Changing Patterns of Trade and Global Value Chains in ASEAN-China Free Trade Area

Yongming Huang[1], Suppakorn Khonkhlong[2*], Imam Abbas[3], Chenchen Tian[4] , Xin Li[5]

[1] Chinese Institute of Development Strategy and Planning,

Wuhan University, Wuhan, Hubei 430072 China

[2,3,4,5]School of Economics and Management,

Wuhan University, Wuhan, Hubei 430072 China

Abstract

The ASEAN-China Free Trade Area brought transformative effects on the economic and trade dynamics between China and ASEAN nations. This article aims to examine the mechanisms through free trade zones facilitate the profound integration of these economies into the global value chain. It explores the eradication of trade barriers, augmentation of bilateral trade volumes, diversification of trade structures, and the promotion of dynamic processes within FTA economic integration. By generalizing the WWZ (2013) export accounting framework, we are able to fully decompose the total value added of bilateral trade into domestic value added (DVA) and foreign value added (FVA) exports at the inter-country and sectoral levels of the ACFTA. This provides a comprehensive understanding of the different categories of goods and services that are being traded as well as the different stages of production that are involved within GVCs.We present the disaggregated decomposition results among China and ASEAN countries in selected sectors from 2000 to 2021 based on the ADB MRIO tables and show how they help us better understand the changing patterns of trade and GVCs in the ASEAN-China FTA.The results show China's escalating significance in ASEAN's trade ecosystem, marked by a pronounced export surge, particularly in intermediate and final products. These results underscore China's central role in regional supply chains and its successful ascension within the value chain, evidenced by a notable increase in DVA exports. Such advancements denote China's growing influence and a strategic shift towards higher production stages. Furthermore, the substantial rise in FVA content, alongside the variations in returned value added and double-counted content, captures economic participation and integration's dynamic and multifaceted nature, shedding light on the intricate supply chains and production processes that characterize contemporary GVCs. The ASEAN-China FTA emerges as a catalyst in this context, enhancing economic connectivity and fostering deeper integration. The FTA has promoted economic upgrading and shifting towards more complex manufacturing and service sectors by easing the exchange of goods and services regionally, thereby accelerating ASEAN's incorporation into GVCs. This has fortified economic ties and introduced a heightened level of complexity and evolved interrelations, paving the way for further collaborative growth within the region.

Keywords: Global Value Chains (GVCs); bilateral trade; decomposition; ASEAN-China FTA

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* Corresponding author

INTRODUCTION

In an era marked by rapid shifts in the global political economy, nations increasingly focus on strengthening trade relationships and supply chain resilience. These changes are driven by a collective endeavor to ensure more reliable, sustainable, and secure economic interactions in a landscape frequently disrupted by geopolitical tensions and environmental challenges. Global Value Chains (GVCs) have long been integral to international trade, intricately connecting economies across borders. The efficiency and interconnectivity of these chains have significantly influenced economic growth and development strategies. However, recent global economic trends, such as rising protectionism and a heightened focus on sustainable and ethical practices, are prompting a reevaluation of these complex networks. This shift underscores the need to understand how GVCs are being reshaped to adapt to these emerging global priorities.

The ASEAN-China Free Trade Agreement (FTA) is a pivotal development in this evolving landscape, established as a cornerstone of economic cooperation between China and ASEAN. This agreement, encompassing a diverse range of economies from a rapidly developing region, has been instrumental in shaping trade patterns and policies. It is a testament to the growing importance of regional trade agreements in the global economic order. This research focuses on dissecting the influence of the ASEAN-China FTA on GVCs, offering vital insights into how such agreements reshape trade patterns and economic policies in the context of the changing global political economy. The literature on China's economic interactions with ASEAN countries within GVCs presents a multifaceted analysis of evolving trade dynamics and regional integration. Taguchi and Zhao (2021) examine China's shift from backward to forward linkages in GVCs, highlighting lesser linkage with ASEAN compared to the US and Japan, attributing this to logistics performance disparities. Peng et al. (2020) reveal the impacts of China's trade agreements and the Belt and Road initiative on GVC upgrades, noting differentiated and spillover effects across various country groups. Yu et al. (2020) discuss the ASEAN-China regional value chain's role in advancing China's manufacturing enterprises up the GVC, mainly through knowledge-intensive manufacturing. Ewa (2023) delves into the intensity of value-added trade flows between ASEAN and China, observing significant changes and a growing role for China. ASEAN economies lose upstream positions but engage more strongly in GVCs and regional value chains (RVCs). These studies underscore the complex, dynamic nature of GVCs, the strategic implications of economic policies, and the transformative power of economic cooperation in shaping the regional economic landscape.

The study aims to intricately analyze the bilateral trade flow decomposition between China and ASEAN nations under the China-ASEAN FT framework, seeking to illuminate the complex interplay between regional trade agreements and global trade dynamics within GVCs. It scrutinizes how these interactions influence GVC dynamics, particularly emphasizing the resilience, reliability, and sustainability of these trade relationships. By evaluating the shifts in DVA and FVA exports, the research highlights the evolving role of China and ASEAN countries in the regional and global economy and the implications of these shifts for economic upgrading and integration. The study also aims to understand the policy implications of these shifts, focusing on China's developed economy and the developing economies within ASEAN, and assesses how the FTA contributes to or challenges these aspects in international trade, considering the broader context of technological advancements and economic strategies.

Utilizing a methodological blend of input-output analysis and bilateral trade flow decomposition, this research paints a detailed portrait of the ASEAN-China FTA's multifaceted economic, environmental, and social ramifications. This approach sheds light on the intricate web of direct and indirect effects the FTA exerts across diverse economic sectors and stakeholders within the member nations. The study's primary objective is to enrich the discourse on international trade dynamics, providing empirical insights that assist policymakers and various stakeholders in effectively navigating the complexities inherent in GVCs under regional trade agreements.

THEORETICAL BACKGROUND

This section will provide a literature review and a theoretical framework relevant to the synergy between input-output analysis, global value chains (GVCs), bilateral trade flow decomposition, and the impact of trade agreements. A comprehensive understanding of economic activities across borders is crucial in the complex landscape of international trade. Integrating input-output analysis, GVCs, and bilateral trade flow decomposition is pivotal.

Input-output analysis is a foundational quantitative method that maps out interdependencies between different sectors of an economy, illustrating how output from one industry is used as input by another (Leontief, 1951). This analysis is critical to unraveling the intricate web of global production networks, particularly within GVCs. In these chains, products are no longer made in a single location; their creation spans multiple geographies, with value added at each stage. IO analysis aids in quantifying this value addition, revealing each

participant's contribution in the chain, from design to manufacturing, marketing, and distribution (Porter, 1985; Krugman, 1991; Gereffi et al., 2005).

By incorporating the knowledge gained from the literature into the wider frameworks of GVCs and bilateral trade flow deconstruction, we can gain a more detailed understanding of the mechanisms that influence global trade dynamics and economic interdependencies. The seminal research conducted by Baldwin and Lopez-Gonzalez (2013) establishes the groundwork for this integration by charting global supply-chain trends, which are crucial for comprehending the operational structure of GVCs. This study highlights the significance of efficiency and geographic distribution in the operation of GVCs, offering a broad perspective on the worldwide interconnections of products and services. The study undertaken by Borin and Mancini (2015) enhances our comprehension by analyzing the value-added in trade, providing a key viewpoint on how bilateral trade flows can be broken down to uncover the nuanced contributions of different countries to the global value chain. This deconstruction is crucial for policymakers and economists to ascertain the specific roles that nations play within GVCs, allowing for the development of focused plans to improve their economic situations and maximize their ability to benefit from these networks. The introduction of average propagation lengths by Dietzenbacher and Romero in 2007, which was further utilized in their subsequent study in 2005, offers a methodological advancement for tracking interregional production chains. This technique significantly enhances our understanding of GVCs by providing a method to measure the interdependence of economies and the extent to which they are integrated into global production networks. These insights are essential for comprehending the potential of GVCs to withstand and be susceptible to regional disturbances. Escaith and Inomata (2016) provide light on the regional dynamics and the impact of trade facilitation policies on shaping GVCs in East Asia. Their analysis illustrates the impact of regional economic integration and policy environments on the formation and development of GVCs, emphasizing the significance of policy frameworks in promoting efficient trade flows and economic cooperation.

In addition, the studies conducted by Hummels, Ishii, and Yi (2001) and Johnson and Noguera (2012) focus on the analysis of vertical specialization and the measurement of intermediates in trade, respectively. These studies are crucial for analyzing the structure of GVCs, revealing how countries focus on specific manufacturing phases and how commerce including value-added components may be precisely quantified and assigned to different countries. It is essential to perform a thorough analysis of bilateral trade flow decomposition in order to gain a clear understanding of how economic advantages are distributed and the

characteristics of international trade interactions. The methodological innovations made by Koopman et al. (2010; 2014) enhance our capability to track value-added in global production chains, specifically addressing important concerns like double counting. This improves the accuracy of analyzing bilateral trade flows, offering a more distinct understanding of global economic contributions and the complexities of participating in global value chains. The creation of the Eora global multi-region Input-Output database by Lenzen et al. (2012; 2013) is a major advancement in economic modeling, providing in-depth understanding of the global economic framework. This database is crucial for assessing GVCs and bilateral trade flows, since it provides detailed data that is essential for comprehending the intricate network of global economic activity and their environmental consequences. Collectively, these studies provide a thorough framework for examining GVCs and breaking down bilateral trade flows. They emphasize the interdependence of global economies and the significance of effective, policy-based trade facilitation. These studies emphasize the requirement for advanced analytical tools and methodologies to navigate the intricacies of international trade, enabling stakeholders to fully utilize the economic development and integration potential of GVCs.

Bilateral trade flow decomposition enriches this analysis by breaking down the trade flow between two countries into its components, such as the types of goods traded and the stages of production involved. This decomposition offers a detailed view of the trade relationship, revealing how trade between two countries often involves a series of value-added processes embedded within GVCs (Koopman, Wang and Wei, 2014). This is particularly relevant in trade agreements like the ASEAN-China FTA, where understanding the nuances of bilateral trade flows is critical to evaluating the agreement's impact (Baldwin, 1998; Gereffi et al., 2005). In the multifaceted realm of international trade, the ASEAN-China FTA presents a dynamic case for examining the intricate connections within GVCs in the region. This research delves into the theoretical underpinnings of the relationship between bilateral trade balance, bilateral exports, and bilateral trade decomposition and how these aspects contribute to understanding the complex web of GVCs (Anderson and van Wincoop, 2003; Feenstra et al., 2005; Hummels and Klenow, 2005; Johnson and Noguera, 2012; Koopman, Wang and Wei, 2014). Each analytical dimension offers unique insights into the economic integration and interdependencies shaped by the FTA, providing a comprehensive understanding of the regional trade dynamics and their global implications. This paper has three points discussed by analyzing bilateral trade balance, bilateral exports, and bilateral trade decomposition that

are deeply related to IO analysis, especially when examining their impact within the context of GVCs and trade agreements like the ASEAN-China FTA as follows:

1) The bilateral trade balance between China and ASEAN countries is critical to each nation's economic role and position within GVCs. A surplus or deficit in trade might reflect a country's economic health and role as a supplier of raw materials, a manufacturer of intermediate goods, or a final consumer. The shifts in trade balances, influenced by the FTA, signal changes in the GVCs, indicating the relocation of manufacturing bases, variations in sourcing inputs, and broader economic and policy trends. This analysis facet helps understand countries' economic weight and influence within the GVCs, revealing the direct impact of policy changes on trade dynamics.

2) The composition of bilateral exports between China and ASEAN countries sheds light on the types of goods and services traded and where countries specialize within the GVCs. This analysis is crucial for understanding the nature of economic specialization, whether in upstream activities like providing raw materials or in more sophisticated downstream activities like assembly and finishing. Moreover, the value-added in exports reveals the technological advancement and sophistication of industries in the region. A higher value-added generally indicates a more significant and advanced role in the GVC, suggesting a move beyond simple manufacturing to more complex and technologically intensive stages.

3) Decomposing the bilateral trade flows provides a granular view of the types of goods and services exchanged and the stages of production involved. This decomposition is instrumental in mapping out how countries are integrated into GVCs and the nature of their economic participation. It highlights the direct and indirect linkages between economies, showing how intermediate goods and services flow between countries and contributes to the final products. This detailed view underlines the interdependencies within the GVCs and provides a basis for understanding the intricate economic relationships shaped by the FTA.

From the three discussion points above, the context of GVCs and IO analysis can show how the country's position influences trade balances in the global production network — whether it is a provider of raw materials, intermediate goods, or end products. IO analysis is particularly well-suited for decomposing trade flows into their constituent parts. It can separate the domestic and foreign content of exports and imports, providing a detailed view of bilateral

trade relationships and how they fit into larger GVC structures. It can reveal the value added processes and the interdependencies that characterize the country's role in GVCs. Integrating insights from the bilateral trade balance, exports, and trade decomposition allows for comprehensive mapping of the GVCs in the China-ASEAN region. This approach not only elucidates the movement of goods and services within the network but also highlights the economic impact and interdependencies among countries. Analyzing these aspects before and after the implementation of the FTA reveals how the agreement has reshaped GVCs, showing changes in trade patterns, shifts in production stages, and alterations in the role countries play within the GVCs. The theoretical exploration of bilateral trade balance, bilateral exports, and bilateral trade decomposition provides a nuanced understanding of the GVCs in the China-ASEAN region. It underscores the importance of comprehensive analysis in capturing the complex economic interactions and dependencies that define regional trade dynamics, shaped significantly by the ASEAN-China FTA. This theoretical background lays a solid foundation for empirical analysis, promising insights rich in detail and broad scope.

DATA AND METHODOLOGY

1. Data

The input-output (IO) analytical framework systematically studies the interrelationships of an economy's industries by using each other's products as inputs to production for their respective outputs. The primary data source for this type of macroeconomic analysis is an IO Table, which describes flows of goods and services that took place in a specific geographic region and a particular accounting period. Estimating bilateral export, bilateral trade balance, value-added exports, or domestic value added in a country's gross exports alone can be accomplished by directly applying the standard Leontief (1936) decomposition similar to the decomposition of GDP by country industry pair, which does not require decomposing international intermediate trade flows. However, uncovering the value-added structure of gross trade at a disaggregated level requires finding a way to decompose intermediate trade into value-added and double-counted components, which cannot be achieved by simply multiplying the Leontief inverse and final demand because gross bilateral intermediate trade flows need to be estimated first from an inter-country input-output (ICIO) model for any given level of final demand before they can be properly decomposed.

The primary data of this paper is that the Asian Development Bank (ADB) has produced Multiregional Input-Output (MRIO) Tables building on the World Input-Output Database (Timmer et al. 2015), which are the multiregional input-output tables and derived indicators across multiple economies covering various periods. Input-output tables provide a detailed picture of an economy through which mutual interrelationships among the producers and consumers in that economy can be systematically quantified. This dataset provides statistics for the bilateral trade balance to analyze cross-border production arrangements at the local, regional, and global levels. This paper also uses a database for trade analysts that provides trade-in value added indicators and principal GVC indicators for trade and policy analysis constructed by RIGVC UIBE. The data used for accounting for the decomposition of gross trade flows and GVC indicator construction are from well-compiled ICIO tables from ADB that have different features in terms of industry classifications, number of economies, years, and the treatment of processing trade.

2. Methodologies for decomposition of gross exports flows

WWZ (2013) framework completely decomposes gross exports into (1) exports of value-added, (2) domestic value-added that returns home, (3) foreign value-added, and (4) double-counted intermediate trade. Identifying which parts of the official data are double counted and the sources of the double counting goes beyond simply extracting value-added trade from gross trade and recovers additional helpful information about the structure of international production sharing at a disaggregated level masked by gross trade data. Country s's gross exports to Country r can be decomposed as follows:

$$
\begin{aligned}
E^{sr} = & \underbrace{(V^s B^{ss})^T \# Y^{sr}}_{(1)-DVA\_FIN} + \underbrace{(V^s L^{ss})^T \#(A^{sr} B^{rr} Y^{rr})}_{(2)-DVA\_INT} \\
& + \underbrace{(V^s L^{ss})^T \# \left[A^{sr} \sum_{t \neq s,r}^G B^{rt} Y^{tt} + A^{sr} B^{rr} \sum_{t \neq s,r}^G Y^{rt} + A^{sr} \sum_{t \neq s,r}^G B^{rt} \sum_{u \neq s,t}^G Y^{tu} \right]}_{(3)-DVA\_INTrex} \\
& + \underbrace{(V^s L^{ss})^T \# \left[A^{sr} B^{rr} Y^{rs} + A^{sr} \sum_{t \neq s,r}^G B^{rt} Y^{ts} + A^{sr} B^{rs} Y^{ss} \right]}_{(4)-RDV\_G} \\
& + \underbrace{\left[(V^s L^{ss})^T \#(A^{sr} B^{rs} \sum_{t \neq s}^G Y^{st}) + (V^s L^{ss} \sum_{t \neq s}^G A^{st} B^{ts})^T \#(A^{sr} X^r) \right]}_{(5)-DDC} \\
& + \underbrace{\left[(V^r B^{rs})^T \# Y^{sr} + \left(\sum_{t \neq s,r}^G V^t B^{ts} \right)^T \# Y^{sr} \right]}_{(6)-FVA\_FIN} \\
& + \underbrace{\left[(V^r B^{rs})^T \#(A^{sr} L^{rr} Y^{rr}) + \left(\sum_{t \neq s,r}^G V^t B^{ts} \right)^T \#(A^{sr} L^{rr} Y^{rr}) \right]}_{(7)-FVA\_INT} \\
& + \underbrace{\left[(V^r B^{rs})^T \#(A^{sr} L^{rr} E^{r*}) + \left(\sum_{t \neq s,r}^G V^t B^{ts} \right)^T \#(A^{sr} L^{rr} E^{r*}) \right]}_{(8)-FDC}
\end{aligned}
$$

$$(1)$$

This transparent framework completely decomposes gross exports into:

(1) exports of value-added that include three categories: the first category, $(V^s B^{ss})^T \# Y^{sr}$ is domestic value added (DVA) embodied in final goods exports (DVA_FIN); the second category, $(V^s L^{ss})^T \#(A^{sr} B^{rr} Y^{rr})$ is DVA in intermediate exports used by direct importer (Country r) to produce local final goods consumed in r (DVA_INT); and the third category includes: $(V^s L^{ss})^T \#(A^{sr} \sum_{t \neq s,r}^{G} B^{rt} Y^{tt})$ is DVA in intermediate exports that are used by Country r to produce intermediates that it re-exports to third Country t for production of local final goods; $(V^s L^{ss})^T \#(A^{sr} \sum_{t \neq s,r}^{G} B^{rt} Y^{rt})$ is DVA in intermediate exports used by Country r to produce final goods that it re-exports to third Country t; and $(V^s L^{ss})^T \#(A^{sr} \sum_{t \neq s,r}^{G} B^{rt} \sum_{u \neq s,t}^{G} Y^{tu})$ is DVA in intermediate exports used by Country r to produce intermediates that it re-exports to third Country t for production of final goods exports that are shipped to other countries (including the direct importer, Country r) except Country s. The third category is DVA in intermediate exports used by the direct importer (Country r) to produce exports ultimately consumed by other countries except s (DVA_INTrex). These three categories are all DVA embodied in Country s's gross exports to Country r and ultimately absorbed abroad, which are value-added exports (labeled as VAX by Johnson and Noguera (2012)) associated with gross export flows based on backward industrial linkages, WWZ (2013) name them collectively as VAX_G.

(2) domestic value-added that returns home is DVA in intermediate exports that are returned to Country s and consumed at home (RDV_G). It also includes $(V^s L^{ss})^T \#(A^{sr} B^{rr} Y^{rs})$, DVA that returns home via its final imports from the direct importer (r); $(V^s L^{ss})^T \#(A^{sr} \sum_{t \neq s,r}^{G} B^{rt} Y^{ts})$, DVA that returns home via final imports from third countries; $(V^s L^{ss})^T \#(A^{sr} B^{rs} Y^{ss})$, DVA that returns home via its intermediate imports and is used to produce domestic final products. It is summing across all sectors and trading partners.

(3) foreign value-added that includes two categories: the first category is summing of foreign value added (FVA) from the importer (r) embodied in final exports and FVA from other Countries (t) embodied in final exports (FVA_FIN) includes $(V^r B^{rs})^T \# Y^{sr}$, is FVA from the importer (r) embodied in final exports and $(\sum_{t \neq s,r}^{G} V^t B^{ts})^T \# Y^{sr}$, is FVA from other Countries (t) embodied in final exports; and the second category is summing of FVA from the importer (r) embodied in intermediate exports, which are then used by importer (r) to produce its domestic final goods and FVA from third Country t embodied in intermediate exports, which are then used by importer (r) to produce its local final goods (FVA_INT) that also includes $(V^r B^{rs})^T \#(A^{sr} L^{rr} Y^{rr})$, is FVA from the importer (r) embodied in intermediate exports, which are then used by r to

produce its domestic final goods and $(\sum_{t\neq s,r}^{G} V^t B^{ts})^T \#(A^{sr} L^{rr} Y^{rr})$, is FVA from third Country t embodied in intermediate exports, which are then used by Country r to produce its local final goods.

(4) double-counted intermediate trade also includes two categories: the first category is the summing of $(V^s L^{ss})^T \#(A^{sr} B^{rs} \sum_{t\neq s}^{G} Y^{st})$, DVA embodied in its intermediate exports to Country r but return home as its intermediate imports and used for production of its final exports, which are parts of DVA in Country s's final exports and are already counted once and $(V^s L^{ss} \sum_{t\neq s}^{G} A^{st} B^{ts})^T \#(A^{sr} X^r)$, DVA in intermediate exports to Country r that returns home as intermediate imports and used for production of its intermediate exports. It is also a domestic double-counted portion caused by the back-and-forth intermediate trade to produce intermediate exports in Country s (DDC); the second category is double-counted terms in Country s's gross exports originating from foreign countries (FDC). It also includes $(V^r B^{rs})^T \#(A^{sr} L^{rr} E^{r*})$, FVA from the importer (r) embodied in intermediate exports to produce its exports, which is a pure double counted term of r's value added in s's exports, and $(\sum_{t\neq s,r}^{G} V^t B^{ts})^T \#(A^{sr} L^{rr} E^{r*})$, FVA from third Country t embodied in intermediate exports to produce its exports to the world.

As demonstrated through the numerical analysis of China and ASEAN countries in the main finding, the components of bilateral trade balance, gross export, and bilateral trade decomposition represent distinct facets of cross-country production sharing arrangements. These components provide invaluable insights into the upstream value added structures of a country's gross exports within various GVCs, offering a nuanced understanding of each nation's economic participation and integration under ASEAN-China FTA.

MAIN FINDING

The complexities of bilateral trade balance, bilateral exports, and trade decomposition within the dynamic realm of Global Value Chains (GVCs), this research unveils critical findings about the economic tapestry of the China-ASEAN region. Our investigation navigates through the nuanced interplay of trade dynamics, policy impacts, and GVC integration shaped significantly by the ASEAN-China FTA (FTA) as follow findings.

1. Tracing the trade dynamics from the bilateral trade balance

We will thoroughly examine the specifics of the bilateral trade balance data to comprehend the intricacies of manufacturing facilities and the acquisition of input resources. We will also examine the evolution of countries' economic significance and impact within GVCs, particularly emphasizing the shifting of manufacturing facilities and fluctuations in sourcing practices. This analysis aims to provide insights into the specific influence of the ASEAN-China FTA on trade dynamics and the resulting modifications in the GVCs.

Table 1 China-ASEAN bilateral trade balance in Total (Unit: million $)

		Trade Partners									
		PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
		2000									
	PRC		-345.36	-304.46	140.54	189.00	-191.01	4.68	17.96	107.37	452.68
	INO	345.36		-240.65	368.57	-525.45	70.81	-0.29	-604.29	71.26	-1770.41
	MAL	304.46	240.65		392.41	796.16	110.09	0.88	524.83	67.03	-1969.94
Country/Region	PHI	-140.54	-368.57	-392.41		205.51	-287.23	0.03	19.34	-2.98	-864.31
	THA	-189.00	525.45	-796.16	-205.51		562.06	121.65	-1.16	160.96	-1051.98
	VIE	191.01	-70.81	-110.09	287.23	-562.06		0.87	2.46	0.64	-1540.84
	LAO	-4.68	0.29	-0.88	-0.03	-121.65	-0.87		0.02	-3.78	-14.14
	BRU	-17.96	604.29	-524.83	-19.34	1.16	-0.64	-0.003		-0.10	-200.49
	CAM	-107.37	-71.26	-67.03	2.98	-160.96	-158.46	3.78	0.10		-196.20
	SIN	-452.68	1770.41	1969.94	864.31	1051.98	1540.84	14.14	200.49	196.20	
		2007									
	PRC		-907.52	-417.11	-1644.96	2208.68	4106.26	18.53	-8.05	608.69	-5027.49
	INO	907.52		459.70	667.56	-2035.98	-3484.13	-16.22	-1357.22	123.57	-9879.71
	MAL	417.11	-459.70		930.50	1939.51	983.09	3.28	782.94	64.78	-5550.00
Country/Region	PHI	1644.96	-667.56	-930.50		-319.19	-959.02	0.10	17.26	0.01	-3667.14
	THA	-2208.68	2035.98	-1939.51	319.19		1129.83	311.16	-48.86	452.26	-4346.04
	VIE	-4106.26	3484.13	-983.09	959.02	-1129.83		2.51	0.79	382.46	-5338.68
	LAO	-18.53	16.22	-3.28	-0.10	-311.16	-2.51		-0.46	0.29	-192.77
	BRU	8.05	1357.22	-782.94	-17.26	48.86	-0.79	0.465		0.36	-369.75
	CAM	-608.69	-123.57	-64.78	-0.01	-452.26	-382.46	-0.29	-0.36		-127.80
	SIN	5027.49	9879.71	5550.00	3667.14	4346.04	5338.68	192.77	369.75	127.80	
		2014									
	PRC		13756.89	2486.39	3070.41	2300.95	13196.76	-1240.94	330.64	1999.65	-13270.25
	INO	-13756.89		4213.19	2186.86	-2086.29	29.54	-28.97	-225.66	257.01	-5921.56
	MAL	-4213.19	-4213.19		2576.33	-324.11	-163.66	22.43	-2197.41	-135.40	-4848.92
Country/Region	PHI	-3070.41	-2186.86	-2576.33		-1474.93	-1477.08	-16.18	-2.68	-1.50	-1790.92
	THA	-2300.95	2086.29	324.11	1474.93		2469.62	3464.56	-314.94	955.22	-3969.72
	VIE	-13196.76	-29.54	163.66	1477.08	-2469.62		-335.07	-48.16	855.88	-6432.11
	LAO	1240.94	28.97	-22.43	16.18	-3464.56	335.07		-0.07	2.10	-363.95
	BRU	-330.64	225.66	2197.41	2.68	314.94	48.16	0.069		-1.01	-284.18
	CAM	-1999.65	-257.01	135.40	1.50	-955.22	-855.88	-2.10	1.01		-879.13
	SIN	13270.25	5921.56	4848.92	1790.92	3969.72	6432.11	363.95	284.18	879.13	
		2021									
	PRC		-192.16	9525.76	13874.96	6619.41	49303.83	-1151.93	-13.95	4840.75	-19182.91
Coun try/R	INO	192.16		7443.57	8293.58	-729.44	3343.12	-1.59	150.71	174.31	-7765.84
	MAL	-9525.76	-7443.57		2946.58	35.69	6604.91	16.75	1945.37	129.45	-3531.18

	PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
PHI	-13874.96	-8293.58	-2946.58		-4309.36	-3276.38	-0.60	-443.64	-18.31	-3882.38
THA	-6619.41	729.44	-35.69	4309.36		8332.74	1188.22	-297.72	1737.59	-5101.77
VIE	-49303.83	-3343.12	-6604.91	3276.38	-8332.74		-183.92	-789.50	-2412.21	-6190.69
LAO	1151.93	1.59	-16.75	0.60	-1188.22	183.92		-0.24	5.35	-92.53
BRU	13.95	-150.71	-1945.37	443.64	297.72	789.50	0.241		-14.81	-323.88
CAM	-4840.75	-174.31	-129.45	18.31	-1737.59	2412.21	-5.35	14.81		-2471.87
SIN	19182.91	7765.84	3531.18	3882.38	5101.77	6190.69	92.53	323.88	2471.87	

Source: ADB MRIO (2022); UIBE GVC Database (2022)

Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam; LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

Table 1 displays the bilateral trade balances between China and ASEAN countries from 2000 to 2021, showcasing a notable shift in China's trade relationships and regional economic sway. China experienced significant changes in its trade dynamics during this period, as its trade deficit with Thailand and Vietnam transformed into a substantial surplus. This alteration indicates a developing trend in commerce and a growing supremacy in the manufacturing and shipment of more valuable commodities. Likewise, China's surplus in the trade relationship with Singapore has notably grown, suggesting possible changes in Singapore's role within the GVCs and China's expanding economic sway. At first, Indonesia, Malaysia, and Thailand had favorable trade surpluses with China, but by 2021, these countries shifted towards unfavorable trade deficits. This modification signifies the region's changing competitive landscape, possibly due to China's improving manufacturing capabilities or shifts in the distribution of regional resources. More precisely, Vietnam's shift from having more exports than imports to a significant trade deficit underlines its growing participation in GVCs, as it now imports an incredible amount of intermediate goods from China for manufacturing and re-exporting.

The data suggests a more extensive transformation in manufacturing and assembly operations in the region, as evidenced by shifts in trade balances in countries such as Vietnam and Thailand. These shifts reflect the evolving roles of these countries in the production process. The shift from surplus to deficit with China indicates a rise in the importation of raw materials or components for domestic industries or involvement in global value chains. The initiation of the ASEAN-China FTA in 2007 brought about a significant shift in trade patterns. This can be attributed to the decrease in tariffs and non-tariff barriers, which impacted economic interactions and potentially led to a greater reliance of ASEAN countries on Chinese products. It also facilitated their integration into GVCs that China predominantly controls. The increasing trade deficits that most countries have encountered with China in recent years may suggest China's

growing dominance as a leading manufacturing hub, owing to its advanced technology, infrastructure, and production capacity. Simultaneously, ASEAN is witnessing the emergence of potential specialization patterns, with Singapore and Malaysia possibly transitioning towards higher-value industries while Vietnam and Thailand strengthen their manufacturing sectors. The complex interplay of mutually advantageous and competitive relationships indicates that specific ASEAN countries are improving their competitiveness in the manufacturing industry while also playing a complementary role within China's economic system.

The bilateral trade balance data from 2000 to 2021 reveals significant shifts in the economic relationships between China and ASEAN countries, indicating broader changes in manufacturing locations, sourcing strategies, and overall economic positioning within global value chains (GVCs). The alterations, prompted by the ASEAN-China FTA, worldwide economic patterns, and regional development strategies, have substantially affected ASEAN's trade dynamics, demonstrating its objective to expand trade partnerships, strengthen industries, and reduce overreliance on collaborators.

2. The evolution of GVCs across the export

By analyzing gross exports, intermediate exports, and final goods and services, we can discern each country's specific types of goods, offering valuable insights into economic specialization within the global value chain. Focusing on intermediate exports allows us to evaluate the worth and categorize the intermediate goods being exchanged. Typically, these goods are raw materials or partially processed products utilized in subsequent production processes. A significant volume of intermediate goods exports suggests that a country plays a crucial role as a supplier within GVCs, with high levels of such trade between countries indicating strong integration within regional production networks. Identifying patterns that reveal whether specific ASEAN countries predominantly obtain their intermediate goods from China or if the exchange is more balanced, reflecting mutual dependency or diversified supply sources, is essential. Examining the final goods and services data reveals countries with a larger share of final goods exports, likely indicating more engagement in downstream activities within the GVCs. These activities can include assembly, finishing, and branding, which are critical for adding value and defining a country's niche in the global market.

Table 2 China-ASEAN gross export in Total (Unit: million $)

		Destination									
		PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
2000											
Country/Region	**PRC**		2958.45	3351.53	567.91	2256.49	995.82	4.68	109.10	117.25	4652.80
	INO	3303.81		2797.17	522.21	955.69	353.06	1.07	39.11	73.39	382.66
	MAL	3655.99	3037.83		1609.03	3484.83	720.22	2.15	529.99	92.24	9523.71
	PHI	427.37	153.64	1216.61		765.85	75.86	0.08	21.02	2.06	1095.00
	THA	2067.49	1481.14	2688.67	560.34		838.60	369.50	43.82	169.44	2069.60
	VIE	1186.83	282.25	610.13	363.09	276.54		1.47	2.46	180.61	397.98
	LAO	0.00	1.37	1.26	0.05	247.85	0.61		0.02	1.71	1.28
	BRU	91.14	643.41	5.16	1.69	44.98	1.83	0.01		0.10	89.59
	CAM	9.88	2.12	25.21	5.04	8.47	22.15	5.49	0.20		56.46
	SIN	4200.11	2153.07	11493.64	1959.32	3121.58	1938.82	15.42	290.08	252.66	
2007											
Country/Region	**PRC**		10895.48	18124.81	4844.58	12894.80	7681.58	20.96	173.75	646.92	14626.82
	INO	11803.00		8036.42	1320.08	2494.09	792.33	21.00	60.85	129.73	7172.76
	MAL	18541.92	7576.72		2928.18	8636.04	2677.36	4.13	939.96	142.97	14981.82
	PHI	6489.55	652.52	1997.68		1491.62	423.11	0.11	19.84	11.84	1970.64
	THA	10686.11	4530.08	6696.52	1810.81		1605.98	632.54	57.94	488.43	3175.77
	VIE	3575.32	4276.46	1694.27	1382.13	476.14		3.46	3.74	463.46	608.46
	LAO	2.43	37.23	0.85	0.01	321.38	0.95		0.01	0.46	1.06
	BRU	181.80	1418.07	157.01	2.58	106.79	2.96	0.48		0.67	76.56
	CAM	38.23	6.16	78.19	11.83	36.16	81.00	0.18	0.31		94.24
	SIN	19654.31	17052.47	20531.81	5637.79	7521.81	5947.14	193.84	446.31	222.04	
2014											
Country/Region	**PRC**		34541.62	32872.47	9430.27	23156.99	32694.11	725.19	441.55	2313.15	29238.39
	INO	20784.73		13516.67	2982.52	7115.71	2065.82	5.16	164.98	274.79	18067.75
	MAL	30386.08	9303.48		4156.77	11145.98	4525.07	23.76	1335.28	226.64	20503.28
	PHI	6359.86	795.66	1580.44		2226.64	757.27	0.28	50.65	17.99	3436.16
	THA	20856.04	9202.00	11470.09	3701.57		5922.81	3683.32	112.58	1169.17	9477.52
	VIE	19497.35	2036.28	4688.73	2234.35	3453.20		320.50	15.95	1337.12	1909.47
	LAO	1966.13	34.14	1.33	16.47	218.75	655.58		0.02	2.10	8.89
	BRU	110.91	390.64	3532.69	53.33	427.51	64.11	0.09		0.36	656.20
	CAM	313.49	17.77	362.04	19.49	213.95	481.24	0.004	1.37		151.03
	SIN	42508.64	23989.31	25352.20	5227.08	13447.24	8341.58	372.84	940.38	1030.16	
2021											
Country/Region	**PRC**		56814.66	57884.79	26854.25	52664.21	120314.57	1554.41	481.18	5874.79	45777.22
	INO	57006.82		13857.79	9066.41	9327.43	8055.33	1.93	183.20	199.33	9426.59
	MAL	48359.03	6414.21		4852.73	10214.58	11761.21	20.50	2192.06	256.04	16963.18
	PHI	12979.29	772.83	1906.15		1845.57	1166.92	0.49	70.06	18.95	3509.17
	THA	46044.80	10056.87	10178.89	6154.93		15668.07	3535.40	117.56	1963.60	7079.20
	VIE	71010.74	4712.21	5156.30	4443.30	7335.33		1041.11	55.64	1806.78	3323.20
	LAO	2706.33	3.52	3.75	1.09	2347.18	1225.04		0.02	5.44	3.83
	BRU	495.13	32.49	246.69	513.70	415.28	845.14	0.26		0.37	163.74
	CAM	1034.04	25.02	126.59	37.26	226.01	4218.99	0.09	15.18		141.45
	SIN	64960.13	17192.43	20494.36	7391.55	12180.97	9513.88	96.36	487.62	2613.32	

Source: ADB MRIO (2022); UIBE GVC Database (2022)

Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam;
LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

Table 2 shows the gross exports between China and ASEAN countries, indicating a substantial increase in China's exports to the region over time. The significant export increase to nations like Thailand and Vietnam between 2000 and 2021 demonstrates a growing economic alliance and a change in their positions within GVCs. China's diverse range of exports indicates its growing participation in both upstream activities, such as supplying raw materials or intermediate goods, and downstream activities, such as providing final goods and services. Indonesia and Malaysia's notable exports to China indicate their role in providing raw materials. Simultaneously, the rising trade imbalances may indicate a growing pattern of ASEAN nations importing intermediate and finished products from China, indicating a change in their economic focus and a more extensive involvement in different stages of global value chains. Vietnam's significant increase in exports and imports from China highlights its growing integration into manufacturing GVCs, potentially transitioning from simple assembly to more complex manufacturing operations. The data clarifies each country's distinct areas of expertise within the GVCs. Countries that consistently experience growth in the export of final goods and services or a significant increase in the export of technologically advanced goods or services are likely transitioning towards more advanced downstream activities. These trends indicate technological advancements, more excellent value added to industries, and improved economic status.

Moreover, the trade of goods between China and ASEAN countries demonstrates the changing roles and degrees of integration within GVCs. Countries shifting from primary exporters of raw materials to major importers of intermediate goods are undergoing a more profound integration into regional and global production networks. These export trends offer policymakers valuable insights into the changing economic landscape and require formulating strategies to improve their country's position in GVCs. For example, an increase in the importation of intermediate goods could lead to actions aimed at expanding domestic manufacturing capabilities or entering into more advantageous trade agreements. Analyzing the gross export data from 2000 to 2021 between China and ASEAN countries provides valuable insights into evolving economic relationships, specialization within GVCs, and the dynamic nature of trade in goods and services. These trends indicate the region's complex and changing economic landscape, influenced by broader economic strategies, technological advancements, and policies like the ASEAN-China FTA.

Table 3 China-ASEAN intermediate export in Total (Unit: million $)

		PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
						Destination					
						2000					
Country/Region	PRC		1612.30	2002.34	298.32	1453.95	596.56	0.00	63.11	75.46	2433.29
	INO	2991.05		2212.44	295.03	587.69	292.61	0.32	26.48	33.41	267.96
	MAL	3299.13	2150.01		1265.88	2727.11	542.89	0.57	316.59	67.59	5513.64
	PHI	325.40	83.48	1056.35		652.84	57.26	0.02	13.56	1.28	753.30
	THA	1693.17	964.01	1954.69	267.25		540.66	157.57	21.57	84.88	1031.63
	VIE	926.23	182.59	425.50	52.19	202.50		0.59	1.39	26.07	156.71
	LAO	0.00	1.19	0.98	0.03	245.51	0.39		0.01	1.70	1.10
	BRU	82.56	638.64	3.46	1.05	41.19	1.04	0.01		0.04	79.62
	CAM	7.71	1.06	22.24	0.99	6.29	17.76	1.58	0.13		6.72
	SIN	2666.99	1681.59	8593.19	917.86	2154.67	479.49	6.78	151.40	33.07	
						2007					
Country/Region	PRC		6534.04	9334.84	2491.04	8978.17	4318.55	0.87	102.16	442.75	7208.75
	INO	10307.85		6456.55	729.33	1846.41	589.55	0.60	41.85	60.51	4725.63
	MAL	16339.29	5618.39		2281.40	6740.41	2119.79	0.78	530.28	94.29	10409.76
	PHI	5697.23	378.75	1481.72		1164.39	358.99	0.03	14.05	3.71	1607.08
	THA	9030.20	3424.62	4492.22	505.00		1004.45	347.81	31.38	207.60	2529.93
	VIE	2895.97	1898.01	937.96	505.17	240.48		0.02	2.08	141.99	358.15
	LAO	1.52	37.11	0.55	0.01	296.29	0.52		0.01	0.33	0.94
	BRU	169.44	1409.94	137.06	1.51	93.78	1.43	0.468		0.06	63.93
	CAM	29.17	2.71	58.77	3.45	25.09	54.90	0.06	0.20		35.70
	SIN	15034.26	8735.62	15258.77	3474.79	5027.30	2530.64	71.39	217.35	70.83	
						2014					
Country/Region	PRC		21328.68	19320.56	5720.28	14241.60	26941.08	339.64	249.42	1650.22	20129.00
	INO	17040.11		10221.83	1811.04	5462.40	1583.00	0.90	51.51	60.54	12314.96
	MAL	24876.41	5727.93		2921.47	7510.84	3098.30	6.97	819.03	98.77	15560.79
	PHI	4357.47	517.60	1140.26		1588.49	604.16	0.11	40.16	8.92	2803.91
	THA	17489.57	6943.19	7341.20	1788.16		4188.74	2127.16	61.87	399.96	6994.04
	VIE	15779.06	1310.45	3167.97	917.16	848.44		138.44	9.90	675.19	1059.85
	LAO	1762.18	33.64	0.75	16.37	164.33	502.99		0.02	0.13	4.42
	BRU	83.82	374.59	3324.92	50.64	421.85	58.38	0.068		0.15	624.22
	CAM	216.67	5.47	121.08	2.78	145.15	329.63	0.00	0.54		67.10
	SIN	34259.03	13647.93	18105.15	3633.01	10063.78	5435.52	151.66	650.75	591.03	
						2021					
Country/Region	PRC		30573.50	36377.86	16774.33	32035.09	83540.54	999.27	323.86	4212.11	33978.14
	INO	50007.76		10997.46	5644.15	5905.34	5020.34	0.85	118.93	68.42	6673.98
	MAL	40456.37	2348.84		2348.84	6004.04	8591.32	7.51	1449.60	202.89	11759.52
	PHI	10709.20	507.20	1359.79		1237.45	752.80	0.21	42.85	11.43	2683.39
	THA	30402.66	7153.10	6755.64	2302.18		10976.30	2363.38	64.28	1075.46	5032.30
	VIE	46691.74	3245.75	2791.09	1103.98	4213.65		580.92	45.04	1123.60	1448.41
	LAO	2497.87	2.96	2.04	0.63	1660.19	1119.16		0.01	3.06	1.79
	BRU	431.22	6.23	184.41	481.95	395.16	783.91	0.027		0.12	100.99
	CAM	354.12	12.34	52.73	3.07	92.21	2694.92	0.02	1.64		81.31
	SIN	49986.87	11246.83	14143.29	4382.87	7895.77	7508.09	47.55	443.49	1808.64	

Source: ADB MRIO (2022); UIBE GVC Database (2022)

Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam;
LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

Table 3 presents data on the intermediate exports traded between China and ASEAN countries, indicating a significant increase in the volume of intermediate goods exchanged in recent years. This rise indicates a progressive integration into GVCs, characterized by more complex trade relationships where countries are closely interconnected through the exchange of intermediate goods crucial for production processes. China's increasing export of intermediate goods to Thailand, Vietnam, and Malaysia highlights its growing importance as a critical supplier in the region's GVCs. China likely exports raw materials and advanced components, aligning with its economic progress. The notable intermediate exports from Indonesia and Malaysia to China indicate their functions as resource hubs or suppliers of specific components within GVCs. Meanwhile, the increasing imports of these goods from China may suggest a growing dependence or a heightened engagement in more complex manufacturing processes that require Chinese inputs. Moreover, the increasing trade of intermediate goods between Vietnam, Thailand, and China indicates their rapid assimilation into advanced manufacturing GVCs, transitioning from simple assembly to more complex production stages.

The growing diversity and advanced technological capabilities of intermediate exports demonstrate economic advancement and progression within the value chain for these nations. This trend suggests that countries are taking on more intricate production duties and improving the complexity of their industries, moving towards manufacturing more intricate and higher-value final products. The enactment of the ASEAN-China FTA and the subsequent decrease in trade obstacles likely facilitated this transfer of intermediate goods, resulting in heightened integration of the regional economies and reorganization of their involvement in Global Value Chains. The analysis of intermediate exports between China and ASEAN countries from 2000 to 2021 highlights the ever-changing nature of economic specialization and integration within GVCs. This indicates a change in roles and a rise in the technological complexity of traded goods. This data offers vital insights into comprehending the changing attributes of regional economic collaboration and the strategic placement of each country within the global economic framework.

Table 4 China-ASEAN final goods and services exports in total (Unit: million $)

				Destination					
PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
2000									
PRC	1346.15	1349.18	269.59	802.53	399.26	4.68	45.99	41.79	2219.51

| | Destination | | | | | | | | | |
	PRC	INO	MAL	PHI	THA	VIE	LAO	BRU	CAM	SIN
INO	312.76		584.73	227.19	368.00	60.46	0.76	12.64	39.97	114.69
MAL	356.86	887.81		343.15	757.72	177.33	1.58	213.40	24.66	4010.07
PHI	101.97	70.16	160.27		113.01	18.60	0.06	7.47	0.78	341.71
THA	374.32	517.14	733.98	293.08		297.94	211.93	22.25	84.56	1037.97
VIE	260.60	99.66	184.63	310.90	74.05		0.88	1.07	154.53	241.27
LAO	0.00	0.18	0.28	0.02	2.35	0.21		0.01	0.01	0.18
BRU	8.59	4.76	1.70	0.64	3.79	0.79	0.005		0.06	9.97
CAM	2.17	1.07	2.97	4.06	2.18	4.40	3.91	0.08		49.74
SIN	1533.13	471.48	2900.46	1041.46	966.91	1459.33	8.64	138.68	219.59	
2007										
PRC		4361.44	8789.98	2353.55	3916.63	3363.03	20.09	71.59	204.18	7418.07
INO	1495.15		1579.86	590.75	647.68	202.78	20.41	19.00	69.22	2447.13
MAL	2202.63	1958.33		646.77	1895.62	557.57	3.35	409.68	48.69	4572.06
PHI	792.31	273.77	515.96		327.23	64.11	0.08	5.79	8.13	363.56
THA	1655.91	1105.45	2204.31	1305.81		601.52	284.73	26.55	280.83	645.84
VIE	679.35	2378.45	756.31	876.96	235.66		3.44	1.66	321.47	250.30
LAO	0.91	0.12	0.30	0.00	25.09	0.43		0.00	0.14	0.12
BRU	12.36	8.13	19.95	1.08	13.01	1.53	0.007		0.61	12.63
CAM	9.06	3.45	19.42	8.38	11.07	26.10	0.12	0.11		58.54
SIN	4620.06	148.09	5273.05	2163.00	2494.51	3416.50	122.45	228.96	151.21	
2014										
PRC		13212.94	13551.91	3709.98	8915.38	5753.03	385.54	192.13	662.93	9109.39
INO	3744.62		3294.84	1171.48	1653.31	482.82	4.26	113.47	214.24	5752.79
MAL	5509.67	3575.56		1235.30	3635.14	1426.77	16.79	516.25	127.87	4942.49
PHI	2002.39	278.05	440.17		638.14	153.11	0.18	10.49	9.07	632.24
THA	3366.47	2258.81	4128.90	1913.41		1734.07	1556.15	50.70	769.21	2483.48
VIE	3718.28	725.83	1520.76	1317.19	2604.76		182.06	6.05	661.93	849.62
LAO	203.95	0.49	0.58	0.09	54.43	152.59		0.00	1.98	4.47
BRU	27.09	16.05	207.77	2.69	5.67	5.73	0.020		0.22	31.98
CAM	96.83	12.30	240.97	16.71	68.80	151.61	0.00	0.83		83.93
SIN	8249.61	10341.38	7247.06	1594.07	3383.46	2906.06	221.18	289.62	439.12	
2021										
PRC		26241.16	21506.93	10079.92	20629.11	36774.03	555.14	157.32	1662.68	11799.08
INO	6999.06		2860.32	3422.26	3422.09	3034.99	1.08	64.27	130.91	2752.60
MAL	7902.66	2400.84		2503.89	4210.54	3169.89	12.99	742.46	53.15	5203.66
PHI	2270.09	265.63	546.36		608.13	414.12	0.28	27.21	7.52	825.78
THA	15642.14	2903.77	3423.25	3852.75		4691.77	1172.01	53.28	888.14	2046.90
VIE	24319.00	1466.45	2365.21	3339.32	3121.69		460.19	10.60	683.18	1874.78
LAO	208.46	0.56	1.71	0.47	686.98	105.87		0.01	2.38	2.04
BRU	63.91	26.26	62.28	31.75	20.12	61.23	0.235		0.25	0.25
CAM	679.92	12.68	73.86	34.18	133.80	1524.08	0.07	13.54		60.14
SIN	14973.26	5945.59	6351.06	3008.68	4285.21	2005.79	48.82	44.13	804.68	

Source: ADB MRIO (2022); UIBE GVC Database (2022)

Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam; LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

Table 4 presents data on the finished goods and services exported between China and ASEAN countries from 2000 to 2021. It emphasizes a significant increase in China's completed product exports to Malaysia, Thailand, and

Vietnam. This trend demonstrates China's increasing importance as a significant supplier of finished goods, in line with its economic progress and a transition towards more advanced and valuable manufacturing processes. This trend highlights China's rise to a higher position in the global value chain. In contrast, Indonesia and Malaysia exhibit contrasting patterns in exporting finished products and services to China. These patterns may indicate that these nations are either supplying unique final goods and services or experiencing increased importation of consumer goods from China. This reflects economic growth and a rise in consumer demand in these countries. Moreover, the development of Vietnam and Thailand's export capacities, shifting from basic goods to more complex and finished products, demonstrates their advancing manufacturing capabilities and upward movement in the value chain.

The increasing scale and diversity of exported final products and services are essential indicators of technological advancement and economic improvement. An uptick in the exportation of sophisticated technology or widely recognized finished products and services indicates that nations are progressing in their industries and transitioning towards more lucrative activities with added value. This indicates a gradual advancement towards more complex phases in the GVCs, where nations are taking on increased accountability and expertise in manufacturing. The rise in the export of finished goods to countries such as Singapore may indicate its function as a center for consumption, suggesting the growth of economic ties and the expansion of consumer markets and industrial capabilities in the area. Moreover, the expanding consumer markets in ASEAN countries, driven by economic expansion, rising incomes, and changing consumer preferences, are likely to be a significant factor in the rise of imports of finished products from China.

The export data of final goods and services between China and ASEAN countries provides valuable insights into economic specialization, the creation of added value, and technological advancement within GVCs. The data demonstrates these countries' changing and developing roles in the global economy, highlighting a transition from basic manufacturing methods to more sophisticated, technology-oriented production. This analysis is essential for comprehending the evolving dynamics of international trade and the strategic alignment of nations within the broader economic framework.

The data from Tables 2 to 4 suggests a probable alteration in the economic dynamics of China and ASEAN countries within GVCs. These countries have shifted from being significant exporters of intermediate goods used in production to becoming more prominent in exporting finished goods and services. This

indicates a significant development in their responsibilities, including earlier and later production phases, with a growing emphasis on downstream operations as countries such as China advance in the value chain. Indonesia, Malaysia, and Thailand are recognized for their substantial participation in upstream activities, marked by a notable level of intermediate exports that reflect the production of raw materials and intermediate goods. Nevertheless, an upward trend in finished goods and services exports indicates a transition towards increased participation in downstream activities involving the assembly and finalization of end products. Vietnam is experiencing a notable shift from mainly engaging in activities at the beginning of the supply chain to adopting more balanced positions in GVCs. This shift reflects Vietnam's economic advancement and growing integration, as evidenced by a substantial increase in exports of intermediate goods and finished products.

The analysis also uncovers different degrees of advancement among other ASEAN nations. The Philippines, Laos, Brunei, and Cambodia exhibit varying levels of progress in transitioning towards more advanced manufacturing and services. On the other hand, Singapore, being a highly developed and prosperous economy, continues to hold a strong position in lucrative industries. This is supported by its significant gross exports and the probability of its intermediate exports consisting of specialized components and services. The substantial and potentially expanding volume of exported final goods and services from Singapore further proves its prominent position in advanced manufacturing and services. China's position as a crucial player in GVCs is emphasized by its unwavering and robust capacity to export across all sectors. China's economic growth and expansion into more advanced manufacturing industries are evident through a significant rise in final goods and services production. The ASEAN-China FTA, in conjunction with other global economic factors, has probably had a significant impact in facilitating these transformations by enhancing market entry, diminishing trade barriers, and enticing investment.

An analysis of the gross export, intermediate export, and final goods and services between China and ASEAN countries demonstrates a dynamic and evolving economic structure of various functions and integration within GVCs. The unique trajectory of each country is influenced by its economic policies, competitive advantages, and broader shifts in regional and global patterns of production and trade. The changing nature of these roles reflects the flexible and responsive economic environment in which these nations function, with significant consequences for their future positioning and strategies in the global economy.

3. Complex connections in GVCs between China-ASEAN

We analyze the complex details of the trade exchanges between China and ASEAN countries using the advanced disaggregated accounting framework developed by WWZ (2013) mentioned earlier. This framework can decompose the gross exports into five distinct components: domestic value-added exported and absorbed by other regions (DVAex), domestic value-added exported but eventually returned (DVArt), double counted domestic content (DDC), foreign value-added in gross exports (FVA), and double counted foreign content (FDC). This decomposition is a methodological improvement that allows us to analyze the intricate network of economic interconnections and production stages that shape and propel GVCs.

This section offers a comprehensive comprehension of the composition of China's exports to ASEAN countries, showcasing the specific categories of goods and services traded and clarifying the different stages of production involved. This analysis is crucial for understanding China's integration into GVCs and economic participation in exports. By examining the direct and indirect connections established by China's exports, we can ascertain the movement of intermediate goods and services from China to its ASEAN counterparts, thereby enhancing the production of their end products.

3.1 China's role in ASEAN by the structure of DVA

Examining the disaggregated accounting framework for China's exports to ASEAN countries provides valuable insights into the changing dynamics of economic relationships and integration within GVCs. The dataset spanning from 2000 to 2021 encompasses information on domestic value added exports (DVAex), domestic value added exports that returned home (DVArt), and domestic double-counted content (DDC). This dataset offers a comprehensive perspective on the trade dynamics and China's regional impact.

Table 5: China's DVA export to ASEAN countries in total (Unit: million $)

Year	DVAex	DVArt	DDC	DVAex	DVArt	DDC	DVAex	DVArt	DDC
	Indonesia			Malaysia			Philippines		
2000	2489.86	21.83	6.03	2727.10	59.12	12.96	481.18	1.91	0.87
2007	8255.56	106.75	64.46	13114.88	434.77	219.33	3485.06	77.75	61.84
2014	27748.24	416.15	201.57	25097.86	1420.26	446.37	7466.49	180.98	75.99
2021	44293.18	1362.24	459.89	42313.20	3735.30	1101.76	20254.35	759.27	337.31
	Thailand			Viet Nam			Lao		
2000	1908.58	21.01	4.94	826.70	13.95	2.99	3.83	0.00	0.00
2007	9953.23	240.85	101.77	5785.82	93.87	48.76	14.89	0.00	0.00

Year									
2014	18325.98	577.95	161.82	24870.70	1509.96	526.29	568.97	16.47	4.11
2021	41231.20	2104.72	479.11	86370.85	8466.81	2369.61	1243.76	37.14	10.21
	Brunei			Cambodia			Singapore		
2000	93.15	0.86	0.20	99.58	0.17	0.15	3712.63	69.43	14.38
2007	139.71	1.42	0.79	519.32	1.45	2.14	10482.67	371.51	159.13
2014	375.04	5.38	1.81	1917.02	19.33	9.55	22456.26	1749.33	429.04
2021	397.71	9.63	3.09	4928.36	141.39	35.34	34079.57	3589.59	856.96

Source: ADB MRIO (2022); UIBE GVC Database (2022)
Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam; LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

The analysis of Table 5, employing the WWZ (2013) framework, demonstrates a distinct pattern of increasing economic linkages and escalating complexity within GVCs, as indicated by the substantial increase in DVAex, DVArt, and DDC in China's exports to ASEAN countries. Indonesia, Malaysia, and the Philippines have witnessed a significant increase in DVAex, which indicates the growing impact of China's expanding influence. This is evident in the rising supply of intermediate goods and final products from China over the years. This demonstrates their increasing participation in the production processes of these economies. The rise in DVArt, specifically in Malaysia, the Philippines, Thailand, and Vietnam, indicates complex multi-phase production processes in which value-added Chinese products are imported again for further processing or assembly. Similarly, the increase in DDC in these countries is a consequence of the increasing complexity and interdependence within GVCs, where goods are often counted multiple times as they cross borders for further stages of production.

Vietnam's rapid industrialization and integration into GVCs closely linked to China is evidenced by its impressive growth in DVAex and DVArt. The substantial increase in DVArt in Thailand and Vietnam suggests intricate production linkages with China, as these countries exchange goods and services at various stages of production. The rise in DDC, specifically in Vietnam and Singapore, emphasizes the growing complexity of trade and production processes, where goods undergo multiple transformations within the region. Brunei, Cambodia, and Singapore have all seen some growth in DVAex, but Singapore stands out with a substantial increase. This is primarily because of its robust economic ties and extensive integration with China. The substantial growth of Singapore's DVArt and the consistent increase in DDC reflect complex economic dynamics, possibly involving re-exports or advanced manufacturing processes. In these processes, Singapore adds value to Chinese inputs before exporting them back.

These trends highlight the complexity and diversity of modern GVCs, which the ASEAN-China FTA dramatically influences. The variations in value

added and double-counted content across different countries underscore the diverse and ever-changing nature of economic participation and integration in the region. Comprehending these dynamics is crucial for policymakers and businesses aiming to navigate and benefit from the opportunities presented by this complex economic environment as these countries persist in integrating and progressing within GVCs.

3.2 Structures of China's FVA in ASEAN

A thorough examination of foreign value-added (FVA) and double-counted foreign content (FDC) in China's exports to ASEAN nations uncovers the complex trade relationships and production complexities that define the region's integration into global value chains. We understand the extent and characteristics of economic interconnections and the changing regional production and commerce patterns.

Table 6: China's FVA export to ASEAN countries in total (Unit: million $)

Year	FVA	FDC	FVA	FDC	FVA	FDC
	Indonesia		Malaysia		Philippines	
2000	325.23	76.58	284.09	220.28	61.84	14.66
2007	1848.66	363.80	2197.22	1711.29	774.92	319.64
2014	4710.94	854.58	3172.60	2151.58	1233.05	304.19
2021	9139.58	1559.76	5892.78	4841.74	4413.35	1089.97
	Thailand		Viet Nam		Lao	
2000	218.33	74.96	104.34	34.42	0.78	0.00
2007	1632.49	692.55	1156.41	412.70	5.41	0.02
2014	2641.55	1053.55	2649.34	2559.42	111.81	10.49
2021	6107.07	2742.11	12394.12	10713.18	235.48	27.82
	Brunei		Cambodia		Singapore	
2000	10.76	2.82	11.74	4.02	462.03	321.11
2007	76.81	34.31	76.81	34.31	2043.45	1201.43
2014	43.67	9.97	234.19	96.48	1911.81	2244.87
2021	57.57	13.18	455.64	314.07	2714.15	4536.95

Source: ADB MRIO (2022); UIBE GVC Database (2022)
Note: PRC = China; INO = Indonesia; MAL = Malaysia; PHI = Philippine; THA = Thailand; VIE = Vietnam; LAO = Lao; BRU = Brunei; CAM = Cambodia; SIN = Singapore

From 2000 to 2021, Indonesia, Malaysia, and the Philippines witnessed a substantial increase in FVA, signifying greater incorporation of foreign elements in Chinese exports and implying a deep integration of China into the regional and global economy. This trend is reinforced by the notable rise in FDC, specifically for Malaysia and the Philippines, which highlights the complex multinational value chains that define the modern manufacturing industry. These networks entail acquiring components from different countries for processing and

subsequent multiple re-exports, highlighting the intricate interconnections of contemporary production systems.

The significant increase in FVA, particularly in Vietnam, Thailand, and Laos, highlights a growing dependence on imported resources due to the expansion of their manufacturing sectors. Simultaneously, a significant rise in FDC for Thailand and Vietnam demonstrates these countries' high degree of integration within regional GVCs, where goods and services traverse borders multiple times during various stages of production. The relatively modest increase in Laos's FVA and the modest growth observed in Brunei and Cambodia suggest that these economies are smaller and less interconnected. On the other hand, Singapore exhibits a significant rise in both FVA and FDC, which indicates its highly developed economy, complex trade features, and crucial involvement in re-exporting and value-adding endeavors. These findings confirm Singapore's strong presence in both local and international networks of economic value. At the same time, the gradual growth in Cambodia's involvement indicates its emerging participation in complex production systems.

Analyzing China's FVA and FDC exports to ASEAN countries reveals a clear trend of increasing foreign content and production networks' complex, multifaceted nature. This trend signifies an intricate and interdependent supply chain and production process system that spans multiple countries. In this system, different parts and components frequently cross multiple borders before reaching their final state. The notable increase in the incorporation of foreign content being counted twice underscores these production chains' complex and diverse nature, illustrating the expanding interconnectedness and interdependence among nations for trade and economic advancement. The rise in FVA and FDC among ASEAN nations indicates a progressive transition towards more advanced and interconnected economic structures within GVCs. The current shift, characterized by the complex nature of contemporary manufacturing and trade networks, emphasizes the crucial role of interconnected supply chains and the growing interdependence among nations in stimulating trade and economic expansion.

The analysis of China's export patterns to ASEAN countries, as presented in Tables 5 and 6, demonstrates a complex and dynamic network of trade relationships and manufacturing interdependencies within the framework of the ASEAN-China FTA. This analysis consolidates the consequences of the DVA and FVA data, emphasizing the more comprehensive framework and influence of the ASEAN-China FTA. The data reveals a significant increase in DVA across most ASEAN countries, indicating China's growing importance and influence. This trend reflects the increasing prevalence of complex and multi-stage production

processes in which Chinese resources are used to manufacture products in ASEAN nations. These processes often involve intricate supply chains that span multiple countries. Subsequently, these products are often re-imported into China for further processing. Simultaneously, the notable increase in FVA in Chinese exports over time highlights China's expanding integration into the global economy and its dependence on various inputs to produce goods for ASEAN markets. The concurrent rise in FDC highlights the significant impact of global value chains, demonstrating the frequent movement of goods and services across multiple borders and their subsequent transformations.

The DVA and FVA data integration reveals China and ASEAN nations' complex and mutually reliant trade dynamics. The ASEAN-China FTA has presumably had a crucial impact in facilitating these intricate trade flows and production connections by reducing trade obstacles and fostering a more liberalized trade atmosphere. The rising domestic value added indicates that ASEAN countries are taking on a more significant role in China's supply chain. This could lead to their progression up the value chain as they engage in more intricate production activities. Moreover, the increasing foreign value added to China's exports suggests that ASEAN economies are becoming more deeply connected to complex and elaborate global production networks. The intricate DVA and FVA patterns witnessed in China's exports to ASEAN countries highlight the growing economic integration facilitated by the ASEAN-China FTA. This agreement has stimulated a more interconnected and dynamic regional economic environment, enabling advanced and intricate trade and production connections. The insights obtained from DVA and FVA data are crucial for comprehending the challenges and opportunities the FTA brings, assisting in the strategic planning for future economic collaboration and expansion within the region as countries adjust to this evolving scenario.

CONCLUSION

This paper has thoroughly examined the complex economic relationships between China and ASEAN countries by comprehensively analyzing bilateral trade imbalances, total exports, intermediate exports, final goods and services exports, domestic value added (DVA), and foreign value added (FVA). The results demonstrate notable changes in trade imbalances, indicating the changing roles in the regional economy and competitive environments, influenced by broader economic strategies, technological advancements, and the ASEAN-China FTA.

China's growing importance is apparent in its significant rise in exports to ASEAN nations, specifically in producing intermediate and final goods. This demonstrates China's pivotal position in the region's supply chains and its progress in moving up the value chain. The shift towards more advanced production stages is highlighted by significant growth in DVA exports, demonstrating China's expanding role and influence. Simultaneously, the significant rise in FVA content and the fluctuations in returned value-added and double-counted content demonstrate economic participation and integration's multifaceted and dynamic nature, emphasizing the complex network of supply chains and production processes that define modern GVCs.

The ASEAN-China FTA plays a crucial role in these dynamics by strengthening economic interconnection and integration. The FTA has promoted economic upgrading and a transition towards more sophisticated manufacturing and services by facilitating the seamless regional exchange of goods and services. Additionally, it has likely expedited the integration of ASEAN countries into GVCs. This has strengthened economic connections, heightened intricacy, and transformed relationships, creating a region conducive to additional collaboration and expansion.

Finally, the knowledge obtained from this extensive examination is precious for policymakers, businesses, and stakeholders to formulate strategies for the future of the China-ASEAN economic corridor. This study highlights the significant impact of economic cooperation and agreements on the changing and developing relationship. It provides valuable insights for future efforts in the interconnected and intricate global trade and production world.

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