“Evaluating key determinants of Vietnam’s integration into global value chains”

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EVALUATING KEY DETERMINANTS OF VIETNAM'S INTEGRATION INTO GLOBAL VALUE CHAINS

Abstract

This study investigates structural and policy determinants influencing Vietnam's participation in global value chains, with a specific focus on both forward and backward linkages. The paper addresses an empirical gap in the literature by applying a unified econometric framework to a transitional economy context. The analysis is based on annual time-series data for the period 2010–2021, covering major phases of Vietnam's trade liberalization, industrial upgrading, and investment openness. Although the data extend only to 2021, this timeframe represents the most recent period for which comprehensive and internationally comparable global value chains indicators are available. The selection is further justified by the structural delay in global value chain data compilation and the coverage of key structural transformations relevant to Vietnam's development trajectory. Using multiple linear regression models, the study reveals that foreign direct investment and regional trade agreements significantly influence Vietnam's global value chain position, though their effects differ across linkage types. Specifically, foreign direct investment inflows and regional trade agreements export coverage are negatively associated with forward linkage participation, while regional trade agreements engagement exerts a positive effect on backward linkages. Technological readiness does not exhibit a statistically significant impact, suggesting limited spillover effects from foreign direct investment to domestic firms. These findings underscore the need for more targeted strategies to enhance local value addition, foster production-oriented cooperation under regional trade agreements, and strengthen domestic absorptive capacity. The study offers timely policy implications for Vietnam and contributes to the broader literature on global value chain integration in emerging economies.

Keywords global value chain participation, Vietnam, linear regression analysis

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INTRODUCTION

Global value chains (GVCs) have emerged as a cornerstone of international trade and economic development, accounting for nearly 70% of global trade (WTO, 2019). Their growing prominence has encouraged countries to adopt GVC participation as a central pillar of long-term development strategies (Amador & Cabral, 2020; Gereffi, 2019; De Marchi et al., 2013; Antràs & Staiger, 2012; Gunnella et al., 2017). For Vietnam, a rapidly developing economy characterized by substantial trade liberalization and structural transformation, engagement in GVCs is both a reflection of increasing economic openness and a determinant of its sustainable development trajectory. However, despite impressive export growth and deeper integration into global markets, Vietnam's position within GVCs remains constrained by several structural limitations. Domestic firms often contribute only marginal value within supply chains dominated by foreign enterprises, and many sectors exhibit limited technological upgrading (Manghnani et al., 2021; OECD, 2021). Concurrently, shifts in global trade architecture, accelerating technological change, and evolving regional economic arrangements have added layers of complexity to GVC participation, challenging traditional development models (Baldwin, 2016; World Bank, 2020; UNCTAD, 2021).

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Within this context, a critical scientific problem arises: understanding the multifaceted determinants (both policy-driven and structural) that govern a country's depth and quality of participation in GVCs. Although the existing literature has offered extensive theoretical and empirical analyses of GVC dynamics, there is a notable gap in context-specific insights related to transitional economies such as Vietnam (Bruno et al., 2018; Gereffi, 2020; Kano, 2020; Pavlinek et al., 2017; Gunnella et al., 2017; Los et al., 2020; Taglioni & Winkler, 2016). Addressing this gap is essential to advancing theoretical perspectives on global production networks and enhancing the policy relevance of GVC-oriented development strategies.

1. LITERATURE REVIEW

In recent decades, global value chains (GVCs) have become increasingly influential in shaping international trade patterns, particularly for developing and emerging economies. By fragmenting production across borders, GVCs have enabled countries to integrate into global trade networks without mastering the entire production process. However, how countries participate in these chains, whether by sourcing inputs (backward linkages) or supplying inputs to other countries (forward linkages), differs considerably and carries distinct developmental implications.

Vietnam's integration into GVCs has followed a trajectory typical of export-oriented economies: increasing participation in global manufacturing through foreign investment, especially in sectors like electronics and textiles. However, as recent literature suggests, the depth and nature of this participation are conditioned by a complex set of structural and policy factors. These include not only the size and development level of the domestic economy but also the strategic orientation of industrial policy, trade openness, and the country's capacity to absorb technology.

Recent literature has increasingly emphasized the need to distinguish between forward and backward GVC linkages, as they reflect fundamentally different development dynamics (Pahl & Timmer, 2020; Meng et al., 2020; Antràs & de Gortari, 2021). While backward participation often reflects a reliance on imported intermediates for export-oriented processing, forward linkage is associated with the ability to supply intermediate goods for global production, thus indicating higher domestic value-added creation. These distinctions are particularly relevant for economies undergoing industrial transformation, where participation patterns may diverge across sectors and time. Several studies have explored these aspects in large emerging economies (e.g., China, India), but there remains a paucity of integrated analyses for transitional economies like Vietnam (Gunnella et al., 2017; Fernandes et al., 2020). Moreover, few empirical works adopt a simultaneous framework to assess structural and policy-related determinants across both linkage types using robust econometric modeling. This study builds on these strands of literature, aiming to contribute to the empirical understanding of GVC determinants in the Vietnamese context.

Market size and income level are foundational factors in shaping GVC dynamics. Larger domestic markets often exhibit a preference for localizing production networks, reducing dependence on imported intermediates, and thereby limiting backward linkage participation (Urata & Baek, 2020; Raei et al., 2019; Kowalski et al., 2015; Foster-McGregor & Stehrer, 2013; Hummels et al., 2001). At the same time, they may show stronger forward participation by exporting raw or semi-processed inputs. The role of income level is more nuanced. Some studies point to a positive linear relationship between income and both types of GVC involvement (Kowalski et al., 2015), while others propose a non-linear, often inverted U-shaped, relationship (Banerjee & Zeman, 2020), suggesting that GVC intensity rises with development up to a point, then declines as countries mature industrially.

Industrial structure, particularly the share of manufacturing in GDP, reflects a country's capacity to absorb and process intermediate goods. Higher manufacturing shares are commonly as-

sociated with increased backward linkages, given the sector's reliance on imported components. However, when domestic absorption dominates and local supply chains are deep, forward linkages may become less pronounced (Van der Marel, 2015; Kowalski et al., 2015; Banga, 2013). Still, this relationship depends on sectoral specialization and the stage of industrial upgrading, which evolve over time (Fernandes et al., 2020).

Technological development is widely acknowledged as a catalyst for deeper GVC participation, especially when it comes to functional upgrading and process sophistication (Hill, 2022). Countries with stronger innovation capabilities are more likely to meet the standards of lead firms in global production networks (Banga, 2014; Olczyk & Kordalska, 2016). Nonetheless, absorptive capacity is a critical mediating factor, especially in economies like Vietnam, where local firms often lag in R&D, and linkages between domestic suppliers and FDI-led production remain weak (Kersan-Škabić, 2019).

Trade policy, particularly tariff regimes on intermediate goods, can either facilitate or hinder integration into global production. High tariffs act as a cost burden and disincentivize backward linkages, while tariff liberalization is generally associated with stronger integration (Banga, 2013). The impact of trade policy is often more visible on the import side than the export side, especially for countries heavily reliant on processing trade.

Regional trade agreements (RTAs) have been a key mechanism for promoting GVC connectivity, particularly in Asia. RTAs can reduce transaction costs, harmonize standards, and encourage intra-regional input sourcing. Empirical findings tend to show a stronger effect of RTAs on backward linkages than on forward linkages (Osnago et al., 2019; World Bank, 2020), likely because RTAs incentivize firms to reconfigure their sourcing strategies more than their export destinations.

Foreign direct investment (FDI) has long been recognized as a vehicle for GVC entry, especially for developing economies. Through FDI, countries like Vietnam gain access to global networks, technologies, and management practices. However, the benefits depend on the extent of local embedding. Several studies have pointed out that in many developing contexts, foreign firms operate in enclaves with limited integration into domestic supplier networks, resulting in strong backward but weak forward participation (Buelens & Tirpák, 2017; Manghnani et al., 2021).

Vietnam's experience in GVCs reflects both success and structural constraints. While the country has carved out a role in several global production networks, particularly in electronics and garments, its value-added contributions remain modest. Much of the export growth is driven by FDI firms, which often import most inputs and generate limited spillovers for domestic firms (OECD, 2021). Although several studies acknowledge these trends, further empirical validation is needed, particularly to disentangle the role of policy instruments versus structural factors. Despite growing attention in policy circles, empirical research on the dual nature of Vietnam's GVC participation (forward vs backward linkages) remains fragmented. Existing studies tend to focus on export growth or trade volumes, without differentiating between the distinct linkages or analyzing the role of structural and policy factors within a unified framework. Moreover, there is limited quantitative work that situates Vietnam in a comparative perspective while considering the interaction of factors such as industrial upgrading, trade liberalization, and investment openness.

This study aims to fill these gaps by empirically examining the key determinants that shape Vietnam's forward and backward participation in GVCs, employing a structured set of explanatory variables rooted in international literature and adapted to the Vietnamese context.

2. METHODOLOGY

Building upon the theoretical framework (Figure 1), this study adopts a quantitative empirical approach to examine the determinants of Vietnam's participation in global value chains (GVCs), with a clear distinction between forward linkages (FL)

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and backward linkages (BL). The objective is to assess how structural and policy-related factors influence each type of linkage and whether these effects are consistent with prior theoretical predictions and international evidence. Following established practices in the GVC literature (e.g., Kowalski et al., 2015; De Backer & Miroudot, 2021), the study utilizes multiple linear regression models with panel time-series data covering the period 2010–2021. This period captures major trends in Vietnam's trade liberalization, FDI inflows, and industrial upgrading under the influence of regional integration and technological transformation.

Although the dataset ends in 2021, this timeframe was selected due to the limited availability of globally harmonized GVC data beyond that year. Key sources such as the OECD TiVA are updated with considerable lag, typically 2–3 years, due to the complexity of compiling multi-country input–output tables. As of mid-2025, no consistent post-2021 data are available for Vietnam's forward and backward GVC participation. Nevertheless, the 2010–2021 period captures critical policy and structural shifts in Vietnam's trade regime, FDI strategy, and technological transformation, making it a valid and relevant time frame for empirical assessment.

To examine the determinants of Vietnam's participation in GVCs, the study estimates two separate models.

Model 1 evaluates factors influencing backward linkages (BL):

$$\begin{aligned} BL_t &= \alpha_0 + \alpha_1 Ln\left(POP_t\right) + \alpha_2 Ln\left(GDPpc_t\right) \\ &+ \alpha_3 MVA_t + \alpha_4 GIIex_t + \alpha_5 SEC_t + \alpha_6 SIC_t \\ &+ \alpha_7 TarCha_t + \alpha_8 TarFa_t + \alpha_9 Ln\left(FDI_t\right) + e_t, \end{aligned} \quad (1)$$

Model 2 assesses drivers of forward linkages (FL):

$$\begin{aligned} FL_t &= \beta_0 + \beta_1 Ln\left(POP_t\right) + \beta_2 Ln\left(GDPpc_t\right) \\ &+ \beta_3 MVA_t + \beta_4 GIIex_t + \beta_5 SEC_t + \beta_6 SIC_t \\ &+ \beta_7 TarCha_t + \beta_8 TarFa_t + \beta_9 Ln\left(FDI_t\right) + e_t, \end{aligned} \quad (2)$$

where BL_t, FL_t present Vietnam's participation index in backward and forward GVC linkages, respectively (measured as % of gross exports). *POP*, *GDPpc*, *MVA*, and *GII* represent structural determinants. *SEC*, *SIC*, *TarCha*, *TarFa*, and *FDI* capture policy-related factors. Natural logarithms are applied to scale-sensitive variables.

All variables are constructed using annual time-series data for Vietnam from 2010 to 2021. A detailed description of each variable, definition, data source, its expected sign, and supporting references are provided in Appendices A and B. The empirical analysis was conducted in 2024 using these secondary data, and all statistical estimations were performed using EViews 10, a widely recognized econometric software for time-series analysis. Preliminary tests include:

- Unit root tests (ADF) to check stationarity.
- Multicollinearity diagnostics (VIF) to avoid variable redundancy.
- Robust standard errors to control for potential heteroskedasticity.
- Model comparison with adjusted R^2, *F*-statistics, and residual analysis.

Given the time-series nature of the dataset, additional diagnostic tests are employed to ensure reliability and avoid spurious regression. The dataset used in this study is archived in Zenodo (Phuong, 2025) under a CC BY 4.0 license. Detailed results of these preliminary tests are reported in Appendices D and E.

3. RESULTS

This paper presents the findings of two econometric models. These models were designed to assess the impact of various factors on Vietnam's involvement in GVCs at both the forward and backward linkages. The results of the econometric model with the dependent variable FL (Vietnam's participation in the forward linkage in GVCs) are shown in Table 1.

According to the results in Table 1, *R2* = 0.8754 means that the independent variable explains 87.54% of the dependent variable's variation. Different tests were performed to ensure the model

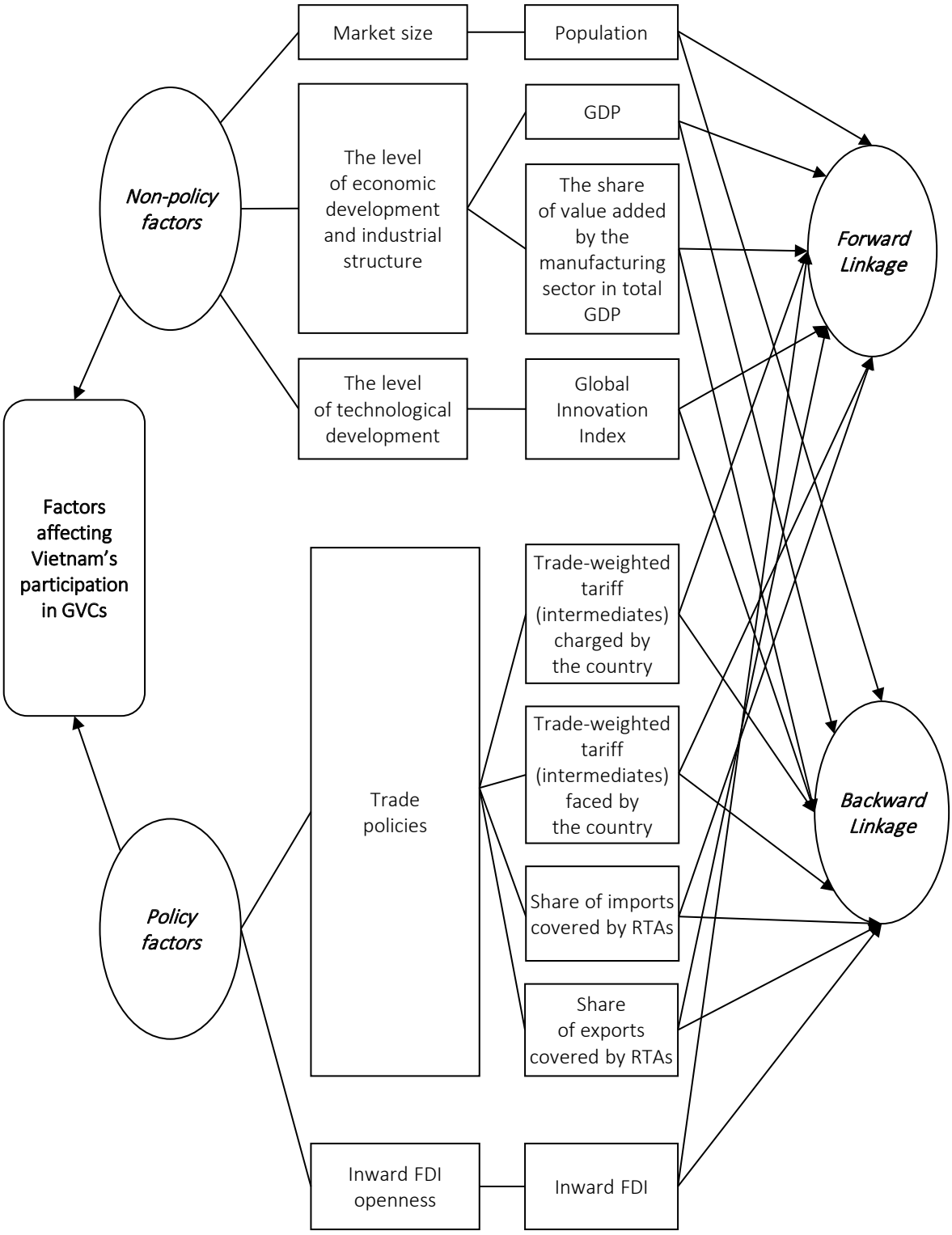

Figure 1. Conceptual framework

was meaningful, including the Heteroskedasticity test, Serial correlation test, and Multicollinearity test (Appendix D). Regression results from Table 1 indicate that two factors that impact Vietnam's forward linkage participation in GVCs include (1) Inward FDI and (2) Share of exports covered by RTAs. Specifically:

1. Accumulated FDI inflows into Vietnam, representing the Inward FDI openness policy fac-

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Table 1. Results of the econometric model with the dependent variable FL

Variable	Coefficient	Std. Error	t–Statistic	Prob.
C	–1.351973	2.704384	–0.499919	0.6434
LOG(POP)	0.104201	0.155627	0.669555	0.5398
LOG(FDI)	–0.041838	0.014716	–2.843023	0.0467
SEC	–0.316814	0.098601	–3.213110	0.0325
SIC	0.331540	0.262747	1.261821	0.2756
R-squared	0.875433	Mean dependent var	0.195328	
Adjusted R-squared	0.750866	S.D. dependent var	0.010533	
S.E. of regression	0.005257	Akaike info criterion	–7.358238	
Sum squared resid	0.000111	Schwarz criterion	–7.248669	
Log likelihood	38.11207	Hannan–Quinn criter.	–7.594688	
F-statistic	7.027818	Durbin–Watson stat	2.462327	
Prob(F-statistic)	0.042685	–		

tor, have a negative impact on Vietnam's participation in the forward linkage of GVCs. If accumulated FDI increases by 1%, Vietnam's participation in the forward link in GVCs will decrease by 0.042%. This result is consistent with the expectation of the econometric model and prior study results.

2. The share of exports covered by RTAs, representing a trade policy factor, also has a negative impact on Vietnam's participation in the forward linkage in GVCs. Specifically, when increasing the share of exports covered by RTAs by 1%, Vietnam's participation in the forward linkage decreased by 0.32%. This result is consistent with the previous research results and the expectation of the econometric model and prior study results.

3. Two other variables present in the results in Table 1 are POP, which represents the market size, and SIC, which is the share of imports covered by RTAs, representing the trade policy factor. Although included in the results table, they are not statistically significant to the dependent variable FL. Similarly, other variables are not included in the results table because there is no statistical significance. The reason may be due to the limitation of research time, which only started in 2010 and ended in 2018, leading to insufficient for some variables to have statistical significance.

The results of the econometric model with the dependent variable BL (Vietnam's participation in the backward linkage in GVCs) are shown in Table 2.

According to the results in Table 2, $R2 = 0.9818$ means that the independent variable explains 98.18% of the dependent variable's variation. Different tests were performed to ensure the model was meaningful, including the Heteroskedasticity test, Serial correlation test, and Multicollinearity test (Appendix E). Regression results from Table 2 indicate that two factors that impact Vietnam's

Table 2. Results of the econometric model with the dependent variable BL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.724474	0.531611	12.64924	0.0002
LOG(GDP)	–0.262019	0.028194	–9.293396	0.0007
SEC	0.645113	0.155043	4.160879	0.0141
SIC	–0.056806	0.430466	–0.131963	0.9014
GII	0.001607	0.002219	0.724165	0.5091
R-squared	0.981891	Mean dependent var	0.365879	
Adjusted R-squared	0.963783	S.D. dependent var	0.044380	
S.E. of regression	0.008446	Akaike info criterion	–6.410081	
Sum squared resid	0.000285	Schwarz criterion	–6.300512	
Log likelihood	33.84537	Hannan–Quinn criter.	–6.646531	
F-statistic	54.22262	Durbin–Watson stat	2.589835	
Prob(F-statistic)	0.000972	–		

forward linkage participation in GVCs include (1) GDP and (2) the Share of exports covered by RTAs. Specifically:

1. Gross domestic product, GDP, which represents the level of economic development, has a negative impact on Vietnam's participation in the backward linkage in GVCs. Specifically, when GDP increases by 1%, Vietnam's participation in the backward linkage in GVCs decreases by 0.26%. This result is consistent with the expectation of the econometric model and prior study results.

2. The share of exports covered by RTAs, representing a trade policy factor, positively impacts Vietnam's participation in the backward linkages in GVCs. When this factor increases by 1%, Vietnam's participation in the backward linkage in GVCs increases by 0.65%. This result is consistent with the expectation of the econometric model and prior study results.

3. Two other variables present in the model's results include SIC, which is the share of imports covered by RTAs, representing the trade policy factor, and the GII, representing the factor of technological readiness of Vietnam, although included in the results table, has no statistical significance to the dependent variable BL. Similarly, other variables are not included in the results table because there is no statistical significance. The reason may be due to the limitation of research time, which only started in 2010 and ended in 2018, leading to insufficient data for some variables to have statistical significance.

4. DISCUSSION

Two policy-related variables – FDI openness and the share of exports covered by RTAs – are found to significantly influence Vietnam's forward GVC participation, both in a negative direction. Specifically, the negative impact of FDI openness suggests that Vietnam's FDI-led integration has not translated into substantial forward linkages. This reflects a well-documented pattern in the literature, where foreign-invested enterprises in developing countries often focus on low-cost assembly operations with limited domestic input sourcing (Kowalski et al., 2015; De Backer & Miroudot, 2021). This outcome is consistent with Antràs and de Gortari (2021) and Meng et al. (2020), who emphasize that GVC trade is primarily driven by intermediate goods rather than final products. In Vietnam, the dominance of final-goods processing by FDI firms means that the value-added embodied in exported intermediates remains modest. These findings also resonate with Pavlinek et al. (2017), who highlighted the enclave nature of FDI operations in Eastern Europe – an insight applicable to Vietnam's electronics and apparel sectors.

However, our result diverges from Buelens and Tirpák (2017), who found a positive relationship between FDI and forward linkages in selected Eastern European economies. The discrepancy may be attributed to differences in absorptive capacity and local firm capability. As Manghnani et al. (2021) and VCCI (2023) suggest, weak linkages between FDI and domestic firms, coupled with limited technology spillovers, continue to constrain Vietnam's potential for upstream integration. This reinforces earlier observations that attracting FDI, while necessary, is insufficient without proactive policies that facilitate supplier upgrading and value chain embedding (Bruno et al., 2016).

Similarly, the negative effect of RTAs on forward GVC participation signals a structural shortfall in Vietnam's trade strategy. Although RTAs have expanded Vietnam's market access for final goods, they have not fostered meaningful co-production or intermediate goods trade. Fernandes et al. (2020) caution that without complementary supply chain cooperation mechanisms, trade liberalization alone may not deepen production linkages. This is further supported by Taglioni and Winkler (2016), who emphasized the role of institutions and capability-building over mere tariff preferences. In the case of Vietnam, where electronics exports are dominated by foreign firms with tightly controlled global supply chains, domestic firms have struggled to insert themselves into upstream tiers (Ministry of Industry and Trade, 2021). Addressing this challenge requires a shift from a "market expansion" logic to a "production integration" agenda within RTAs.

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In terms of backward linkages, the analysis reveals that GDP has a negative influence on Vietnam's reliance on imported intermediates, whereas RTAs facilitate greater backward participation. The inverse relationship between GDP and backward linkages is consistent with the theoretical expectation that economic development enhances domestic supply capabilities, thereby reducing dependency on foreign inputs (Lopez-Gonzalez, 2012). As local firms in Vietnam upgrade and diversify, particularly in low- and mid-tech industries, they may become more capable of substituting imported components with domestically sourced inputs. This dynamic reflects the early stages of industrial deepening, where increased production self-sufficiency is seen as a marker of progress.

Conversely, the positive association between RTAs and backward linkages confirms the role of trade agreements in enabling access to competitively priced and higher-quality intermediate goods. This finding aligns with empirical evidence from Kersan-Škabić (2019) and Gereffi (2020), who show that RTAs reduce input costs and facilitate participation in international production networks, especially in regions like Asia, where supply chains are highly fragmented. For Vietnam, RTAs may serve as an important enabler of integration into global assembly processes – provided that complementary policies support domestic firms' ability to absorb and utilize imported technology and components.

Interestingly, the study finds no statistically significant effect of technological capability – proxied by the Global Innovation Index – on either forward or backward linkage participation. This may seem counterintuitive given the literature's consensus on the role of innovation in enabling GVC upgrading (De Marchi et al., 2013; OECD, 2021). However, our finding echoes concerns raised by Antràs and de Gortari (2021), who caution that innovation capacity alone does not guarantee GVC integration without institutional coordination and implementation effectiveness. In Vietnam's case, while digital transformation has become a national priority, actual progress remains uneven. Factors such as limited R&D investment, weak linkages between universities and industry, and underdeveloped digital infrastructure may explain why innovation inputs have yet to translate into improved GVC positioning. De Marchi et al. (2013) refer to this as the "implementation gap" – a disjuncture between policy ambition and outcomes – which appears particularly relevant for emerging economies like Vietnam. Bridging this gap requires not only technological investments but also broader reforms in education, logistics, and regulatory governance (World Bank, 2020).

CONCLUSION

This study aims to investigate the structural and policy drivers of Vietnam's global value chain participation, with an emphasis on distinguishing the dynamics of forward and backward linkages. By integrating trade liberalization, foreign direct investment (FDI), and innovation capacity into the analysis, the paper seeks to uncover the asymmetric patterns underlying Vietnam's GVC integration.

The findings suggest a pattern of unbalanced and low-value integration. While inward FDI and regional trade agreements (RTAs) have expanded Vietnam's export performance, they are negatively associated with forward GVC participation, highlighting the country's continued specialization in low-complexity assembly tasks with limited domestic value addition. Conversely, RTAs contribute positively to backward linkages by enhancing access to competitive intermediate inputs, while rising GDP reduces reliance on imported components, suggesting growing domestic production capabilities. Notably, technological capacity (measured through the Global Innovation Index) shows no significant relationship with either dimension, reflecting persistent gaps in the institutional and infrastructural foundations necessary to translate innovation policy into GVC upgrading.

These insights carry several important policy implications. Vietnam's future GVC strategy must shift from a quantitative focus on attracting FDI and expanding trade volumes to a qualitative emphasis on

deepening local value capture and technological absorption. This requires more than isolated industrial or innovation programs; it demands a systemic transformation of the domestic production environment. Strengthening vertical linkages between foreign and local firms must be matched by targeted support for supplier upgrading, including technology transfer schemes, quality certification systems, and access to finance for domestic producers. In addition, the implementation of RTAs should be reframed not only as a tool for export market expansion but also as a platform to embed Vietnamese firms more deeply into regional production networks, through joint ventures, skills partnerships, and institutional cooperation.

Crucially, the disconnect between innovation policy and GVC performance points to the need for better alignment between science, technology, and industrial policy. Investments in R&D, infrastructure, and digital governance must be accompanied by mechanisms that facilitate the diffusion of technology within and across sectors, especially to small and medium-sized enterprises. The state must play an enabling role in orchestrating this transformation, not only by building hard and soft infrastructure, but by fostering an ecosystem where capabilities can be cultivated and retained.

Looking ahead, further research should extend the timeframe beyond 2018 to capture recent disruptions in global production systems, including the COVID-19 pandemic, the rise of digital regionalism, and reshoring dynamics. Moreover, disaggregated analysis at the firm or sector level could uncover sector-specific bottlenecks or success stories, allowing for more targeted policy design. Comparative studies across ASEAN or other emerging economies would also help position Vietnam's GVC experience within a broader developmental context, identifying strategic levers for deeper and more resilient integration.

AUTHOR CONTRIBUTIONS

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Writing – review & editing: Thu Nguyen Anh, Linh Nguyen Thi Phuong.

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APPENDIX A

Table A1. Summary of variables and data sources

Type of variable	Variable	Description	Unit	Sources
Dependent	FL	Participation of country/industry in the backward linkage of GVCs		UNCTAD-MRIO
	BL	Participation of country/industry in the forward linkage of GVCs		UNCTAD-MRIO
Independent	POP	The population of a country	Million of people	World Bank
	GDPpc	GDP per capita of a country	USD	World Bank
	MVA	The share of value added by the manufacturing sector in total GDP	% of GDP	World Bank
	GIIex	Technology readiness	%	WIPO
	SEC	Share of exports covered by RTAs (Appendix C)	%	Author's calculation from WITS
	SIC	Share of imports covered by RTAs (Appendix C)	%	Author's calculation from WITS
	TarCha	Trade weighted tariff (intermediates) charged by the country	%	Author's calculation from WITS
	TarFa	Trade weighted tariff (intermediates) faced by the country	%	Author's calculation from WITS
	FDI	Inward FDI	Billion of USD	World Bank

APPENDIX B

Table B1. Expected signs of variables and supporting literature

Variable	Definition	Expected Sign on BL	Expected Sign on FL	Key References
BL	Backward linkage (% of exports using foreign inputs)	Dependent	–	OECD, World Bank
FL	Forward linkage (% of exports used as inputs abroad)	–	Dependent	OECD, World Bank
Ln(POP)	Total population	–	+	Banerjee and Zeman (2020), World Bank (2020)
Ln(GDPPC)	GDP per capita	–	+	European Central Bank (2019), Vrh (2018), Stehrer and Stollinger (2015)
MVA	Manufacturing share in GDP	+	–	Kowalski et al. (2015), Banga (2013)
GII	Global Innovation Index	+	+	Olczyk and Kordalska (2016), Kersan-Škabić (2019)
SEC	Share of exports covered by RTAs	+	–	Osnago et al. (2019)
SIC	Share of imports covered by RTAs	+	–	World Bank (2020)
TarC	Tariff charged by Vietnam on intermediates	–	–	Banga (2013), Kowalski et al. (2015)
TarF	Tariff faced by Vietnam on intermediates	–	–	Osnago et al. (2019)
Ln(FDI)	Inward FDI stock	+	–	Buelens and Tirpák (2017), UNCTAD (2021)

APPENDIX C

Table C1. Countries that have RTAs with Vietnam

No.	Partner country	No.	Partner country
1	Armenia	27	Kazakhstan
2	Australia	28	Korea, Rep.
3	Austria	29	Lao PDR
4	Belarus	30	Latvia
5	Belgium	31	Lithuania
6	Brunei	32	Luxembourg
7	Bulgaria	33	Malaysia
8	Cambodia	34	Malta
9	Canada	35	Mexico
10	Chile	36	Myanmar
11	China	37	The Netherlands
12	Croatia	38	New Zealand
13	Cyprus	39	Peru
14	The Czech Republic	40	The Philippines
15	Denmark	41	Poland
16	Estonia	42	Portugal
17	Finland	43	Romania
18	France	44	The Russian Federation
19	Greece	45	Singapore
20	Germany	46	The Slovak Republic
21	Hungary	47	Slovenia
22	India	48	Spain
23	Indonesia	49	Sweden
24	Ireland	50	Thailand
25	Italy	51	The United Kingdom
26	Japan		

APPENDIX D

Table D1. Heteroskedasticity test – Breusch-Pagan-Godfrey (Model 1; Dependent variable: FL)

Test Statistic	Value	Prob.
F-statistic	0.054908	Prob. F(4,4) = 0.9922
Obs*R-squared	0.468452	Prob. Chi-Square(4) = 0.9765
Scaled explained SS	0.023145	Prob. Chi-Square(4) = 0.9999

Table D2. Variance inflation factors (VIF) – Multicollinearity (Dependent variable: FL)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	7.313692	2,381,567	NA
LOG(POP)	0.024220	2,651,008	5.662943
LOG(FDI)	0.000217	7,148.620	5.899708
SEC	0.009722	1,364.097	1.199111
SIC	0.069036	14,453.10	1.927537

Table D3. Breusch-Godfrey serial correlation LM test (Dependent variable: FL)

Test Statistic	Value	Prob.
F-statistic	0.648222	Prob. F(1,3) = 0.4796
Obs*R-squared	1.599134	Prob. Chi-Square(1) = 0.2060

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Table D4. Heteroskedasticity test – Breusch-Pagan-Godfrey (Model 2; Dependent variable: FL)

Test Statistic	Value	Prob.
F-statistic	0.545332	Prob. F(4,4) = 0.7143
Obs*R-squared	3.176010	Prob. Chi-Square(4) = 0.5288
Scaled explained SS	0.798156	Prob. Chi-Square(4) = 0.9387

APPENDIX E

Table E1. Heteroskedasticity test – Breusch-Pagan-Godfrey (Dependent variable: BL)

Test Statistic	Value	Prob.
F-statistic	0.545332	Prob. F(4,4) = 0.7143
Obs*R-squared	3.176010	Prob. Chi-Square(4) = 0.5288
Scaled explained SS	0.798156	Prob. Chi-Square(4) = 0.9387

Table E2. Serial correlation LM test – Breusch-Godfrey (Dependent variable: BL)

Test Statistic	Value	Prob.
F-statistic	1.233102	Prob. F(1,3) = 0.3478
Obs*R-squared	2.621698	Prob. Chi-Square(1) = 0.1054

Table E3. Multicollinearity test – Variance inflation factor (VIF) (Dependent variable: BL)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.282610	35,656.14	NA
LOG(GDP)	0.000795	67,445.86	2.385144
SEC	0.024038	1,306.799	1.148743
SIC	0.185301	15,030.87	2.004591
GII	4.92E-06	821.6234	1.530789