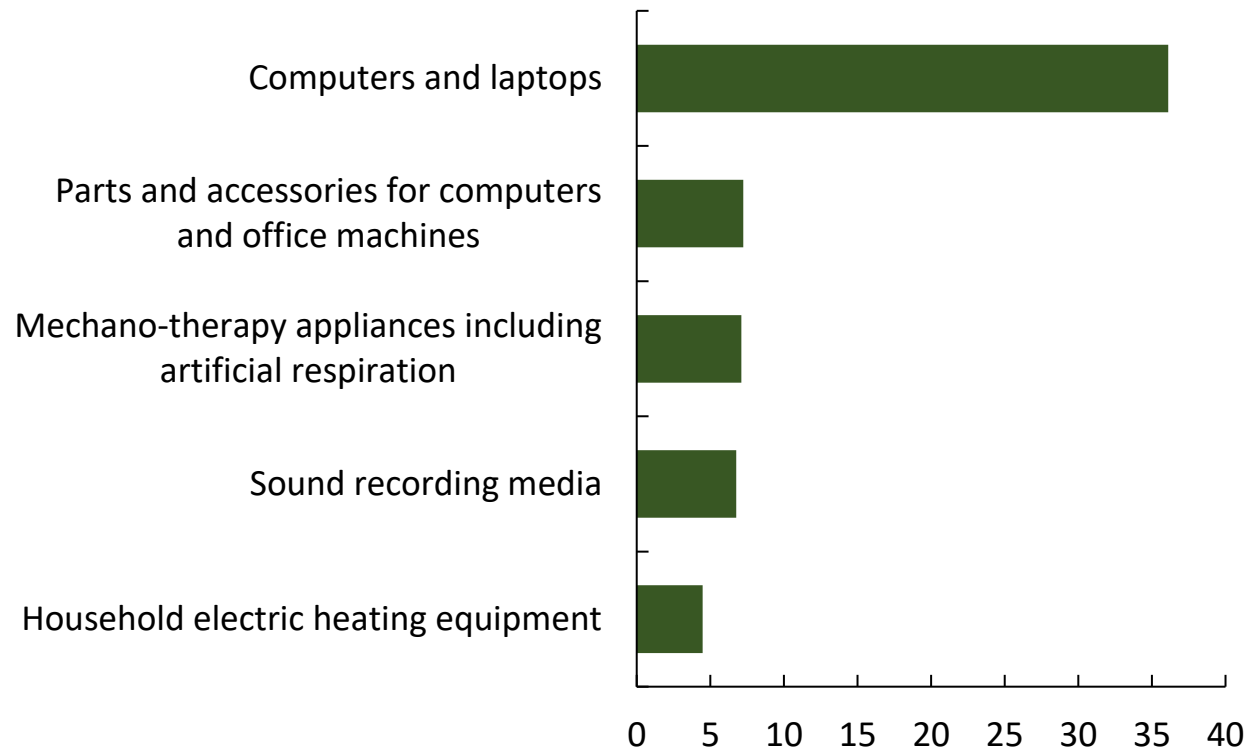


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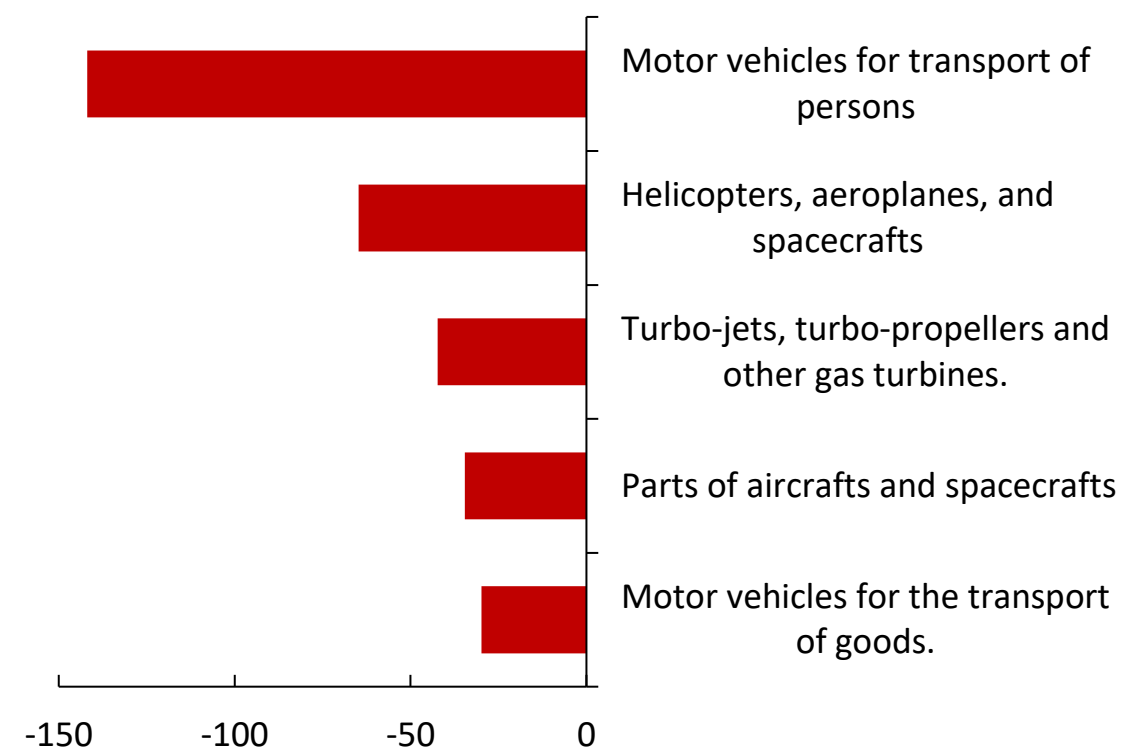
Source: ADB calculations using data from United Nations. Commodity Trade Database. <https://comtrade.un.org> (accessed 16 July 2021).

World's Top gaining and losing products that use chips (\$ billion, 2020)

a. Top 5 gaining exports that use chips



b. Top 5 losing exports that use chips

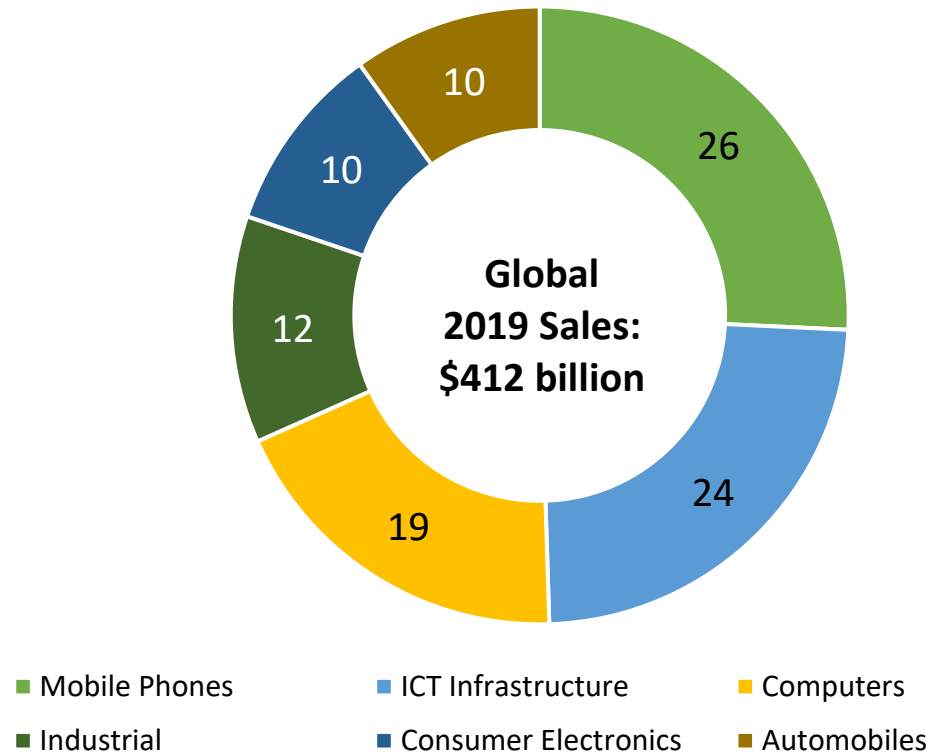


Notes: The top 5 commodities that “gained” the most are the products at Harmonized System (HS) 4-digit commodity code which increased the most by level of export value out of 186 products that depend on semiconductor chips (1,222 products in total). The top losers on the other hand, decreased the most in export value.

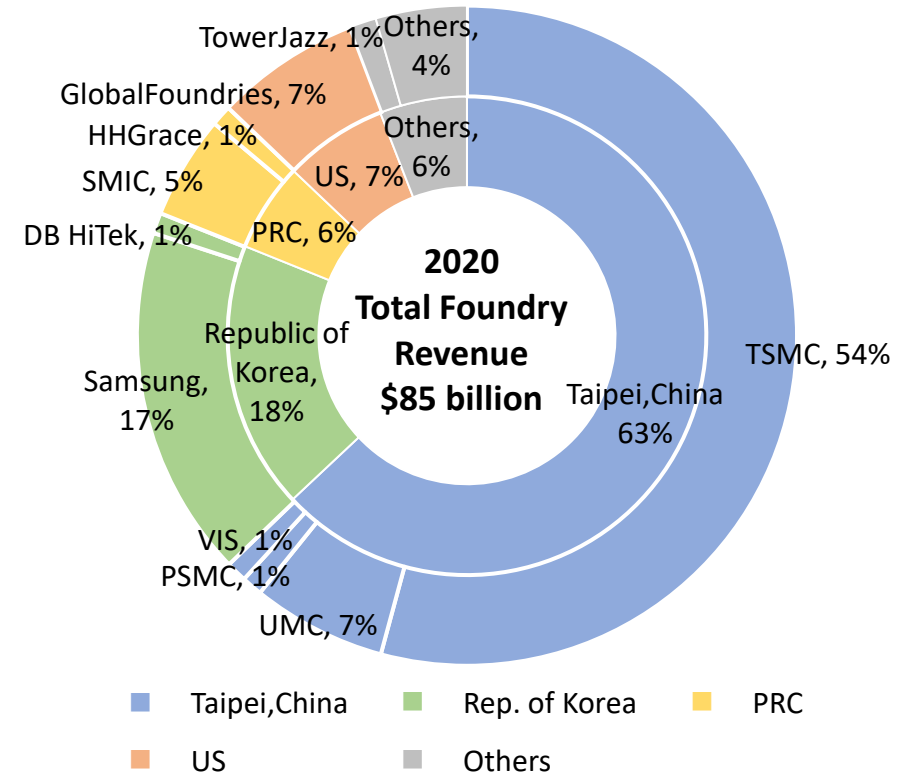
Source: ADB calculations using data from United Nations. Commodity Trade Database. <https://comtrade.un.org> (accessed 16 July 2021).

Global semiconductor sales by sector and top foundry producers

Global semiconductor sales by application market, 2019 (%)



Foundry Market Share (%), 2020

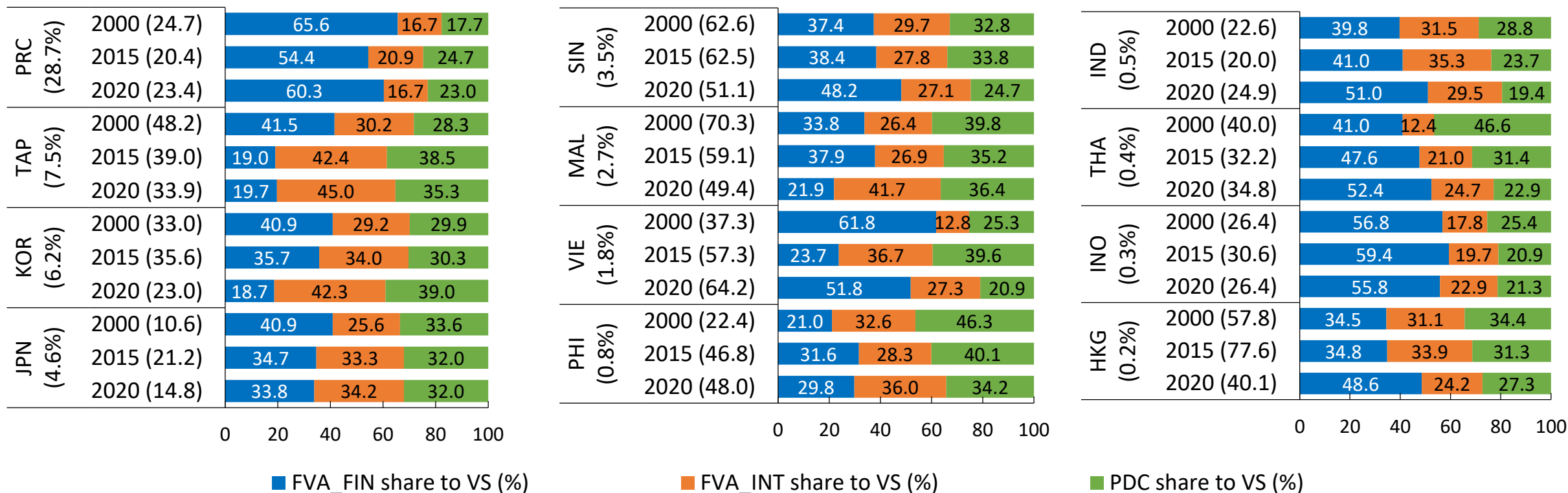


DB = Dongbu; HHGrace = Shanghai[, China] Huahong Grace Semiconductor Manufacturing Corp; PSMC = Powerchip Semiconductor Manufacturing Corporation; SMIC = Semiconductor Manufacturing International Corporation; TSMC = [Taipei,China] Semiconductor Manufacturing Company; UMC = United Microelectronics Corporation; VIS = Vanguard International Semiconductor Corporation.

Note: ICT infrastructure include data centers and communication networks.

Source: Semiconductor industry association (April 2021) and TrendForce (March 2021)

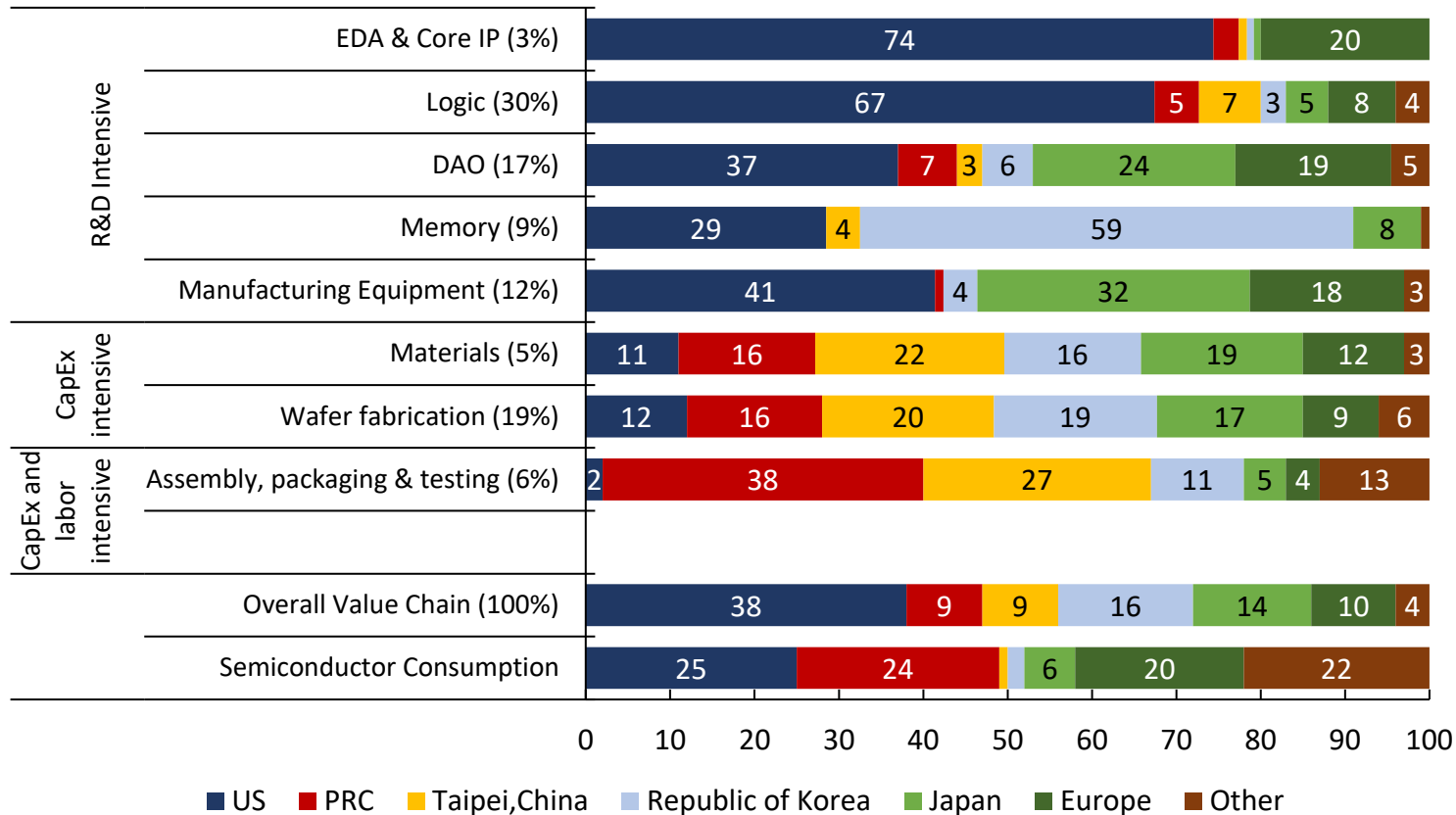
Vertical Specialization (VS) of Selected Asian Countries in Electrical and Optical Equipment



Notes: The countries chosen are the top 12 exporters in the electrical and optical equipment sector, out of 26 Asian countries in ADB MRIO database. Percentages near the economy's 3-letter codes are the share of the economy's gross export to global export of electrical and optical equipment in 2020. Values near the years are the share of vertical specialization to gross exports in the electrical and optical equipment sector.

Source: ADB calculations using data from ADB Multi-Regional Input-Output Tables; and methodology by Wang, Wei, and Zhu (2013, revised 2018).

Coping with vulnerabilities associated with semiconductor value chains



• Policy responses

- Reshoring and self-sufficiency
- Diversification
- Just-in-case inventory management
- Investment in R&D
- Capital investment
- Education and training for engineers

CapEx = Capital expenditure, DAO = discrete, analog and optoelectronics and sensors, EDA = electronic design automation, IP = intellectual property.

Notes: Regional breakdown on EDA, design, manufacturing equipment and raw materials based on company revenues and company headquarters location. Regional breakdown on wafer fabrication and assembly & testing based on installed capacity and geographic location of the facilities.

Source: Semiconductor industry association (April 2021)

Key Messages

- Having demonstrated strong resilience amidst the pandemic in 2020, Asia's merchandise trade continues its rapid growth in 2021 due to strong rebound in external demand and PRC's early recovery in trade growth
- Asia managed to strengthen intraregional trade linkages during the first wave of the COVID-19 pandemic in 2020, largely due to trade ties with the PRC.
- Intraregional trade linkages further strengthened for East Asia, South Asia, and the Pacific and Oceania sub-regions in 2020 while weakened in Central Asia.
- Rising shipping costs pose challenges to trade flows and supply chain management. Fostering digitalization, competition and investment could help ease the constraints
- Sectoral supply-demand mismatch, and geographical concentration and extreme specialization exacerbate semiconductor shortage problem. Supply chain diversification, R&D and capex investment along with training for engineers needs pursuing
- Asia's value chain linkage with world shrank in 2020 in tandem with the world's global value chain linkages. Yet, its regional value linkages strengthened further during the pandemic.
- RVC is gearing toward more sophisticated pattern of value chain linkages