ISSN: 2288-7709
JEMM website: https://accesson.kr/jemm
doi: http://doi.org/10.20482/jemm.2025.13.6.55

Trade-in-Value-Added Analysis of East Asian Production Networks: Focusing on Changes during the First Trump Administration

Woocheol LEE[1]

Received: October 24, 2025. Revised: November 24, 2025. Accepted: December 26, 2025.

Abstract

Purpose: This study examines how the U.S.–China trade conflict during the first Trump administration (2017–2020) reshaped the structure of East Asian production networks from a trade-in-value-added (TiVA) perspective. **Research design, data and methodology:** Using the Asian Development Bank's multiregional input–output tables (MRIOT, 2007–2023, constant 2010 USD), the paper constructs a six-economy framework—China, Japan, Korea, Taiwan, Vietnam, and the Rest of the World—and reclassifies 35 industries into six technology-based sectors (PP, RB, LT, MT, HT, Services). The analysis measures each country's domestic value-added share (DVA) and value-added exports (VAX) ratios. **Results:** Results show that, while DVA remained stable overall, Korea and Taiwan experienced a sharp rise during the Trump years, whereas China's share declined modestly. Bilateral VAX ratios reveal declining interdependence among China, Japan, and Korea but rising linkages with Vietnam. **Conclusions:** These findings suggest a transition from a hub-and-spoke to a multi-hub network structure in East Asia's manufacturing value chains.

Keywords : East Asian Production Network, Multiregional Input-Output Analysis, Trade-in-Value-added Analysis, Domestic Value-added Share, Value-added Exports(VAX) Ratio, US-China Trade Conflict.

JEL Classification Code : C67, F43, F62

1. Introduction

During his first term, President Donald Trump identified reducing the U.S. trade deficit with China and promoting the reshoring of manufacturing industries as key national policy priorities. Beginning in 2018, the administration implemented a series of trade measures against China—including high tariffs, restrictions on technology transfer, and tighter investment screening—which had widespread repercussions throughout global production networks. These actions also disrupted the structural stability of East Asia's manufacturing-centered production networks, leading to significant changes in regional patterns of industrial specialization and value creation.

Since the 1980s, East Asia's production network has evolved into a complex and functionally segmented system in which Japan, Korea, and Taiwan supply capital goods and key components, while China and emerging ASEAN economies—especially Vietnam—perform labor-intensive assembly processes. Through this multilayered division of labor encompassing parts, intermediates, and final assembly stages, countries such as Japan, Korea, Taiwan, Vietnam, and China have developed highly interdependent linkages that maximize manufacturing efficiency (Kimura & Ando, 2005; Humphrey & Schmitz, 2002).

1 First Author. Associate Professor, Gyeongsang National University, Korea. Email: w.lee226@gnu.ac.kr

However, since 2018, the combined effects of the Trump administration's tariff policies and the accelerating pressure for supply chain reconfiguration have altered both the connectivity and comparative advantage structures of these regional networks. For instance, Vietnam and Taiwan have emerged as major assembly and component production bases in the electronics and ICT sectors, while Korea and Japan have strengthened their roles as independent supply hubs in advanced materials and semiconductor equipment. These transformations extend beyond shifts in trade volumes—they represent a structural realignment of value-added creation pathways and the technological and functional specialization among countries.

Existing studies have primarily focused on macro-level trade fluctuations or the direct tariff effects of the U.S.–China trade conflict (Bown, 2021; Amiti et al., 2019; Fajgelbaum et al., 2019), or they have used international input–output tables to examine its implications for global value chains (Inoue & Todo, 2019; Wu et al., 2021; Mao & Görg, 2020). A growing body of research has also explored East Asian countries' adaptive responses to supply chain disruptions (Rha et al., 2023; Kim & Cho, 2024; Hayakawa, 2024). Yet, relatively few studies have empirically assessed the impact of Trump's first-term trade policies on East Asia's production networks using value-added-based trade indicators, particularly the VAX ratio—a key measure of domestic value-added embodied in exports introduced by Johnson and Noguera (2012).

To fill this gap, this paper analyzes how the U.S.–China trade conflict affected East Asia's manufacturing production networks through the lens of value-added trade. The analysis utilizes the Asian Development Bank's Multiregional Input–Output (MRIOT) Tables spanning 2007–2023, covering five major manufacturing economies—Taiwan, Vietnam, Japan, China, and Korea—along with a Rest-of-the-World (ROW) aggregate. The original dataset comprises 35 industries, of which 16 belong to manufacturing. These manufacturing sectors are reclassified into five technology-based groups—(1) PP (Primary Products), (2) RB (Resource-Based Industries), (3) LT (Low-Tech Industries), (4) MT (Medium-Tech Industries), and (5) HT (High-Tech Industries)—while all service sectors are aggregated into a single category.

Based on this reconstructed dataset comprising six economies and six aggregated sectors, the study calculates each country's domestic value-added share and VAX ratio over the 2007–2023 period. When computing the VAX ratio, instead of using year-by-year total exports (the conventional denominator), this study employs the period-average total export value to minimize the influence of annual fluctuations in trade volumes. This adjustment enables a more stable estimation of structural changes in value-added generation, independent of short-term trade volatility.

The key findings are as follows. First, domestic value-added shares—reflecting the contribution of domestic firms and labor to export value—remained relatively stable for all countries except Vietnam between 2007 and 2023 (see Figure 1). Vietnam's domestic value-added share fell sharply from 66% in 2007 to 43% in 2022, including during Trump's first term, before rebounding to 55% in 2023. Korea and Taiwan recorded gains of up to 9 percentage points, peaking in 2020, while China's share declined from 88% to 85%. This pattern suggests that Korea and Taiwan benefited relatively, whereas China experienced a loss of domestic value capture amid the U.S.–China trade conflict. Despite Vietnam's expansion as an alternative assembly base, its domestic firms and labor have not captured substantial value-added gains.

Second, by industry (see Table 3), China continues to exhibit a high concentration in primary-product industries, while Korea and Taiwan have steadily increased their shares in high-technology sectors. Third, with respect to VAX ratios (see Figure 2), China recorded high ratios in trade with Korea and Taiwan, Japan–Korea–Taiwan exhibited high ratios in trade with China, and Vietnam showed elevated ratios in trade with Korea. However, during Trump's first term, VAX ratios fluctuated markedly across nearly all countries except Taiwan (see Figure 3): ratios vis-à-vis China declined sharply, while those vis-à-vis Vietnam rose. Industry-level data (see Table 4) show that 59% of all sectoral VAX ratios fell, with particularly pronounced declines in medium- and high-technology manufacturing sectors.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on value-added trade and the impact of the U.S.–China trade conflict on global production networks. Section 3 presents the data construction process and analytical framework. Section 4 discusses the empirical results concerning the interdependence and value-added structure of East Asia's regional production networks. Section 5 concludes with policy implications.

2. Literature Review

The evolution of global production networks has simultaneously promoted both fragmentation and concentration of production processes, thereby deepening the interdependence among participating economies. The international spread of production sharing has led to a dramatic expansion of trade in intermediate goods, making it increasingly important to analyze how much value added each country creates and retains in international trade (Feenstra, 1998). With the development of international input–output (IIO) databases, it has become possible to quantify complex cross-border flows of intermediates and the associated value-added movements in a standardized and comparable manner.

Pioneering studies such as Daudin et al. (2011), Dietzenbacher (2001), Johnson and Noguera (2012), and Koopman et al. (2014) demonstrated that international input–output tables enable value-added-based trade analysis not only at the country level but also across industries. This approach moves beyond conventional trade volume analysis, allowing researchers to empirically address the question of "who creates value added for whom" within production networks.

Global value chain (GVC) theory emphasizes how power relations, technological capabilities, and governance structures shape value capture across fragmented production networks (Gereffi et al., 2005; Humphrey & Schmitz, 2002). In vertically specialised industries where tasks cross borders multiple times, technological dependence and the position of economies within the chain strongly influence domestic value-added retention. TiVA-based indicators such as DVASH and VAX operationalize these theoretical ideas by quantifying how much domestic value is retained at each production stage and how value-added flows between economies evolve as supply-chain structures shift.

Trade Fragmentation Theory further highlights how shocks—including tariffs, investment restrictions, and policy uncertainty—can reconfigure the geography of intermediate production (Baldwin & Freeman, 2022). In such contexts, economies with complementary technological capabilities may strengthen their hub-like positions, while others experience declines in value-added capture. By examining DVASH and VAX over time, this study empirically traces how these underlying theoretical mechanisms manifest in East Asia's evolving production networks.

However, value added generated in global production networks is not distributed evenly across participating economies. The functional roles performed by each country are closely linked to their technological capabilities, which in turn determine their relative shares of value creation. Timmer et al. (2015) argued that developing economies tend to capture smaller shares of value added in global value chains (GVCs) compared with what is implied by gross trade statistics. Kordalska and Olczyk (2023) emphasized that differences in functional positions—between high-value activities such as product design or R& D and low-value tasks such as sewing or assembly—produce structural inequalities in value capture. Similarly, Lee (2024) found that trade between Korea and Vietnam exhibits an asymmetric distribution of gains, with Korea benefiting disproportionately.

This structural asymmetry has been conceptually illustrated by the "smile curve" hypothesis (Coveri & Zanfei, 2023; Stöllinger, 2021), which depicts higher value added at the upstream and downstream stages of production compared to the midstream assembly phase. Recent studies further argue that such asymmetries have socio-economic consequences within countries. For instance, Coveri et al. (2024) analyzed the relationship between an economy's functional position and income inequality, finding that deeper integration into complex industries tends to exacerbate inequality in middle- and low-income countries, whereas concentration in downstream activities increases inequality in high-income economies.

The economic ascent of East Asian countries can be largely explained by the region's sequential export-led growth trajectory—from Japan to Korea and Taiwan, and subsequently to China and Vietnam. These economies not only gained access to large consumer markets in North America and Europe but also succeeded in securing self-sustaining engines of export growth. By upgrading technological capabilities and shifting their export composition from income-inelastic to income-elastic goods, they gradually transformed their industrial structures toward higher value-added sectors (Hausmann et al., 2007). Through participation in international production networks, they internalized learning-by-doing effects and benefitted from technology diffusion and spillovers through foreign direct investment (Goldberg et al., 2024), leading to qualitative industrial transformation. Such structural upgrading has been closely intertwined with the formation of East Asia's regional production networks.

According to UN Trade data, since the 2010s, the share of intra-regional trade among East Asian countries has remained comparable to that of extra-regional trade. Consequently, a growing body of research has examined the evolving interconnectedness within the region. Koopman et al. (2008) showed that the domestic value-added share of Chinese exports averaged about 50%, but was substantially lower in high-technology sectors. Pei et al. (2012) found, using China's input–output tables, that the contribution of high-technology exports to overall growth had been overstated. Kwon and Ryou (2015), using international input–output data covering 1995–2009, confirmed China's rising position alongside Japan's and Korea's enduring strengths. Lee (2025), employing the Asian Development Bank's Multiregional Input–Output (MRIOT) tables for a 16-year panel, demonstrated that intra-regional linkages in East Asia have continued to intensify, with China's technological upgrading and Vietnam's rise as a manufacturing base occurring simultaneously.

3. Data Construction and Model Design

3.1. Data Construction and Processing

To analyze the production linkages of East Asia's manufacturing sector in terms of value-added trade, this study utilizes the Multiregional Input–Output Tables (MRIOTs) provided by the Asian Development Bank (ADB). The latest dataset covers the period 2007–2023 and includes trade and production data for 62 economies. All monetary values are expressed in constant 2010 U.S. dollars.

The ADB MRIOT has a standard block structure comprising: a square matrix of intermediate transactions, a primary input block containing value-added and total input (row vector), and a final demand block with total output (column vector) (see Table 1).

Each economy's activities are classified into 35 industries, including 16 manufacturing sectors and 19 service sectors. The full MRIOT is constructed by vertically (inputs/imports) and horizontally (uses/exports) stacking the national I–O tables 62 times, forming a comprehensive global matrix.

For analytical clarity and regional focus, this study concentrates on five major manufacturing-based economies in East Asia—Taiwan, Vietnam, Japan, China, and Korea—which play central roles in the regional production network. The remaining 57 economies are aggregated into a single composite region, defined as the Rest of the World (RoW). Accordingly, the original data are restructured into a six-region system.

This reclassification serves two analytical purposes. First, technology-intensity groupings capture heterogeneous exposure to trade and geopolitical shocks, as industries with different technological and supply-chain characteristics respond asymmetrically to tariff escalation and policy-driven disruptions. Second, Lall's taxonomy has been widely used in studies examining structural transformation, industrial upgrading, and GVC reorganisation, allowing the results to be compared more directly with existing empirical work. Alternative aggregation schemes, such as end-use classifications or OECD ISIC-based groupings, are less suited to tracing technology-driven fragmentation in production networks, which is central to understanding post-2018 adjustments.

Through this reclassification, the original 35 industries are consolidated into six aggregated sectors—five manufacturing groups and one service sector—producing a coherent dataset for analysing cross-industry value-added flows within East Asia's regional production network from 2007 to 2023.

To facilitate interpretation of structural adjustments associated with the U.S.–China trade conflict, the analysis adopts a clear temporal segmentation aligned with the official implementation of major tariffs in mid-2018. Years 2007–2017 are designated as the pre-shock period, capturing the stable phase of East Asia's production network prior to the tariff escalation, while 2018–2023 constitute the post-shock period, during which the trade conflict and related policy measures were in full effect.

It is important to note that, unlike causal identification frameworks such as difference-in-differences or event-study designs, the TiVA/MRIO measures used in this study (e.g., DVASH, VAX) are structural accounting indicators rather than estimated treatment effects. The pre/post distinction is therefore used solely to organise and interpret the evolution of value-added linkages, not to infer causal impacts. Rather, it provides a temporal structure for assessing how value-added flows evolved as regional production networks adapted to tariff escalation, supply-chain diversion, and FDI relocation.

3.2. Analysis Model

The multiregional input–output (MRIO) tables used in this study record a web of trade relations in which countries act simultaneously as suppliers (exporters) and users (importers) of intermediate and final goods. Owing to this structure, the data are well suited to analyzing multilateral interdependencies. This subsection explains how the I–O framework is used to derive (i) the domestic value-added share and (ii) the value-added export ratio (VAX ratio), both for multilateral and bilateral trade among participating economies.

The core demand-side intuition of I–O analysis is as follows. In equilibrium, total demand—the sum of intermediate demand and final demand—equals total output. Hence, a change in final demand for any product necessarily induces proportional changes in the supplies of intermediate inputs used to produce it, and thus in total output. This logic applies not only to closed economies but also to open economies engaged in multilateral trade: because each country is simultaneously a supplier and a user, a change in one country's export demand affects import demand elsewhere and, in turn, the total output of the economies supplying those intermediates.

Consider, for exposition, an MRIO with three countries (A, B, C) and two industries (1, 2). Let z denote goods and services used as intermediates and f those used as final demand. Reading the MRIO by columns shows, for a given country–industry, how much it uses of each domestic and foreign input (i.e., imports). Reading the MRIO by rows shows where the outputs of a given country–industry are used across domestic and foreign users (i.e., exports). Thus, columnwise reading yields import/use information, whereas rowwise reading yields export/supply information.

For example, in the intermediate block, the element $z_{12}^{AB} (= \frac{A_{12}^{AB}}{Z_2^B})$ interpreted columnwise is the input (technical) coefficient: the share of industry 2's total inputs in country

B that is sourced from industry 1 in country A. Interpreted rowwise as $z_{12}^{AB}(= A_{12}^{AB}/X_1^A)$, it is the allocation (distribution) coefficient: the share of industry 1's output in country A that is sold to industry 2 in country B. Final demand can be interpreted analogously, for example, $f_{12}^{CA}(= F_{12}^{CA}/X_1^C)$.

Table 1: Example of a multiregional input-output table

		Intermediate goods						Final consumption						Total output
		Country A		Country B		Country C		Country A		Country B		Country C		
	Industry	1	2	1	2	1	2	1	2	1	2	1	2	
A	1	z_{11}^{AA}	z_{12}^{AA}	z_{11}^{AB}	z_{12}^{AB}	z_{11}^{AC}	z_{12}^{AC}	f_{11}^{AA}	f_{12}^{AA}	f_{11}^{AB}	f_{12}^{AB}	f_{11}^{AC}	f_{12}^{AC}	X_1^A
	2	z_{21}^{AA}	z_{22}^{AA}	z_{21}^{AB}	z_{22}^{AB}	z_{21}^{AC}	z_{22}^{AC}	f_{21}^{AA}	f_{22}^{AA}	f_{21}^{AB}	f_{22}^{AB}	f_{21}^{AC}	f_{22}^{AC}	X_2^A
B	1	z_{11}^{BA}	z_{12}^{AB}	z_{11}^{BB}	z_{12}^{BB}	z_{11}^{BC}	z_{12}^{BC}	f_{11}^{BA}	f_{12}^{BA}	f_{11}^{BB}	f_{12}^{BB}	f_{11}^{BC}	f_{12}^{BC}	X_1^B
	2	z_{21}^{BA}	z_{22}^{BA}	z_{21}^{BB}	z_{22}^{BB}	z_{21}^{BC}	z_{22}^{BC}	f_{21}^{BA}	f_{22}^{BA}	f_{21}^{BB}	f_{22}^{BB}	f_{21}^{BC}	f_{22}^{BC}	X_2^B
C	1	z_{11}^{CA}	z_{12}^{CA}	z_{11}^{CB}	z_{12}^{CB}	z_{11}^{CC}	z_{12}^{CC}	f_{11}^{CA}	f_{12}^{CA}	f_{11}^{CB}	f_{12}^{CB}	f_{11}^{CC}	f_{12}^{CC}	X_1^C
	2	z_{21}^{CA}	z_{22}^{CA}	z_{21}^{CB}	z_{22}^{CB}	z_{21}^{CC}	z_{22}^{CC}	f_{21}^{CA}	f_{22}^{CA}	f_{21}^{CB}	f_{22}^{CB}	f_{21}^{CC}	f_{22}^{CC}	X_2^C
Value-added		V_1^A	V_2^A	V_1^B	V_2^B	V_1^C	V_2^C							
Total input		Z_1^A	Z_2^A	Z_1^B	Z_2^B	Z_1^C	Z_2^C							

Source: Author's work

Diagonal blocks describe within-country input–output linkages; off-diagonal blocks capture cross-border linkages. By construction, the column sums of intermediates z plus value added V equal total inputs Z, and the row sums of intermediates plus final demand equal total output X. In value terms, $\sum Z = \sum X$.

Let A denote the matrix of input coefficients (constructed from the z block). With total output vector X and final demand vector f, equilibrium in an MRIO can be written as

$$X = AX + f \Rightarrow X = (I - A)^{-1} f \equiv Bf, \qquad (1)$$

where I is the identity matrix and $B = (I - A)^{-1}$ is the multiregional Leontief inverse. Equation (1) compactly represents multilateral input–output relationships in trade.

All international transactions in goods and services embody corresponding value-added flows—commonly referred to as Trade in Value Added (TiVA) (OECD 2013). These flows can be decomposed into domestic value added (DVA) captured by domestic factors (firms and labor) and foreign value added (FVA) captured abroad.

Suppose the six economies analyzed in this paper (China, Japan, Korea, Taiwan, Vietnam, and Rest of the World) are each represented by a single sector for notational clarity. Let $v = \text{diag}(V/X)$ be the diagonal matrix of value-added coefficients (value added per unit of gross output), B the Leontief inverse partitioned by origin–destination, and f_x the diagonal matrix of gross exports by origin.

$$TiVA = V \cdot B \cdot f_x$$

$$= \begin{bmatrix} v^{CN} & 0 & \cdots & 0 \\ 0 & v^{JP} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & v^{RW} \end{bmatrix} \cdot \begin{bmatrix} B^{CN,CN} & B^{CN,JP} & \cdots & B^{CN,RW} \\ B^{JP,CN} & B^{JP,JP} & \cdots & B^{JP,RW} \\ \vdots & \vdots & \ddots & \vdots \\ B^{RW,CN} & B^{RW,JP} & \cdots & B^{RW,RW} \end{bmatrix} \cdot \begin{bmatrix} f_x^{CN} & 0 & \cdots & 0 \\ 0 & f_x^{JP} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & f_x^{RW} \end{bmatrix} \qquad (2)$$

$$= \begin{bmatrix} v^{CN} B^{CN,CN} f_x^{CN} & v^{CN} B^{CN,JP} f_x^{JP} & \cdots & v^{CN} B^{CN} \\ v^{JP} B^{JP,CN} f_x^{CN} & v^{JP} B^{JP,JP} f_x^{JP} & \cdots & v^{JP} B^{JP,} \\ \vdots & \vdots & \ddots & \vdots \\ v^{RW} B^{RW,CN} f_x^{CN} & v^{RW} B^{RW,JP} f_x^{JP} & \cdots & v^{RW} B^{RW} \end{bmatrix}$$

Element (i,j) of equation (2) has several useful interpretations. It measures the value added generated in country i that is induced by exports of country j. For example, $v^{CN}B^{(CN,JP)}f_x^{JP}$ is the value added created in China due to Japan's exports (Japan's exports require intermediate inputs from China via $B^{(CN,JP)}$, which generate Chinese value added scaled by v^{CN}). Diagonal elements (e.g., $v^{CN}B^{(CN,CN)}f_x^{CN}$) represent a country's domestic value added embodied in its own exports (DVA). Row sums of off-diagonals capture indirect value-added exports from a given origin induced by other countries' exports. Column sums of off-diagonals measure foreign value added embodied in a country's exports (FVA). DVA share and FVA share can be calculated by dividing DVA and FVA by gross exports.

Following Johnson and Noguera (2012) and Kwon and Ryou (2015), a convenient indicator of value-added trade at the bilateral level is the VAX ratio, defined as the ratio of value-added exports to gross exports. To motivate the construction, aggregate industries to a single sector and write the row-wise market-clearing conditions:

$$\begin{aligned} X^{AA}+X^{AB}+X^{AC}+Y^{AA}+Y^{AB}+Y^{AC} &= X^{A} \\ X^{BA}+X^{BB}+X^{BC}+Y^{BA}+Y^{BB}+Y^{BC} &= X^{B} \\ X^{CA}+X^{CB}+X^{CC}+Y^{CA}+Y^{CB}+Y^{CC} &= X^{C} \end{aligned} \quad (3)$$

where X^{ij} are intermediate sales from origin i to user j, and Y^{ij} are final-demand sales from origin i to destination j.

Let $a = X/Z$ denote the input coefficients. Stacking by countries, the system can be rewritten as

$$\begin{pmatrix} X^A \\ X^B \\ X^C \end{pmatrix} = \begin{pmatrix} a^{AA} & a^{AB} & a^{AC} \\ a^{BA} & a^{BB} & a^{BC} \\ a^{CA} & a^{CB} & a^{CC} \end{pmatrix}\begin{pmatrix} X^A \\ X^B \\ X^C \end{pmatrix} + \begin{pmatrix} Y^{AA} \\ Y^{BA} \\ Y^{CA} \end{pmatrix} + \begin{pmatrix} Y^{AB} \\ Y^{BB} \\ Y^{CB} \end{pmatrix} + \begin{pmatrix} Y^{AC} \\ Y^{BC} \\ Y^{CC} \end{pmatrix} \quad (4)$$

Collecting terms and inverting yields the production-induced form:

$$\begin{pmatrix} X^A \\ X^B \\ X^C \end{pmatrix} = \begin{pmatrix} I-A^{AA} & -A^{AB} & -A^{AC} \\ -A^{BA} & I-A^{BB} & -A^{BC} \\ -A^{CA} & -A^{CB} & I-A^{CC} \end{pmatrix} + \begin{pmatrix} Y^{AA}+Y^{AB}+Y^{AC} \\ Y^{BA}+Y^{BB}+Y^{BC} \\ Y^{CA}+Y^{CB}+Y^{CC} \end{pmatrix} \quad (5)$$

$$= \begin{pmatrix} B^{AA} & B^{AB} & B^{AC} \\ B^{BA} & B^{BB} & B^{BC} \\ B^{CA} & B^{CB} & B^{CC} \end{pmatrix} + \begin{pmatrix} Y^{AA}+Y^{AB}+Y^{AC} \\ Y^{BA}+Y^{BB}+Y^{BC} \\ Y^{CA}+Y^{CB}+Y^{CC} \end{pmatrix}.$$

If the second term on the right-hand side of equation (5), that is, the final demand vector, is post-multiplied by a vector consisting entirely of ones and then re-expressed, the right-hand side of equation (5) can be written as in equation (6).

$$\begin{pmatrix} B^{AA} & B^{AB} & B^{AC} \\ B^{BA} & B^{BB} & B^{BC} \\ B^{CA} & B^{CB} & B^{CC} \end{pmatrix}\begin{pmatrix} Y^{AA} & Y^{AB} & Y^{AC} \\ Y^{BA} & Y^{BB} & Y^{BC} \\ Y^{CA} & Y^{CB} & Y^{CC} \end{pmatrix} = \begin{pmatrix} X_{CT}^{AA} & X_{CT}^{AB} & X_{CT}^{AC} \\ X_{CT}^{BA} & X_{CT}^{BB} & X_{CT}^{BC} \\ X_{CT}^{CA} & X_{CT}^{CB} & X_{CT}^{CC} \end{pmatrix} \quad (6)$$

For example, the element on the right-hand side of equation (6) represents the total production induced in country A by the final demand from countries A, B, and C ($X_{CT}^{AC} = B^{AA}Y^{AC} + B^{AB}Y^{BC} + B^{AC}Y^{CC} (i,j = A,B,C)$). Therefore, summing the elements on the right-hand side horizontally yields the total output of the country, ($X^i = X_{CT}^{iA} + X_{CT}^{iB} + X_{CT}^{iC}$).

The main focus of this study, the value-added export amount, can be computed by multiplying the total output by each country's value-added rate. That is, the value-added amount $a^i = (1 - a^{Ai} - a^{Bi} - a^{Ci})X^i = (1 - a^{Ai} - a^{Bi} - a^{Ci})(X_{CT}^{iA} + X_{CT}^{iB} + X_{CT}^{iC})$. This amount represents the value added generated in the country by final demand for products produced by each country or the value added exported by the country to others. As previously explained, the VAX ratio is defined as the value-added amount divided by the total export value, which is va^{ij}/E^{ij}. Existing analyses use total exports as the denominator of the VAX ratio. However, as shown in the calculation formula, the VAX ratio changes if either the numerator or denominator changes. Since this study focuses on value-added exports, to minimize fluctuations in the VAX ratio caused by variations in total exports, the denominator for calculating the VAX ratio is the average export value over the 17-year study period, rather than export values from a single year.

4. Results and Discussion

4.1. Changes in Domestic Value-Added Shares

The domestic value-added share (DVA share) used in this study measures the proportion of total value added generated during a country's export process that is retained domestically. This indicator provides an effective means of assessing the extent to which a country's firms and workers benefit in real terms from its export activities.

As shown in Figure 1, the temporal evolution of DVA shares across East Asian economies reveals broadly stable patterns for all countries except Vietnam, whose share declined markedly over time but rebounded sharply in 2023, the final year of observation. In contrast, Japan, China, Korea, and Taiwan maintained relatively steady or slightly increasing levels throughout the period.

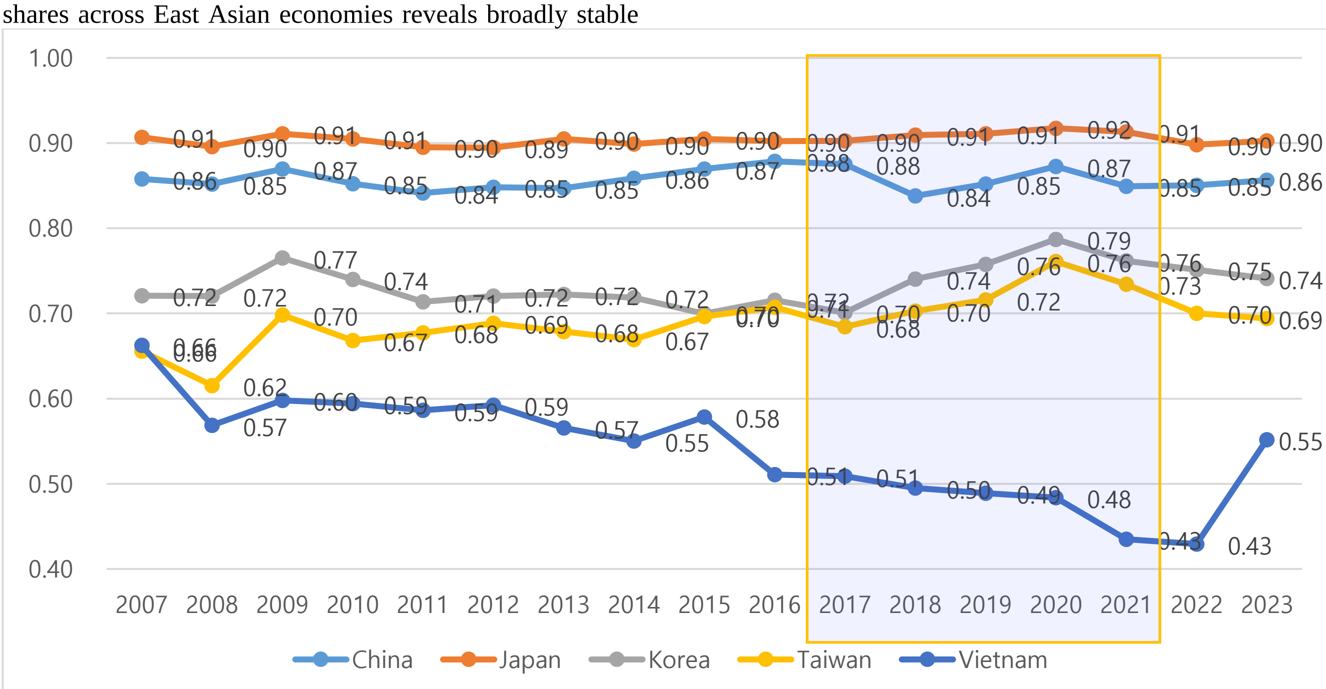


Figure 1 DVA share within regional production networks (2007-2023)

Note: Shaded rectangle area indicates Trump's first presidency (2017-2021)
Source: Author's work.

Ranking countries by their average DVA share yields the following order: Japan > China > Korea > Taiwan > Vietnam. Notably, China's DVA share—ranging between 84% and 88%—remains exceptionally high, second only to Japan's early-90% level. Korea's share fluctuates between 70% and 79%, while Taiwan's ranges from 62% to 76%. At first glance, these results appear to challenge the conventional perception that China occupies primarily low–value-added segments of production chains, whereas Korea and Taiwan specialize in higher-value activities.

China's persistently high domestic value-added share may instead indicate the growing localization of its production structure. Once labeled the "world's assembly plant," China has, over recent decades, developed substantial indigenous value-added capacity across a range of industries. This suggests that China's position within regional production networks has expanded beyond low-value-added assembly to encompass higher-value segments as well. In contrast, Vietnam's lower and more volatile DVA share reinforces this interpretation—its economy remains heavily engaged in labor-intensive assembly operations with limited domestic spillovers of value creation. A more detailed discussion based on industry-level results is presented in Table 2.

Turning to the period surrounding the U.S.–China tariff escalation, the clearly defined pre-shock (2007–2017) and post-shock (2018–2023) windows allow for a more transparent examination of how domestic value-added shares evolved around the 2018 disruption. Although the TiVA framework does not estimate causal effects in the econometric sense, comparing these two periods highlights meaningful structural adjustments within regional production networks. Between 2018 and 2023, sharp movements in DVA shares are observed for all economies except Japan, suggesting that the reconfiguration of supply chains—triggered by the tariff shock—coincided with shifts in domestic value-added retention. Notably, Korea and Taiwan registered gains of roughly 10 percentage points during the post-shock period, whereas China and Vietnam experienced gradual or steep declines, respectively. These post-2018 divergences underscore how production network adjustments after mid-2018 differentially influenced value-added capture across the region.

These patterns suggest that Korea and Taiwan benefited relatively in terms of value-added capture amid the trade tensions between the United States and China. The reconfiguration of production networks—particularly the diversion of intermediate stages away from China—appears to have strengthened their domestic value-added retention. Conversely, although Vietnam expanded its role as an alternative assembly hub, the gains in domestic value added were limited, implying that the economic benefits of production relocation were largely captured by foreign investors or upstream suppliers rather than domestic firms and workers.

Table 2 DVA share based on technology-based industry classification

2008	PP	RB	LT	MT	HT
CN	0.91	0.87	0.83	0.80	0.70
JP	0.85	0.88	0.88	0.78	0.85
KR	0.83	0.73	0.73	0.57	0.65
TW	0.71	0.62	0.56	0.41	0.50
VN	0.63	0.59	0.45	0.40	0.39
2013					
CN	0.90	0.88	0.85	0.80	0.73
JP	0.85	0.89	0.89	0.80	0.86
KR	0.82	0.73	0.72	0.58	0.63
TW	0.77	0.72	0.61	0.47	0.63
VN	0.59	0.59	0.46	0.43	0.29
2018					
CN	0.91	0.89	0.83	0.79	0.73
JP	0.84	0.90	0.91	0.79	0.88
KR	0.82	0.70	0.70	0.58	0.72
TW	0.74	0.67	0.58	0.52	0.65
VN	0.51	0.52	0.42	0.36	0.23
2023					
CN	0.92	0.89	0.86	0.81	0.71
JP	0.88	0.89	0.90	0.78	0.85
KR	0.81	0.72	0.73	0.60	0.68
TW	0.72	0.68	0.64	0.47	0.64
VN	0.65	0.57	0.47	0.42	0.28

Note: PP (Primary Products), RB (Resource-based), LT (Low-tech), MT (Medium-tech), and HT (High-tech)
Source: Author's work.

Table 2 presents industry-level domestic value-added (DVA) shares for each country, offering a more detailed picture than that shown in Figure *1*. Although only four benchmark years are reported due to space constraints, the data are sufficient to capture both the direction and characteristics of variation across industries.

Regarding China's high overall DVA share, the 2008 results show an average of 86%, with 91% in primary products (PP), 87% in resource-based industries (RB), 83% in low-technology industries (LT), 80% in medium-technology industries (MT), and 70% in high-technology industries (HT). When interpreted in light of technological intensity, this pattern suggests that China's elevated aggregate DVA share largely stems from low–value-added sectors, while its LT, MT, and HT industries all record DVA levels below the national average. In particular, China's HT sector exhibits a relatively low DVA share of around 70%, indicating limited domestic retention of value added in technologically advanced manufacturing.

This pattern is not unique to China. Excluding Japan, other regional economies—Korea, Taiwan, and Vietnam—display similar distributions of DVA shares across industries, with higher domestic value capture in low-technology sectors and lower shares in high-technology sectors.

However, over the 17-year sample period, both Korea and Taiwan show substantial increases in DVA shares within their MT and HT industries—especially during Trump's first term (2018–2023). For example, Korea's HT-sector DVA share rose from 65% in 2008 to 72% in 2018, while Taiwan's increased from 50% to 65%. In contrast, Vietnam's HT-sector DVA share fell sharply from 39% to 23% during the same period. Similar upward trends for Korea and Taiwan are also evident in the MT sector.

Taken together, Table 3 and Figure 1 reveal that China's high overall DVA share is primarily driven by low-technology and resource-based industries, whereas the notable increase in Korea's and Taiwan's DVA shares during the Trump administration originated largely from technological upgrading in MT and HT industries. In other words, while China's economy has advanced rapidly, the traditional view that it remains concentrated in low–value-added activities continues to hold when examined from the perspective of value-added retention.

4.2. VAX and its changes

Given the dense network of linkages among countries participating in regional production systems, one country's final demand effectively represents the export supply of another. Each country's exports, in turn, depend on intermediate inputs sourced from elsewhere, creating complex feedback of value-added flows across borders. As outlined in Equation (6), when Korea consumes final goods from China, Japan, Taiwan, or Vietnam, the resulting value added generated in each of those economies can be quantified. This value added embodied in exports is referred to as value-added exports (VAX) (Johnson and Noguera 2012).

For any two countries—say, Korea (the exporter) and China (the destination)—the bilateral VAX quantifies either (i) the value added that Korea exports to China, or equivalently, (ii) the value added generated in Korea as a result of China's final demand.

To assess the degree of interdependence among regional economies, it is useful to examine the ratio of VAX to gross bilateral exports. This ratio depends jointly on the magnitude of value-added exports and the scale of bilateral trade flows (Kwon and Ryou 2015). To minimize the influence of short-term trade fluctuations, this study calculates the VAX ratio using the average bilateral export

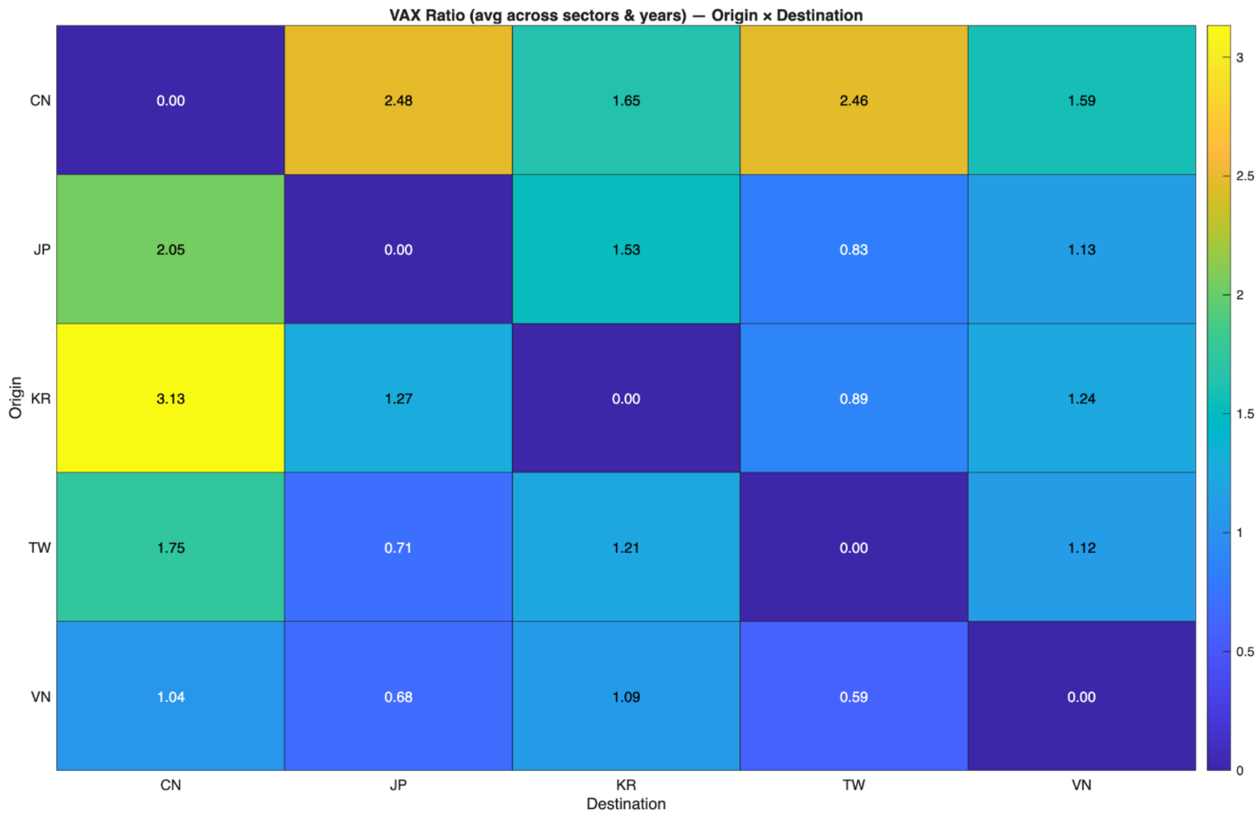


Figure 2: Bilateral VAX ratio within regional production networks (2007-2023)

Note: The lighter the colour the higher the VAX ratio. The vertical axis indicates origin countries and the horizontal axis destination countries. The diagonal cells are zeros because of the definition of VAX.
Source: Author's work.

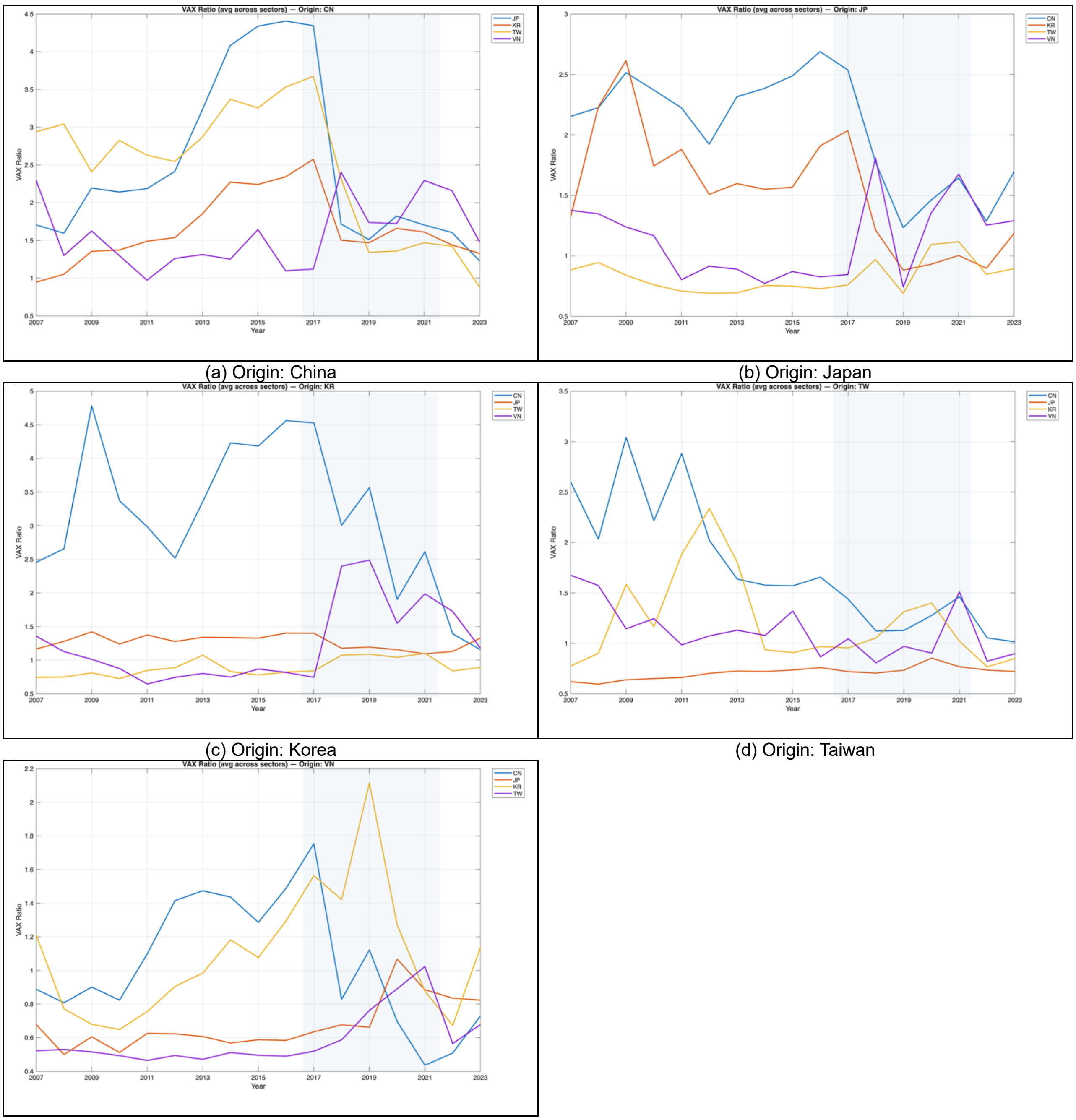
values over the 16-year period (2007–2023) as the denominator.

Figure 2 reports the resulting multilateral VAX ratios within the East Asian production network, based on each country's mean VAX values over 2007–2023. By definition, diagonal elements of the VAX matrix are zero, as a country cannot export value added to itself. For consistency with the treatment of DVASH, bilateral VAX ratios are also interpreted relative to the same pre-shock (2007–2017) and post-shock (2018–2023) periods. This temporal delineation does not imply a causal research design; rather, it provides a coherent frame for tracking structural reorganisation in value-added flows following the mid-2018 tariff implementation.

The results reveal several key patterns. For China, the highest VAX ratios occur in exports to Japan and Taiwan. Conversely, Japan, Korea, and Taiwan record their highest VAX ratios in exports to China, while Vietnam exhibits its highest ratio in exports to Korea. Among all country pairs, Korea's VAX ratio vis-à-vis China stands out as the largest, at 3.13, indicating that Korea derives substantially greater value-added gains from its exports to China than vice versa. The corresponding Chinese VAX ratio vis-à-vis Korea is only 1.65, underscoring the asymmetry of value-added benefits in their bilateral trade.

These findings imply that, within the regional production network, Korea captures a disproportionately large share of value added through its trade with China. In contrast, despite its growing role as an assembly hub, Vietnam's relatively low VAX ratios suggest that the domestic value-added gains from its participation in regional supply chains remain limited.

Figure 3 illustrates how the value-added export (VAX) ratios of East Asian economies evolved over the full sample period. A striking observation is that—with the exception of Taiwan—nearly all countries experienced significant fluctuations in their VAX ratios during Trump's first term (2017–2021).



(a) Origin: China

(b) Origin: Japan

(c) Origin: Korea

(d) Origin: Taiwan

(e) Origin: Vietnam

Figure 3: Annual bilateral VAX ratios within regional production networks (2007-2023)

Note: Shaded rectangle area indicates Trump's first presidency (2017-2021)
Source: Author's work.

Table 3: Rate of change of bilateral VAX ratios (2017-2021, %)

		Destination				
		China	Japan	Korea	Taiwan	Vietnam
Origin	Industry					
China	PP		60.1	38.4	40.3	-828.6
	RB		8.2	-14.7	-79.2	30.6
	LT		4.0	-10.0	-20.3	49.1
	MT		-13.6	-17.2	-57.0	-35.0
	HT		8.7	-5.4	0.3	38.6
Japan	PP	-35.2		26.1	-26.0	-240.6
	RB	-2.0		-4.0	0.5	-50.0
	LT	-13.0		-18.1	-18.6	37.3
	MT	-4.8		-18.9	-17.2	-8.5
	HT	3.2		-17.2	-4.5	-103.3
Korea	PP	55.8	49.6		8.1	-280.1
	RB	-31.7	-16.9		-20.0	-113.1
	LT	-158.6	-77.6		-13.1	-135.9
	MT	-20.4	-20.6		-21.2	-34.3
	HT	-21.7	-34.1		-16.5	0.3
Taiwan	PP	37.1	0.0	3.8		-445.2
	RB	16.2	21.2	6.3		11.9
	LT	8.8	14.3	21.8		21.1
	MT	-7.5	-5.9	-8.9		8.2
	HT	-27.4	-23.4	-32.3		-35.1
Vietnam	PP	-23.9	-69.9	28.6	-7.7	
	RB	59.1	49.8	50.4	56.1	
	LT	41.7	25.2	22.5	-1.8	
	MT	63.2	38.0	28.6	29.1	
	HT	-27.2	-111.8	-148.9	-108.1	

Source: Author's work.

A country-by-country summary is as follows: 1) China recorded its highest VAX ratios in exports to Japan and Taiwan prior to the Trump administration. During Trump's first term, these ratios fell sharply to below 1.5 for both partners, and the ratio vis-à-vis Korea also declined. In contrast, China's VAX ratio with Vietnam more than doubled—from around 1.1 to 2.4—indicating a substantial shift in value-added linkages toward Vietnam; 2) Japan exhibited its highest VAX ratios vis-à-vis China, which declined sharply during Trump's presidency. At the same time, Japan's VAX ratio vis-à-vis Vietnam increased markedly. Although the ratio vis-à-vis Korea also decreased during the Trump years, the downward trend had already begun around 2009; 3) Korea consistently registered the highest VAX ratios in trade with China, but this value fell dramatically—from 4.5 to 1.2—during the Trump period. The ratios with Japan and Taiwan remained relatively stable, while Korea's ratio vis-à-vis Vietnam surged from 0.5 to 2.5 before later declining; 4) Taiwan maintained its highest VAX ratio in exports to China, showing a gradual downward trend since 2011 but no abrupt changes during Trump's first term; and 5) Vietnam displayed the highest VAX ratio in exports to Korea. Over time, however, its ratio vis-à-vis China dropped steeply from 1.75 to 0.45 during Trump's presidency. Conversely, its ratio vis-à-vis Korea increased from 1.55 to 2.1 before declining again, while the ratios vis-à-vis Japan and Taiwan rose gradually.

Synthesizing these findings, the countries exhibiting the most pronounced changes in VAX ratios are China, Japan, and Korea, each showing a decline in mutual VAX ratios while simultaneously recording increases in ratios vis-à-vis Vietnam. This pattern suggests that the U.S.–China trade conflict during Trump's first term reshaped intra-regional production linkages, partially redirecting value-added export destinations from China toward Vietnam.

Recent evidence supports this interpretation. Iyoha et al. (2025) reported that Vietnam's exports to the United States rose by 1.74 percentage points between 2018 and 2019, largely driven by Chinese outward investment into Vietnam. As tariffs were imposed on Chinese intermediate and final goods, countries embedded in regional production networks likely faced reduced value-added generation associated with Chinese intermediates. Consequently, some assembly processes may have been relocated from China to Vietnam.

However, these results should not be misinterpreted as evidence that Vietnam itself captured more value added. The VAX ratio measures the value added generated by the exporting country, not by the destination country. Therefore, an increase in VAX ratios toward Vietnam means that exporting countries (e.g., Korea, Japan, or China) captured more value added through exports to Vietnam, not that Vietnam gained greater domestic value.

This interpretation is reinforced by the absolute magnitudes of VAX values shown in Figure 3. Whereas most countries record maximum VAX values between 3 and 5, Vietnam's peak remains below 2.2. This indicates that the absolute level of value-added exports (the numerator of the VAX ratio) originating from Vietnam is considerably smaller than that of the other economies.

Finally, we examine changes in the industry-specific Value-Added Export (VAX) ratios within regional multilateral trade. Having previously established the absolute magnitudes of the VAX ratios through Figures 1 and 2, analyzing their rates of change provides a more effective means to assess the impact of the first Trump administration term on regional production networks. Due to space constraints, average changes for the period 2017–2021 are presented in Table **3**.

The industrial changes in VAX ratios reported in Table 4 concretize insights derivable from Figure 3. Across all participant countries within the regional production network, 41% of industries recorded an increase in VAX ratios, whereas 59% exhibited a decline, with increases predominantly observed in Taiwan and Vietnam. A more detailed examination reveals that: (1) China showed a pronounced increase in VAX ratios in primary product (PP) industries but experienced declines in resource-based (RB), low-tech (LT), medium-tech (MT), and high-tech (HT) sectors vis-à-vis Korea and Taiwan; (2) Japan displayed decreasing VAX ratios in PP industries, contrasting with China, alongside notable declines across most industries, particularly vis-à-vis Vietnam; (3) South Korea recorded VAX ratio declines in all sectors except PP industries relative to China, Japan, and Taiwan, with especially steep decreases against China and Vietnam; (4) Taiwan generally exhibited increased VAX ratios except in MT and HT industries, where declines were significant; (5) Vietnam demonstrated rising VAX ratios across all industries except PP and HT, with particularly large VAX ratio decreases in HT sectors—amounting to approximately 112%, 150%, and 108% reductions relative to Japan, Korea, and Taiwan, respectively.

In summary, during the first Trump administration term, China, Japan, and Korea all exhibited decreased VAX ratios vis-à-vis intra-regional production networks, indicating reduced value-added exports embodied in their final demand. Despite efforts to diversify intermediate goods supply in response to US-China trade tensions and reconfigure regional production networks, these trade conflicts exerted a non-negligible impact on the regional economic bloc.

Interestingly, two metrics measuring domestic value-added generated through exports—the domestic value-added share (DVASH) and the VAX ratio—display contrasting patterns. While DVASH statistics remain relatively stable, VAX ratios are markedly more volatile. This divergence, ostensibly counterintuitive, reflects the effects of production network diversification and can be interpreted as a consequence of trade tensions during the first Trump administration term.

The domestic value-added share captures the proportion of a country's exports originating from domestic production rather than imported intermediates (OECD, 2022). This share tends to be relatively inert, primarily influenced by the domestic industrial composition; absent structural shifts, stability is expected, in line with the data presented herein.

Conversely, the VAX ratio quantifies the proportion of domestic value-added not re-exported through other countries but ultimately absorbed abroad via final demand (Johnson and Noguera, 2012). As such, it is sensitive to the fragmentation level of regional or global production networks, specifically the frequency with which intermediates cross borders. Consequently, products with complex production networks undergoing multiple import-export cycles tend to exhibit lower VAX ratios. For instance, Chang-Soo and Inkyo (2015) employed the VAX metric to analyze automotive industry production networks in Korea, Japan, China, and the US, concluding that declines in

Korea's VAX ratio reflected increased global value chain participation. Consistent with the definition of VAX,

Table **3** and

Figure **3** confirm that nearly all countries saw VAX ratio decreases during the first Trump administration term.

The complexity of regional production networks during this period increased due to tariffs imposed on Chinese final goods or on final goods from other countries using Chinese intermediates. Such developments included shifting from completing production within mainland China using Chinese intermediates, to exporting unfinished intermediates to third countries where assembly or finishing occurred. These production relocations and the transfer of intermediate-stage production outside China produced significant regional shifts. Accordingly, the observed increased volatility and general decline in VAX ratios can be interpreted as a direct consequence of such structural adjustments within regional production networks.

Furthermore, several of the post-2018 shifts documented in DVASH and VAX align with known developments during the trade conflict period. Tariff-induced cost increases for Chinese intermediates encouraged multinational firms to reallocate assembly stages to Vietnam and elsewhere in ASEAN, a pattern consistent with the rising VAX ratios of Korea and Japan vis-à-vis Vietnam. Likewise, China's moderate decline in DVASH and bilateral VAX ratios reflects both the imposition of tariffs on Chinese exports and the redirection of value-added activity toward alternative hubs. These developments complement recent evidence documenting increased outward FDI from China into Vietnam and diversification of intermediate sourcing patterns across the region.

5. Conclusion

This study analyzed the impact of the US-China trade conflict during the first Trump administration term (2017–2020) on the structure of the East Asian regional production network through the lens of trade in value-added. Using the Asian Development Bank's (ADB) multi-regional input-output table (MRIOT) for 2007–2023, we constructed a six-country system comprising five major manufacturing countries—Taiwan, Vietnam, Japan, China, South Korea—and the rest of the world. The dataset was reclassified into six industry groups (PP, RB, LT, MT, HT, and services) according to industry-specific technology levels. This framework enabled us to compute each country's domestic value-added share and value-added export (VAX) ratio, analyze their temporal changes, and identify structural characteristics by sector.

The analysis yielded several key findings. First, the domestic value-added share—the proportion of value added generated in the country during the export process—remained relatively stable in most countries except Vietnam. Vietnam exhibited a continuous decline until the late 2010s but rebounded in 2023. Japan and China consistently maintained high shares (averaging over 85%), while South Korea and Taiwan experienced approximately a 10-percentage point increase during the first Trump administration term. These results suggest that Korea and Taiwan gained relative benefits, particularly in high-technology sectors, whereas China's share declined mildly and Vietnam's expansion as an assembly base did not translate into substantial domestic value-added generation.

Second, sectoral analysis revealed that China's high domestic value-added ratios primarily stemmed from low value-added industries such as PP and RB, with below-average shares in HT industries. Conversely, South Korea and Taiwan showed significant increases in domestic value-added shares particularly in medium- and high-technology industries during the period 2018–2021, indicative of their strengthened roles as core hubs within the global value chain in advanced sectors.

Third, the VAX ratio analysis indicated a general decline in the inter-country VAX ratios among China, Japan, and Korea during the first Trump administration term, while VAX ratios vis-à-vis Vietnam showed an increasing trend. This pattern reflects realized production base shifts and adjustments in supply chain circumventing prompted by the US-China trade conflict. However, Vietnam's absolute VAX ratio remains low, suggesting its role as an intermediate assembly base rather than a primary beneficiary of value-added gains.

Taken together, the Trump administration′s tariff policies and supply chain sanctions during its first term weakened the hub-centric structure of the East Asian production network and triggered a gradual transition toward a multi-polar network. While the China-centric vertical division of labor system has not completely collapsed, peripheral countries such as South Korea, Taiwan, and Vietnam have emerged as autonomous supply hubs in specific sectors, especially medium- and high-technology industries, reflecting functional and spatial reorganization within the production network.

From a policy perspective, these structural transformations bear three implications. First, supply chain diversification acts as a driver for sustainable industrial restructuring beyond short-term trade diversion effects. Second, the coexistence of increased complexity in intermediate goods trade and stable domestic value-added shares implies relatively high absorptive capacity in the East Asian economy in the face of external shocks. Third, low domestic value-added shares in emerging assembly countries like Vietnam indicate persistent imbalances in intra-regional division of labor, highlighting the importance of regional industrial cooperation and technology transfer strategies going forward.

With the imposition of universal tariffs on East Asian countries showing trade surpluses with the United States in the second Trump administration term, the regional production network faces increased uncertainty and pressure for structural transition. Accordingly, East Asian countries must internalize tariff risks within their industrial strategies through proactive supply chain diversification, preemptive responses to cumulative rules of origin, and continuous monitoring of network indicators reflecting tariff shocks. Highly technology-intensive hub countries such as South Korea, Taiwan, and Japan should enhance their role as multi-polar hubs in medium- and high-technology sectors, while assembly-oriented countries like Vietnam need to strengthen supplier capacities and localization strategies to expand domestic value-added.

Future research should examine whether these structural changes persist or whether intra-regional supply chains undergo reintegration during extended periods of protectionism under the second Trump administration or beyond. Additionally, integrating national- and industry-level analyses with micro-level firm data will be important to evaluate the effects of global value chain restructuring on firm strategy and technological accumulation comprehensively.

References

Amiti, M., Redding, S. J., & Weinstein, D. E. (2019). The Impact of the 2018 Tariffs on Prices and Welfare. *Journal of Economic Perspectives, 33*(4), 187–210.

Baldwin, R. and R. Freeman (2022), Risks and Global Supply Chains: What We Know and What We Need to Know. *Journal of Economic Perspectives*, *36*(4), 23–46

Bown, C. P. (2021). The US–China trade war and Phase One agreement. *Journal of Policy Modeling*, *43*(4), 805–843. https://doi.org/https://doi.org/10.1016/j.jpolmod.2021.02.009.

Chang-Soo, L., & Inkyo, C. (2015). Value-Added Exports and the Decomposition of Exports in Korea Trade. *Journal of Korea Trade (JKT), 19*(4), 43–61.

Coveri, A., Paglialunga, E., & Zanfei, A. (2024). Global value chains and within-country inequality: The role of functional positioning. *Structural Change and Economic Dynamics, 70* 382–397.

Coveri, A., & Zanfei, A. (2023). Functional division of labour and value capture in global value chains: a new empirical assessment based on FDI data. *Review of International Political Economy, 30*(5), 1984–2011.

Daudin, G., Rifflart, C., & Schweisguth, D. (2011). Who produces for whom in the world economy? *Canadian Journal of Economics/Revue canadienne d'économique, 44*(4), 1403–1437.

Dietzenbacher, E., Romero, I., & Bosma, N. S. (2005). Using Average Propagtion Lengths to Identify Production Chains in Andalusian Economy. *Estudios de Economía Aplicada, 23*, 405–422.

Fajgelbaum, P. D., Goldberg, P. K., Kennedy, P. J., & Khandelwal, A. K. (2019). The Return to Protectionism. *The Quarterly Journal of Economics, 135*(1), 1–55.

Feenstra, R. C. (1998). Integration of Trade and Disintegration of Production in the Global Economy. *The Journal of Economic Perspectives, 12*(4), 31–50.

Freund, C., Mattoo, A., Mulabdic, A., & Ruta, M. (2024). Is US trade policy reshaping global supply chains? *Journal of International Economics, 152* 104011.

Gereffi, G., et al. (2005), The governance of global value chains, *Review of International Political Economy, 12*(1), 78–104.

Goldberg, P. K., Juhász, R., Lane, N. J., Lo Forte, G., & Thurk, J. (2024). Industrial Policy in the Global Semiconductor Sector. *National Bureau of Economic Research Working Paper Series*, No. 32651. https://doi.org/10.3386/w32651.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What You Export Matters. *Journal of Economic Growth, 12*(1), 1–25. http://www.jstor.org.ezproxy.lib.rmit.edu.au/stable/40216112.

Hayakawa, K. (2024). Exports to the US and Imports from China during the US-China Tariff War: Evidence from Regional Trade Data in Vietnam†. K*DI Journal of Economic Policy, 46*(3), 49–66. https://doi.org/10.23895/KDIJEP.2024.46.3.49.

Humphrey, J., ed. 2019. *Global Value Chains*. Cheltenham: Edward Elgar.

Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies, 36*(9), 1017–1027.

Inoue, H., & Todo, Y. (2019). Firm-level propagation of shocks through supply-chain networks. *Nature Sustainability, 2*(9), 841–847. https://doi.org/10.1038/s41893-019-0351-x.

Iyoha, E., Malesky, E., Wen, J., & Wu, S.-J. (2025). Exports in Disguise? Trade Rerouting During the U.S.-China Trade War. *Harvard Business Working Paper, 24*(072).

Johnson, R. C., & Noguera, G. (2012). Accounting for intermediates: Production sharing and trade in value added. *Journal of International Economics, 86*(2), 224–236. https://doi.org/https://doi.org/10.1016/j.jinteco.2011.10.003.

Kim, H., & Cho, J. (2024). The Impact of US Export Controls on Korean Semiconductor Exports. *KDI Journal of Economic Policy, 46*(3), 1–23.

Kimura, F., & Ando, M. (2005). Two-dimensional fragmentation in East Asia: Conceptual framework and empirics. *International Review of Economics & Finance, 14*(3), 317–348.

Koopman, R., Powers, W., Wang, Z., & Wei, S.-J. (2010). Give Credit Where Credit Is Due: Tracing Value Added in Global Production Chains. *National Bureau of Economic Research Working Paper Series*, No. 16426.

Koopman, R., Wang, Z., & Wei, S.-J. (2008). How much of Chinese exports is really made in China? Assessing foreign and domestic value-added in gross exports. *National Bureau of Economic Research Working Paper Series*, No. 14109.

---. (2014). Tracing Value-Added and Double Counting in Gross Exports. *American Economic Review, 104*(2), 459–494. https://doi.org/10.1257/aer.104.2.459.

Kordalska, A., & Olczyk, M. (2023). Upgrading low value-added activities in global value chains: a functional specialisation approach. *Economic Systems Research, 35*(2), 265–291.

Kwon, T., & Ryou, J.-W. (2015). Global Value Chains of East Asia: Trade in Value Added and Vertical Specialization. *Asian Economic Journal, 29*(2), 121–143.

Lee, W. (2024). From a Spoke to a Hub: The Case of South Korea. *Review of Radical Political Economics, 56*(4), 531–543. https://doi.org/10.1177/04866134241270550.

---. (2025). The Development of Interconnectedness within East Asian Regional Production Chains. *Global Economic Review, 54*(3), 225–248.

Mao, H., & Görg, H. (2020). Friends like this: The impact of the US–China trade war on global value chains. *The World Economy, 43*(7), 1776–1791.

OECD. 2013. *Interconnected Economies: Benefitting from Global Value Chains.* Paris: OECD Publishing.

OECD. 2022. G*uide to OECD Trade in Value Added (TiVA) Indicators*, 2022 Edition. OECD

Pei, J., Oosterhaven, J., & Dietzenbacher, E. (2012). HOW MUCH DO EXPORTS CONTRIBUTE TO CHINA'S INCOME GROWTH? *Economic Systems Research, 24*(3), 275–297. https://doi.org/10.1080/09535314.2012.660746.

Stöllinger, R. (2021). Testing the Smile Curve: Functional Specialisation and Value Creation in GVCs. *Structural Change and Economic Dynamics, 56* 93–116.

Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R., & de Vries, G. J. (2015). An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production. *Review of International Economics, 23*(3), 575–605.

Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R., & de Vries, G. J. (2014). Slicing Up Global Value Chains. T*he Journal of Economic Perspectives, 28*(2), 99–118. http://www.jstor.org.ezproxy.lib.rmit.edu.au/stable/23723486.

Wu, J., Wood, J., Oh, K., & Jang, H. (2021). Evaluating the cumulative impact of the US–China trade war along global value chains. *The World Economy, 44*(12), 3516–3533. https://doi.org/https://doi.org/10.1111/twec.13125.