AMRO
ASEAN +3 MACROECONOMIC RESEARCH OFFICE

Analytical Note

Trade Wind Series

How are ASEAN and China Leveraging Their Positions in Global Value Chains?[1]

March 18, 2024

I. Introduction

1. **ASEAN and China play crucial roles as increasingly important participants in global trade, even as globalization appears to be in retreat.** Contributions by ASEAN and China to world exports increased to 7.6 and 14.5 percent in the 12 months to October 2023 from 6.5 and 2.9 percent in 1995, respectively. Their importance has not diminished despite the acceleration in trade fragmentation following a long period of rapid globalization and the proliferation of global value chains (GVCs).[2] Trade reconfiguration is also taking place—China's exports have evolved from low-skilled, labor-intensive goods to high-skilled and technology-intensive products, resulting in a drop in its global export share of the former and an increase in the latter. Concurrently, ASEAN economies, particularly Vietnam, have seized the opportunity to gain market shares in sectors where China has recorded a decrease (Zhao and Ho 2023). Overall, China and ASEAN have maintained or increased their share of the global export market.

2. **The extent to which economies can accrue gains by expanding exports and integrating into GVCs is pivotal.** Exports may be decomposed into domestic and foreign components (Koopman, Wang, and Wei 2014; Aslam, Novta, and Rodrigues-Bastos 2017; Appendix I.A). *Gross* exports represent an economy's presence in the global export market but only *domestic* value-added exports—involving the use of domestic inputs such as labor, capital, and technology within the country—contribute to GDP; the foreign value-added part does not. Hence, higher domestic value-added exports contribute to faster economic growth. So, it is more meaningful to analyze trade dynamics in the region through the lens of domestic value-added achieved from actively participating in GVCs, instead of focusing on the expansion of an economy's share of global exports. In particular, it is important to parse

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[2] See Box 1 for a discussion on various GVC concepts and definitions.

the value-added portion captured by an economy where intermediate goods imports are brought in and exports are sent out.

3. **This note studies the spillovers of GVC participation to domestic production.** Both ASEAN and China have benefited from their involvement in GVCs, leading to the expansion of their exports on a global scale. Integration into GVCs also facilitates technology transfer by enhancing the knowledge content in those exports. However, the degree to which international trade promotes or stimulates domestic production and growth varies across economies and is associated with GVC length and the positions of economies in those GVCs.

Box 1. Global Value Chains: Concepts and Definitions

A GVC consists of a series of stages involved in producing a good or service that is sold to consumers, with each stage adding value and at least two stages being produced in different countries. A firm is said to participate in a GVC if it produces in at least one stage in a GVC (Antras 2020). To trace value-added trade flows across countries, global input-output tables are constructed by combining customs trade flow data with national input-out tables. These global input-output tables enable the decomposition of exports into domestic and foreign contents, facilitating the assessment of countries' participation in GVCs.[1/] An economy's GVC Participation Index (Koopman and others 2010) comprises the sum of (1) the share of foreign value-added in its gross exports (backward participation); and (2) the share of its domestic value-added embedded in foreign exports (forward participation).[2/]

"GVC length" refers to the total stages needed to produce the final products of a specific industry. The higher the number of GVC stages retained within an economy, the greater the likelihood of generating more domestic value-added as more domestic firms participate in the GVC. The length of GVCs within an economy is product- or industry-specific. However, a longer GVC is not necessarily associated with greater efficiency or productivity.[3/]

The "distance-to-final-demand" (DFD) serves as an indicator to estimate the "upstreamness" of an industry's position in GVCs within a specific economy. It measures the number of remaining stages when a particular industry in any given economy enters GVCs with inputs to produce final goods for other industries. The move toward a more upstream position in production is associated with a growing share of GVC value-added captured by the economy. For example, upstream activities such as research and design often encompass the highest share of value-added (Baldwin 2013; Cheng and others 2015). Therefore, it is meaningful to assess the position of an industry within an economy. A larger DFD number indicates that production is more distant from final demand, signifying a more upstream position.[4/]

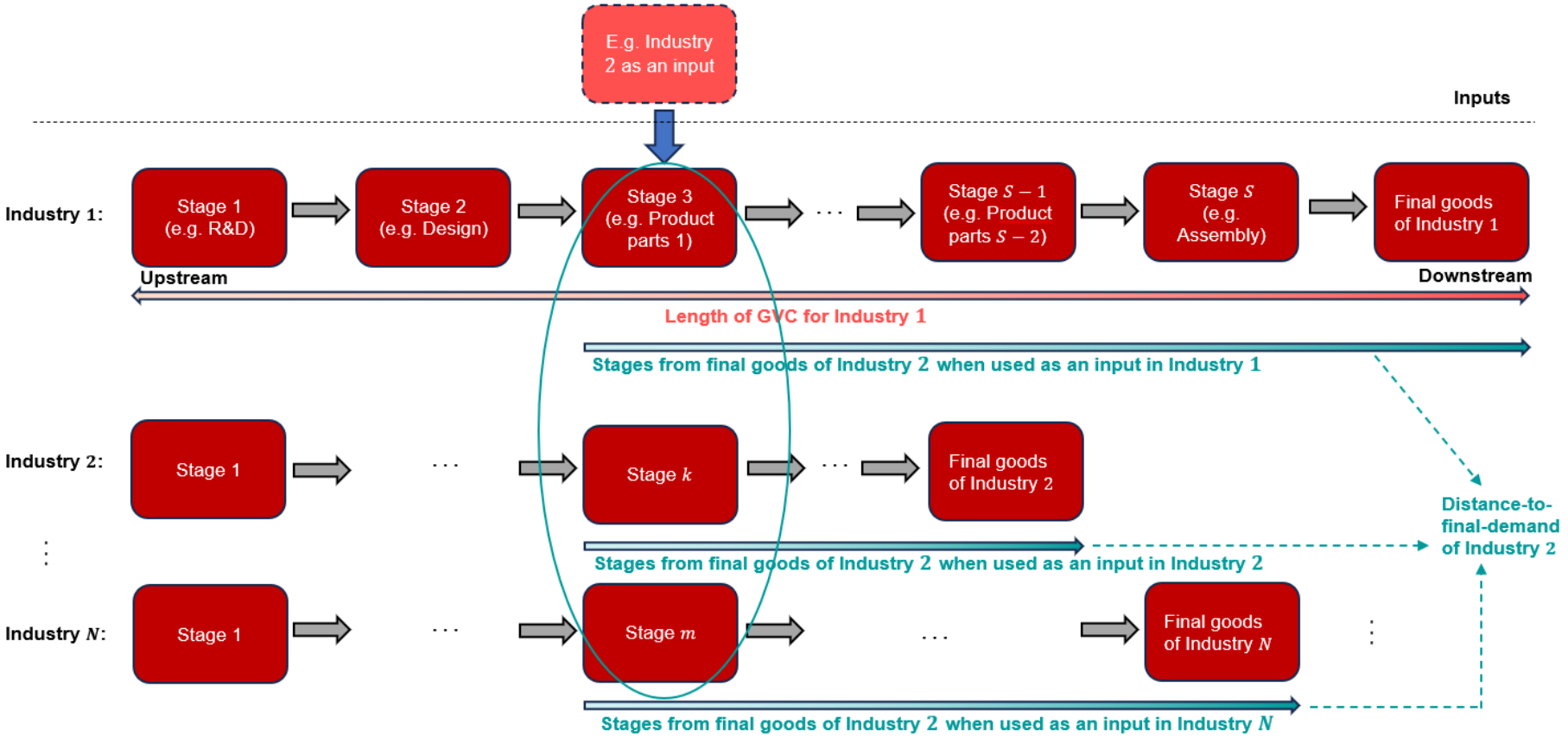
Box Figure 1 illustrates the GVC length and DFD concepts and how they relate to each other:

- The GVC length for Industry 1 takes the value "1" if there is a single production stage. It increases when more inputs are utilized and additional stages are required to produce final goods. In our example, there are S stages to produce the final goods of Industry 1, with one raw input—produced in a single step—at each stage. Therefore, the GVC length for Industry 1 is S. If the production for any of these inputs involves multiple stages, these additional stages will be reflected in the GVC length for Industry 1, depending on the extent to which those inputs are included in the final goods of Industry 1. In the general case, the GVC length is calculated as the weighted sum of the production stages of all inputs that are utilized.

- The DFD for Industry 2, when used as an input in Industry 1, for example, can be depicted by the stages between the point when inputs from Industry 2 enter the GVC of Industry 1 and the completion of final goods in the same GVC, thereby being a part of the GVC length for Industry 1. As Industry 2 may be used in many industries as input, the stages to final goods of different industries vary. Consequently, the DFD of Industry 2 is calculated as the weighted sum of stages from final goods of each industry that it uses as input. The weights are determined by the extent to which Industry 2 is used in those industries.

[1/] Appendix I.A describes the decomposition of gross exports into various components.
[2/] Appendix I.B presents the method for estimating the GVC Participation Index.
[3/] Appendix I.C describes the indicator of GVC length used to measure the number of production stages.
[4/] Appendix I.D shows how the DFD of a GVC may be computed for an industry within a country.

Box Figure 1. Illustration: An Industry's GVC Length and Distance-to-Final-Demand in a Typical Manufacturing Production Process



- **Length of GVC for Industry 1 is the weighted sum of production stages of all inputs (could be from Industry 1 to N).**
- **Distance-to-final-demand of Industry 2 is the weighted sum of stages from final goods of Industries 1 to N when it is used as an input.**

Source: AMRO staff visualization.

II. Gains from Participating in GVCs

4. **The rapid development of GVCs contributes to economic growth.** GVC integration generally enables countries to increase value-added, especially when participating in upstream stages (Kummritz, Taglioni, and Winkler 2017), creating more and better jobs (ADB 2023), enhancing labor productivity (Constantinescu, Mattoo, and Ruta 2019; Cigna, Gunnella, and Quaglietti 2022), and leading to technology transfers and accelerating income convergence (IMF 2013). The GVC Participation Index increased rapidly worldwide from 1995 but started to moderate after the global financial crisis (Figure 1). This abatement may be attributed to the slowdown in globalization and changes in the sectoral composition of gross exports (Cigna, Gunnella, and Quaglietti 2022).

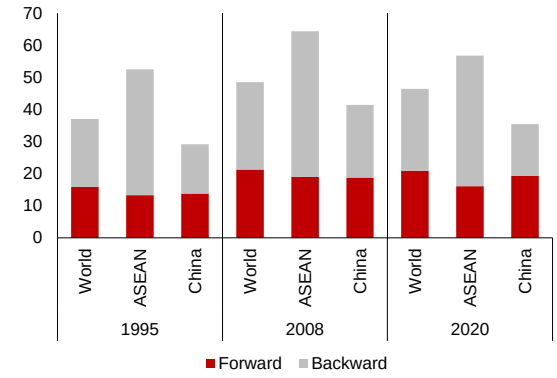
5. **China and ASEAN are increasing their participation in GVCs by deepening their integration.** China is not only the world's top manufacturer, but also a production center for intermediate manufactured goods, which has advanced even more rapidly than its production of final goods (Baldwin, Freeman, and Theodorakopoulos 2023). China's GVC Participation Index rose from 29 percent in 1995 to 41 percent in 2008, followed by a small gradual decline to 35 percent in 2020. Meanwhile, ASEAN's index has surpassed China's and the world average, indicating a higher concentration of value chain-related production in this subregion (AMRO 2021). However, there is a notable imbalance between backward and forward participation activities—ASEAN is increasingly relying on foreign inputs for its exports compared to China and hence has a greater share of the former (Figure 1).

6. **The market shares of both China's and ASEAN's domestic value-added exports have increased alongside their gross export shares.** Similar to the pattern observed in gross exports, China's share of domestic value-added exports increased steadily from 2000 and has remained stable since 2016. In ASEAN, this share has risen rapidly since 2008, largely driven by Vietnam.[3] Moreover, it is noteworthy that China has a larger share of domestic value-added exports compared to its gross exports, whereas ASEAN exhibits the opposite trend, implying a higher proportion of foreign inputs in its exports compared to the rest of the world (Figure 2). The average shares of foreign inputs in gross exports for ASEAN and the world from 1995 to 2020 are 42 percent and 28 percent, respectively.

7. **Various industries in both China and Vietnam exhibit similar growing trends in their global shares of domestic value-added exports.** Following a consistent pattern, the global shares of domestic value-added exports for several major industries—such as textiles, chemicals, machinery, and electronics—have increased for China since 2000 and Vietnam since 2008, mirroring the overall manufacturing trend**.** Where China's share of domestic value-added exports has been rising, in chemicals, machinery, and electronics, the country has correspondingly gained more market share in gross exports (Figure 3). When China's global share of gross exports in textiles began declining in 2015, the country's share of domestic value-added exports in this product also decreased. Meanwhile, all four industries in Vietnam have recorded growing shares of domestic value-added exports in tandem with their respective shares of global gross exports, albeit with the former rising at a slower pace compared to the latter (Figure 4).

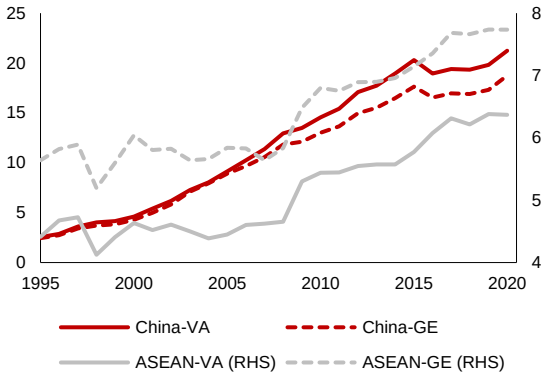
[3] The global share of domestic value-added exports has risen by 1.7 percentage points in ASEAN from 2008 to 2020, with Vietnam making the largest contribution at 0.8 percentage points.

Figure 1. ASEAN and China: Participation in Global Value Chains, 1995–2020
(Percent)



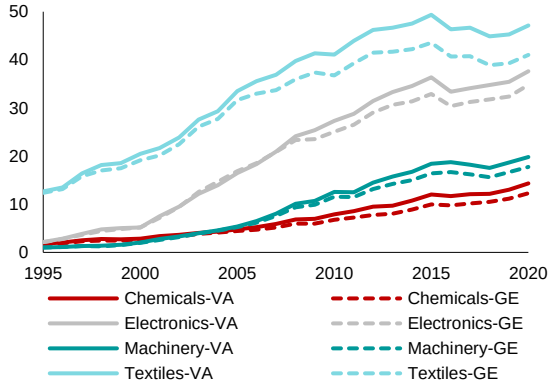
Sources: OECD TiVA; and AMRO staff calculations.

Figure 2. ASEAN and China: Global Share of Domestic Value-Added and Gross Exports in Manufacturing, 1995–2020
(Percent)



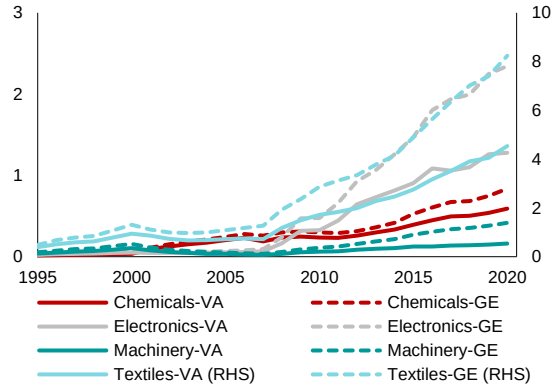
Sources: OECD TiVA; and AMRO staff calculations.
Note: VA = domestic value-added exports, GE = gross exports.

Figure 3. China: Global Share of Domestic Value-Added and Gross Exports in Selected Industries, 1995–2020
(Percent)



Sources: OECD TiVA; and AMRO staff calculations.
Note: VA = domestic value-added exports, GE = gross exports.

Figure 4. Vietnam: Global Share of Domestic Value-Added and Gross Exports in Selected Industries, 1995–2020
(Percent)



Sources: OECD TiVA; and AMRO staff calculations.
Note: VA = domestic value-added exports, GE = gross exports.

8. **The knowledge content in China's and major ASEAN's exports has undergone enhancement over time.** Using a refined estimate of Revealed Comparative Advantage (RCA),[4] which involves replacing gross exports with domestic value-added exports, we assess each country's relative advantage in exporting specific goods.[5] The manufacturing sectors are grouped into labor-intensive, capital-intensive, and knowledge-intensive sectors (Appendix II), and the results show that:

- China's modified RCA increased rapidly between 1995 and 2020 in knowledge-intensive sectors, narrowing the gap with advanced economies such as Germany, Japan, Korea, and the US but declined in labor-intensive sectors (Figure 5).

[4] RCA is defined as the proportion of a sector's exports in a country's total gross exports relative to the share of the same sector's exports in world total exports.

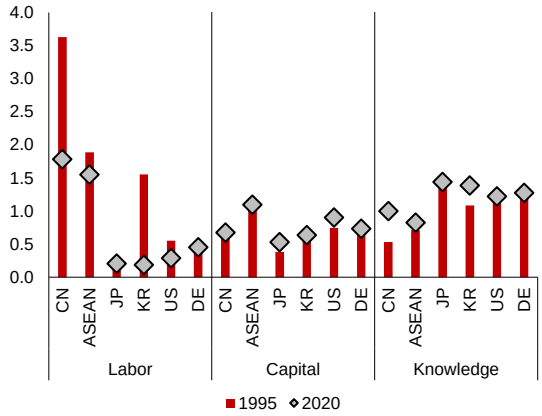
[5] This modification allows for the exclusion of imported intermediates and eliminates the distortion of double counting in official trade statistics (Rahman and Zhao 2013).

- Most ASEAN economies, such as Indonesia, the Philippines, and Thailand, have followed similar patterns to China—their modified RCA improving in knowledge-intensive sectors and falling sharply in labor-intensive sectors, although the overall RCA for ASEAN has not changed significantly,

- Vietnam's modified RCA has strengthened in knowledge-intensive sectors but declined only slightly in labor-intensive sectors (Figure 6).

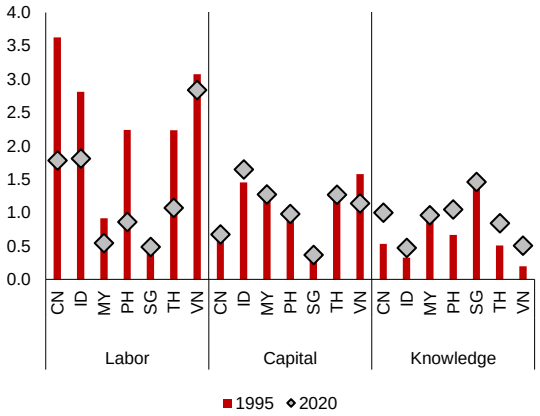
Importantly, the "catch-up" by China and major ASEAN economies to advanced economies in the knowledge-intensive manufacturing sectors points to the impact of technology transfers from the latter to emerging and developing economies through value chain integration.

Figure 5. China, ASEAN, and Selected Advanced Economies: Modified Revealed Comparative Advantage in Manufacturing, 1995 and 2020
(Ratio)



Sources: OECD TiVA; and AMRO staff calculations.
Note: Modified RCA is defined as the proportion of a sector's exports in a country's total domestic value-added exports relative to the share of the same sector's exports in world total domestic value-added exports. CN = China; DE = Germany; JP = Japan; KR = Korea; US = United States.

Figure 6. China and Selected ASEAN: Modified Revealed Comparative Advantage in Manufacturing, 1995 and 2020
(Ratio)



Sources: OECD TiVA; and AMRO staff calculations.
Note: Modified RCA is defined as the proportion of a sector's exports in a country's total domestic value-added exports relative to the share of the same sector's exports in world total domestic value-added exports. CN = China; ID = Indonesia; MY = Malaysia; PH = the Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

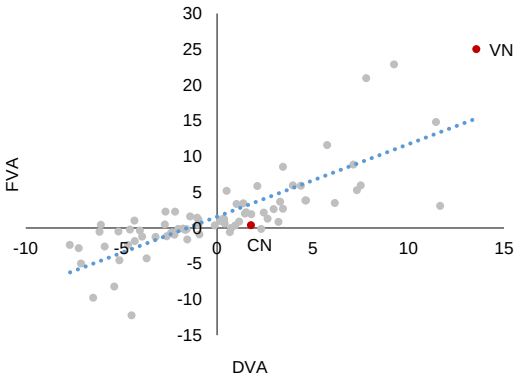
III. Spillovers to Domestic Production

9. **The benefits of participating in GVCs vary across economies.** Engaging in GVCs and incorporating more foreign value-added in exports could promote domestic value-added. Foreign and domestic value-added are complementary, completing the value chain. Consequently, domestic value-added exports have increased significantly in nominal terms, in tandem with the presence of foreign components. The empirical evidence suggests that increases in domestic value-added tend to be positively correlated with greater foreign value-added, and econometric evidence shows causality from the growth in foreign value-added to domestic value-added (Rahman and Zhao 2013). However, the outcome has differed across economies. In the ASEAN region, Vietnam stands out—despite a similar amount of foreign value-added, there appears to be limited domestic value-added (Figure 7). This outcome implies that GVC participation has not necessarily stimulated Vietnam's domestic production, leading to fewer benefits thus far.

10. **The proportion of domestic value-added embodied in an economy's gross exports is a crucial factor in determining the magnitude of its benefits from engaging in GVCs.** Breaking down the global share of domestic value-added exports entails the multiplication of two factors: (1) the global share of gross exports; and (2) the proportion of an economy's domestic value-added exports in its gross exports relative to the entire world (Appendix I.E). These two factors can be assessed from the perspective of extensive margin (global share of gross exports) and intensive margin (relative share of domestic value-added exports). Put another way, an economy can reap the benefits from GVCs through two channels—by exporting more to the world or by increasing the value-added contribution embodied in its exports.

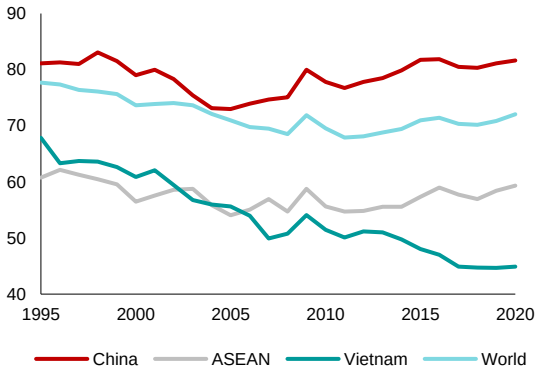
11. **The share of domestic value-added in gross exports varies widely across economies.** In China, this indicator is notably high, at about 80 percent, implying that for each unit of China's gross exports, approximately 0.8 unit is contributed by domestic inputs such as labor and/or capital. China's share has consistently surpassed both the world and ASEAN averages since 1995—their annual averages over the 1995–2020 period are 72 percent and 58 percent, respectively. In contrast, the indicator is considerably lower in Vietnam, standing at about 45 percent in 2020, a decrease from 68 percent in 1995 due to the slower pace of domestic value-added growth relative to gross export growth (Figure 8). In other words, Vietnam appears to operate as a transit hub in international trade, importing substantial value in intermediates with limited domestic value-added before exporting them.

Figure 7. The Change in Foreign and Domestic Value-Added Exports, 1995–2020
(Percent of GDP)



Sources: OECD TiVA; and AMRO staff calculations.
Note: DVA = domestic value-added exports, FVA = foreign value-added exports. CN = China; VN = Vietnam.

Figure 8. China and ASEAN: Domestic Value-Added Share in Gross Exports, 1995–2020
(Percent)



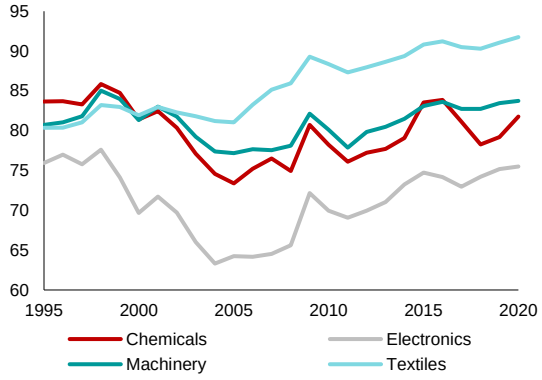
Sources: OECD TiVA; and AMRO staff calculations.

12. **The domestic content in China's exports has been consistently increasing since 2005.** In aggregate, its share of domestic value-added in gross exports rose steadily from 72 percent in 2004 to 82 percent in 2020. For example, the domestic value-added contribution from the textile industry continues to increase despite the reduction in its gross export share in the global market. This trend aligns with China's industrial transfer from low-value-added to high-value-added exports for the same products. In other industries where China is expanding its global market shares—notably machinery and electronics—domestic value-added shares in gross exports are also increasing rapidly (Figure 9). China's rising domestic content in exports may be attributed to exporters substituting domestic products for imported materials. Such substitution was facilitated by the country's liberalization of trade

and foreign direct investment, which lead to a greater variety of domestic materials becoming available at lower prices (Kee and Tang 2016).

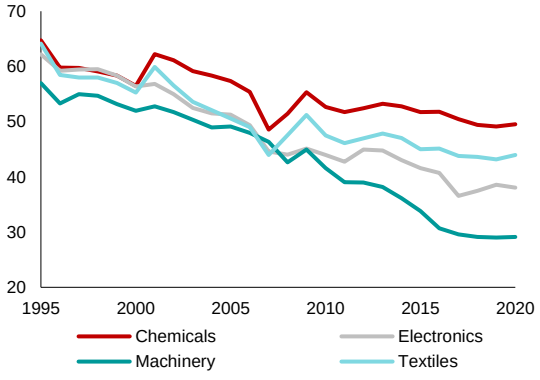
13. **In contrast, domestic contributions to gross exports in Vietnam have decreased significantly.** Across all manufacturing sectors, the share of domestic value-added in gross exports dropped from nearly 70 percent in 1995 to 45 percent in 2020. Even with Vietnam rapidly expanding its global export share since 2008, there has been a six percentage point decline in this indicator. And this drop has been consistent across all major industries. The 13 percentage point share decrease in the machinery industry from 2008 to 2020 was more than twice the overall decline in manufacturing during this period (Figure 10).

Figure 9. China: Domestic Value-Added Share in Gross Exports for Selected Industries, 1995–2020
(Percent)



Sources: OECD TiVA; and AMRO staff calculations.

Figure 10. Vietnam: Domestic Value-Added Share in Gross Exports for Selected Industries, 1995–2020
(Percent)



Sources: OECD TiVA; and AMRO staff calculations.

IV. Factors Associated with Domestic Value-Added

14. **The length of GVCs within an economy is linked to its domestic value-added.** China's GVCs lengthened prior to 2014 across most sectors and then stabilized. However, GVC length decreased in 2019, possibly because of the US-China trade conflict, but has since recovered (Figure 11). These findings are consistent with the analysis carried out on Chinese firms, which shows that the number of production stages in which a typical firm is involved increased sharply over the 1992–14 period (Chor, Manova, and Yu 2021).

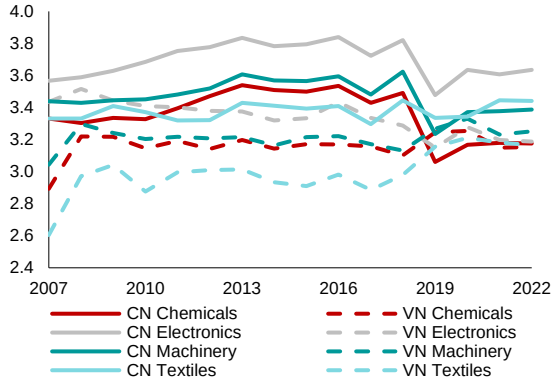
15. **China tends to have longer GVCs across various industries compared to ASEAN economies.** For example, Vietnam's GVCs remain shorter than China's across most industries despite their continuous lengthening (Figure 11). This contrast is especially pronounced in the electronics industry (Figure 12). However, the lengthening of GVCs may increase their exposure to risks and potentially render them less resilient. Thus, firms need to balance between increasing value-added and minimizing the costs of reduced resilience when deciding on the number of production stages.

16. **A country's position in GVCs impacts domestic value-added as well.** In this context, the average distance-to-final-demand across all industries can be used to make comparisons across economies. China's position in GVCs is more distant from final demand compared to ASEAN economies, indicating that its production is more concentrated upstream and has the potential to capture more value-added along GVCs (Figure 13). The indicator rose across China's industries prior to 2018 but has since shown smaller changes.

Conversely, the indicator has remained relatively stable across Vietnam's industries, suggesting that the country's production position in GVCs has not undergone significant change (Figure 14).

Figure 11. China and Vietnam: Length of GVCs for Selected Industries, 2007–2022

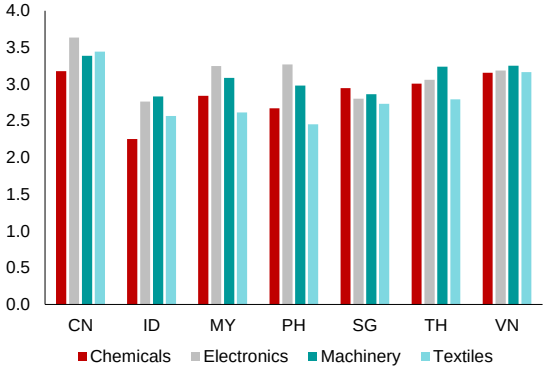
(Index)



Sources: ADB Multiregional Input-Output Database; and AMRO staff calculations.
Note: GVC length refers to the total number of stages required to produce the final goods for a specific industry. CN = China; VN = Vietnam.

Figure 12. Selected Economies: Length of GVCs for Selected Industries, 2022

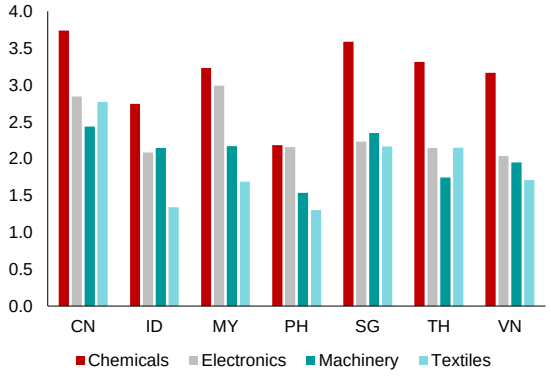
(Index)



Sources: ADB Multiregional Input-Output Database; and AMRO staff calculations.
Note: GVC length refers to the total number of stages required to produce the final goods for a specific industry. CN = China; ID = Indonesia; MY = Malaysia; PH = the Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Figure 13. Selected ASEAN+3: Distance-to-Final-Demand for Selected Industries, 2022

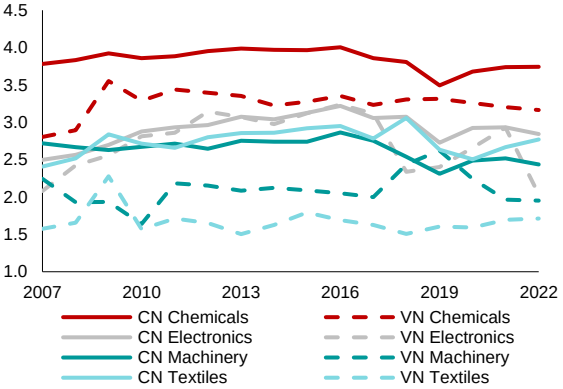
(Index)



Sources: ADB Multiregional Input-Output Database; and AMRO staff calculations.
Note: Distance-to-final-demand refers to the number of remaining stages when a particular industry in any given economy enters GVCs with inputs to produce final goods for other industries. CN = China; ID = Indonesia; MY = Malaysia; PH = the Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Figure 14. China and Vietnam: Distance-to-Final-Demand for Selected Industries, 2007–2022

(Index)



Sources: ADB Multiregional Input-Output Database; and AMRO staff calculations.
Note: Distance-to-final-demand refers to the number of remaining stages when a particular industry in any given economy enters GVCs with inputs to produce final goods for other industries. CN = China; VN = Vietnam.

17. **Several other factors may drive the differences in GVC spillovers to domestic production in individual economies.** The absence of a skilled labor force, lack of institutional and infrastructural support, and few financing options may inhibit the absorptive capacity of domestic firms to benefit from knowledge transfer by international frontier firms, preventing the economy from moving upstream in the value chain (Saia, Andrews, and Albrizio 2015; Criscuolo and Timmis 2017). Additionally, economies capable of producing a diverse range of products less commonly produced by other countries tend to capture a

larger share of domestic value-added from GVCs (Cheng and others 2015). Given that Vietnam remains an import-dependant exporter that is facing governance challenges, inadequate logistics, and shortage of skilled labor, it is unsurprising that spillover benefits from GVC participation remain relatively limited (Choi and others 2021; del Rosario and Zhao 2023).

V. Conclusion

18. **Engaging in GVCs helps to enhance domestic value-added but positive spillovers from GVC participation to domestic production differ across economies in the ASEAN+3 region.** China and ASEAN economies have augmented their global shares in both gross exports and domestic value-added exports through active participation in GVCs. Additionally, the modified RCA for their exports in knowledge-intensive sectors have improved , highlighting the benefits of technology transfer through GVC participation. However, the share of domestic value-added in gross exports in Vietnam is well below that of China's, ASEAN's, and the world average, suggesting that the former's gains from GVCs are comparatively smaller. In addition, the proportion of domestic value-added in Vietnam has been decreasing since 1995 because it is growing at a much slower rate than the foreign value-added component.

19. **Both an economy's GVC length and its position within GVCs affect its domestic contribution to exports.** For example, Vietnam has shorter GVCs than China, offering fewer opportunities for domestic contributions. Additionally, more GVC production in Vietnam is situated closer to final demand and incorporates fewer domestic inputs. As a result, Vietnam's share of domestic value-added in its gross exports is substantially lower than China's. Hence, economies in the region could benefit from global export expansion by enhancing their domestic value-added. In the ongoing global supply chain reconfiguration process, ASEAN economies, particularly Vietnam, have gained global market share across various sectors. Although this achievement contributes to GDP growth, further acceleration in growth can be achieved by increasing the proportion of domestic value-added in exported goods.

20. **The cultivation of a robust industry ecosystem is crucial for retaining more stages of a value chain within an economy.** When an economy can competitively provide a diverse range of inputs and intermediates, the sectors that previously sourced supplies from outside the country will turn to domestic suppliers and thus more production stages are likely to remain within that country. It would consequently lead to the establishment and/or growth of domestic firms and increase domestic value-added. Fostering an industry ecosystem requires government support across various domains, including infrastructure development, research and innovation, and education and training. Creating an environment conducive to foreign direct investment would help bolster the development of industry ecosystems.

21. **Policies to facilitate moving upstream in the value chain are imperative in generating more domestic value-added.** Except for raw materials, most of the upstream production in manufacturing involves advanced technologies. Thus, governments should focus on upskilling employees, enhancing the development of human capital, and promoting innovation policies. By strengthening comparative advantage through these measures, economies create the conditions necessary for moving upstream, potentially leading to increased benefits from GVCs.

Appendix I. Methodologies

A. Decomposition of Gross Exports

Following Koopman, Wang, and Wei (2014),

Gross exports = Domestic content + Foreign Content
= (VT + VS1) + VS

where:

- *VT* refers to value-added exports which include: (1) domestic value-add in direct final goods exports; (2) domestic value-add in intermediates exports absorbed by direct importers; (3) intermediates re-exported to third countries.
- *VS1* refers to domestic content in intermediate exports that finally return home which include: (1) domestic value-add in intermediates that returns via final imports; (2) domestic value-add in intermediates that returns via intermediate imports; (3) double counted intermediate exports produced at home.
- *VS* refers to foreign content which includes: (1) foreign value-add in final goods exports; (2) foreign value-add in intermediate goods exports; and (3) double-counted intermediate exports produced abroad.

B. GVC Participation Index

Following Koopman and others (2010),

$$GVC\_participation_i = \frac{IV_i}{EX_i} + \frac{FV_i}{EX_i},$$

where:

- IV_i: indirect value-added exports of economy *i.*
- FV_i: foreign value-added in gross exports of economy *i.*
- EX_i: gross exports of economy *i.*

The GVC participation is therefore the sum of:

(1) The share of indirect value-added exports in gross exports ($\frac{IV_i}{EX_i}$), also known as forward participation.

(2) The share of foreign value-added in gross exports ($\frac{FV_i}{EX_i}$), also known as backward participation.

C. Length of GVCs

Following de Backer and Miroudot (2014), the length of GVC of an industry within a country can be computed using input-output tables:

$$N = u.(I - A)^{-1}$$

where:

- N: column vector with the indexes for all *countries i* and *industries k*
- u: column unit vector
- I: identity matrix
- A: matrix of technical coefficients in the Inter-Country Input-Output model
- $(I - A)^{-1}$ is the *Leontief inverse* and follows the calculation of backward linkages.

D. Distance-to-Final-Demand

Following de Backer and Miroudot (2014), the distance-to-final-demand of a GVC of an industry within a country can be computed using input-output tables:

$$D = u.(I - G)^{-1}$$

where:

- D: column vector with the indexes for all *countries i* and *industries k*
- u: column unit vector
- I: identity matrix
- G: matrix of output coefficients
- $(I - G)^{-1}$ is known as the *output inverse* or *Gosh inverse* and follows the calculation of forward linkages.

E. Correlation between Value-Added Share and Gross Export Share

For economy *i*, its share of domestic value-added export in the world (*w*) is,

$$VA\ share_i = \frac{VA_i}{VA_w} = \frac{\frac{VA_i}{EX_i}}{\frac{VA_w}{EX_w}} * \frac{EX_i}{EX_w},$$

where:

- *VA*: domestic value-added exports
- *EX*: gross exports

Therefore, the global share of domestic value-added exports is the multiplication of two factors:

(1) Factor 1: $\frac{\frac{VA_i}{EX_i}}{\frac{VA_w}{EX_w}}$, which is the relative share of domestic value-added embodied in gross exports of economy *i* to the world.

(2) Factor 2: $\frac{EX_i}{EX_w}$, which is the share of gross exports of economy *i* to the world.

Appendix II. Classification of Manufacturing Exports

Based on Rahman and Zhao (2013), we classify OECD's manufacturing sectors into labor-intensive, capital-intensive, and knowledge-intensive categories.

Appendix Table 1. Categories of Manufacturing Exports

Categories	Sector Number	Sector Name
Labor-intensive manufacturing	C13T15	Textiles, wearing apparel, leather, and related products
	C16	Wood and products of wood and cork
	C31T33	Manufacturing n.e.c; repair and installation of machinery, and equipment
Capital-intensive manufacturing	C10T12	Food products, beverages, and tobacco
	C17_18	Paper products and printing
	C19	Coke and refined petroleum products
	C22	Rubber and plastic products
	C23	Other non-metallic mineral products
	C24_25	Basic metals and fabricated metal products
Knowledge-intensive manufacturing	C20_21	Chemicals and pharmaceutical products
	C26_27	Computer, electronic, and electrical equipment
	C28	Machinery and equipment n.e.c
	C29_30	Transport equipment

Sources: Rahman and Zhao (2013); and AMRO staff compilation.
Note: n.e.c. = not elsewhere classified.

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