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THE EFFECTS OF MACROECONOMIC CONDITIONS AND BUSINESS ENVIRONMENT ON GLOBAL VALUE CHAIN PARTICIPATION: EVIDENCE FROM VIETNAM'S MANUFACTURING SECTOR

EFEITOS DAS CONDIÇÕES MACROECONÔMICAS E DO AMBIENTE DE NEGÓCIOS NA PARTICIPAÇÃO NA CADEIA DE VALOR GLOBAL: EVIDÊNCIAS DO SETOR FABRIL DO VIETNÃ

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Abstract
This study examines the effects of macroeconomic conditions, the business environment, and industry-level characteristics on the participation of Vietnam's manufacturing sector in global value chains (GVCs). Using firm-level data from the Vietnam Enterprise Survey (2011-2020), combined with GVC indicators derived from the EORA MRIO database, the analysis employs a dynamic panel framework estimated through the System-GMM approach. The results confirm significant path dependence in GVC participation, with prior levels of engagement strongly influencing subsequent performance. Macroeconomic factors exhibit heterogeneous effects: inflation positively affects GVC integration, whereas Gross Domestic Products (GDP) growth shows mixed and channel-specific impacts. Institutional quality, proxied by the Provincial Competitiveness Index (PCI), enhances overall and backward GVC participation but reduces forward linkages. Firm-level characteristics, such as age, productivity, and market concentration, also play critical roles. FDI spillovers, particularly horizontal linkages, consistently promote deeper GVC involvement. These findings highlight the importance of stabilizing macroeconomic conditions, improving institutional quality, and strengthening FDI-domestic firm linkages to enhance Vietnam's manufacturing integration into global production networks.

Resumo
Este estudo examina os efeitos das condições macroeconômicas, do ambiente de negócios e das características do setor manufatureiro do Vietnã na participação das cadeias globais de valor (CGVs). Utilizando dados em nível de empresa da Pesquisa Empresarial do Vietnã (2011-2020), combinados com indicadores de CGV derivados do banco de dados EORA MRIO, a análise emprega um modelo de painel dinâmico estimado pela abordagem System-GMM. Os resultados confirmam uma significativa dependência da trajetória na participação em CGVs, com os níveis anteriores de engajamento influenciando fortemente o desempenho subsequente. Os fatores macroeconômicos apresentam efeitos heterogêneos: a inflação afeta positivamente a integração às CGVs, enquanto o crescimento do Produto Interno Bruto (PIB) mostra impactos mistos e específicos para cada canal. A qualidade institucional, representada pelo Índice de Competitividade Provincial (ICP), aumenta a participação geral e a montante nas CGVs, mas reduz as ligações a jusante. Características em nível de empresa, como idade, produtividade e concentração de mercado, também desempenham papéis críticos. Os efeitos indiretos do Investimento Estrangeiro Direto (IED), particularmente as ligações horizontais, promovem consistentemente um envolvimento mais profundo nas CGVs. Essas descobertas destacam a importância de estabilizar as condições macroeconômicas,

Keywords: Global Value Chains. Manufacturing. Macroeconomic Environment. Institutional Quality. FDI Spillovers.

melhorar a qualidade institucional e fortalecer os vínculos entre o IDE e as empresas nacionais para aprimorar a integração do setor manufatureiro do Vietnã às redes globais de produção.

Palavras-chave: *Cadeias Globais de Valor. Manufatura. Ambiente Macroeconômico. Qualidade Institucional. Transbordamentos do IDE.*

1 INTRODUCTION

In the context of deepening globalization and increasing fragmentation of international production, participation in GVCs has become a critical determinant of productivity, innovation capacity, and long-term growth prospects for developing economies (Gereffi & Fernandez-Stark, 2016; World Bank, 2020). International studies emphasize that effective GVC integration requires a combination of stable macroeconomic conditions, a conducive business environment, and strong institutional capacity that enables firms to enhance the quality of their linkages within global production networks (OECD, 2013, 2025). These factors are particularly important for export-oriented economies, where firms are highly sensitive to transaction costs, logistics performance, regulatory frameworks, and the predictability of economic policies.

For Vietnam, although the manufacturing sector has become a key driver of growth and the most GVC-integrated segment of the economy, empirical evidence indicates that firms remain concentrated in low-value-added stages, rely heavily on imported inputs, and face considerable challenges in upgrading to higher positions within the value chain (UNCTAD, 2023; World Bank, 2020). Recent macroeconomic shocks, including global supply chain disruptions, geopolitical tensions, and regional production restructuring, have further highlighted the vulnerability of economies whose GVC participation depends strongly on foreign intermediate inputs (Baldwin & Freeman, 2022). Hence, a systematic assessment of how macroeconomic conditions and the business environment jointly promote or hinder GVC participation in the manufacturing sector has become increasingly essential.

Despite extensive international literature underscoring the roles of macroeconomic stability, institutional quality, and FDI in shaping trade and GVC

integration, there remains a lack of studies that simultaneously examine the effects of macroeconomic variables and business environment conditions on industry-level GVC participation. In Vietnam, most existing research focuses on FDI, firm productivity, or inter-firm linkages, while the combined influence of inflation, exchange rates, economic growth, and institutional quality on manufacturing GVC participation has not been comprehensively analyzed. Moreover, internationally standardized GVC measures based on value-added indicators (foreign value added - FVA, domestic value added in partners' exports - DVX) remain underutilized in the Vietnamese context.

This study contributes to the emerging body of literature on the determinants of GVC integration in developing economies by providing empirical evidence from Vietnam, a country increasingly recognized as a key node in Asian supply chains (OECD, 2021). The findings are expected to offer meaningful implications not only for domestic policy formulation but also for other developing countries with similar industrial structures, especially as global value chains continue to be reshaped by green transition, digital transformation, and shifts in the geoeconomic landscape.

The remainder of the paper is structured as follows. Section 2 reviews the literature on the impacts of macroeconomic and business environment factors on GVC participation in the manufacturing sector. Section 3 outlines the empirical methodology and data, including model specification, variable construction, estimation techniques, and data sources. Section 4 presents the empirical results and discusses the key findings. The final section concludes the study and offers policy implications.

2 THEORETICAL OVERVIEW OF GLOBAL VALUE CHAINS AND THE INFLUENCE OF THE MACROECONOMIC AND BUSINESS ENVIRONMENT ON MANUFACTURING SECTOR PARTICIPATION IN GLOBAL VALUE CHAINS

The concept of the value chain was first systematized by Porter (1985), emphasizing the sequence of activities undertaken by firms to create added value for products or services (Porter, 1985). However, as global production has become increasingly fragmented, the notion of the value chain has evolved into the GVC. According to Gereffi and Fernandez-Stark (2016), GVCs represent a dispersed network of activities ranging from design and manufacturing to assembly and distribution,

coordinated by firms located in multiple countries in order to optimize costs and exploit specialization at each stage. GVCs therefore reflect the micro-level international division of labor and are closely linked to cross-border flows of trade, investment, and technology (Gereffi & Fernandez-Stark, 2016)

Within GVCs, linkages are commonly classified into backward and forward linkages. Studies by ADB et al. (2021) and the World Bank (2020) indicate that backward linkages capture the share of foreign intermediate inputs used in a country's exports (FVA), while forward linkages reflect the domestic value added embodied in other countries' exports (DVX). These two dimensions describe the degree of integration of an economy into global production networks and highlight its role within regional and international supply chains.(ADB, UIBE, WTO, IDE-JETRO, & CDRF, 2021; World Bank, 2020)

In terms of measurement, GVC participation indicators are typically derived from Multi-Regional Input-Output (MRIO) tables constructed by organizations such as the OECD, WTO, ADB, or WIOD (OECD, 2013). According to Banga (2013) and UNCTAD (2023), three widely used indicators include: (i) foreign value added in exports (FVA), capturing backward participation; (ii) domestic value added (DVA); and (iii) domestic value added used in partner countries' exports (DVX), capturing forward participation. Overall GVC participation is measured as the sum of FVA and DVX (Banga, 2013; UNCTAD, 2023). This approach is consistently applied in OECD's ICIO database, the WTO-OECD TiVA database, and MRIO datasets by ADB and WIOD.

In addition, recent studies emphasize the importance of examining GVC participation through the lenses of participation depth and position indices, which capture the extent to which economies move up toward higher–value-added stages of production (Koopman, Wang, & Wei, 2014; Wang, Wei, Yu, & Zhu, 2017). These indicators provide a more comprehensive understanding of an economy's role within GVCs and are particularly relevant for developing countries seeking to upgrade within global production systems.

International studies have highlighted that a stable macroeconomic environment plays a crucial role in shaping firms' capacity to integrate into GVCs. Shepherd (2021) emphasizes that macroeconomic conditions such as inflation can directly influence the investment decisions of multinational corporations, which are key actors structuring global GVC networks (Shepherd, 2021). Similarly, Angawati and Kurniawati (2022)

show that inflation and exchange rate volatility exert a negative and statistically significant impact on exports in five ASEAN countries, implying that macroeconomic instability weakens trade competitiveness (Angawati & Kurniawati, 2022). Silalahi et al. (2021) provide a more nuanced perspective by finding that inflation has a negative short-run effect but a positive long-run effect on industry-level GVC participation (Silalahi, Iranto, & Sebayang, 2021). At the sectoral level, Oduor et al. (2021) report that a one-percentage-point increase in inflation can reduce value added in manufacturing by 0.19269 units (Oduor, Ngala, Ruto, & Abdillahi, 2021). Conversely, Okpe and Ikpesu (2021) show that inflation may increase food imports while simultaneously reducing food exports in Nigeria, reinforcing the argument that the effects of inflation vary depending on industrial structure (Okpe & Ikpesu, 2021).

Economic growth also exerts a notable influence on GVC participation through the export channel. Bulut and Yaşar (2023) find that economic growth positively affects export performance at lower levels of export intensity, although this effect diminishes as export volumes increase. Moreover, the relationship between inflation and export activity appears to vary across stages of export expansion: a positive association is observed when export volumes are high, whereas no significant relationship is found during the initial phase of export growth. These findings suggest that macroeconomic factors not only directly shape trade dynamics but also indirectly influence the degree of integration into global value chains.(BULUT & YAŞAR, 2023)

Alongside the macroeconomic environment, institutional quality and the broader business environment constitute an equally important group of determinants. Dollar and Kidder (2017) show that strong institutions enhance a country's comparative advantage, thereby promoting deeper participation in global value chains (Dollar & Kidder, 2017). Ge et al. (2020) argue that weak institutional frameworks pose significant barriers to GVC development and regional integration in countries participating in the Belt and Road Initiative (Ge, Dollar, & Yu, 2020). At the industry level, Dollar et al. (2016) also document a consistent positive correlation between GVC participation and various indicators of institutional quality (Dollar, Ge, & Yu, 2016). At the firm level, Ramadan and Ahmad (2018) find that uncertainty in the business environment reduces the performance of manufacturing enterprises (Ramadan & Ahmad, 2018). In the case of Vietnam, Hồ and Nguyễn (2024) demonstrate that factors such as land access, informal costs, and labor quality significantly influence the ability of small and medium-sized

enterprises to access international markets, thereby affecting their level of participation in GVCs (Hồ & Nguyễn, 2024).

An important strand of research further highlights the role of foreign direct investment (FDI) in fostering participation in global value chains. Fernandes et al. (2022) emphasize that favorable trade conditions, political stability, and domestic industrial capacity are critical determinants of a country's ability to engage in GVCs (Fernandes, Kee, & Winkler, 2022). Nguyen et al. (2021) find that linkages between FDI firms and Vietnamese SMEs enhance GVC participation by expanding the use of imported inputs and increasing firms' capacity to supply both domestic and export markets(NGUYEN, NGUYEN, NGUYEN, & PHAM, 2021). Similarly, Hoekman and Sanfilippo (2023) provide evidence of vertical spillover effects, showing that domestic firms located near FDI projects are more likely to engage in trade through either imports or exports (Hoekman & Sanfilippo, 2023). Recent studies, such as Özdamarlar and Wigley (2025) and Anh et al. (2025), further reinforce the argument that FDI serves as a crucial driver of GVC integration in developing economies.(Anh, Phuong, & Hong, 2025; Özdamarlar & Wıgley, 2025)

3 RESEARCH METHODOLOGY AND DATA SOURCES

3.1. Research methodology

The study constructs a model to evaluate the effects of institutional conditions, policies, and the macroeconomic environment on the participation of Vietnam's manufacturing sector in GVCs as follows:

$$GVC_{jt} = \beta_0 + \beta_1 PO_t^P + \beta_2 MA_t^P + \beta_3 F\_CHA_{i,j,t}^P + \beta_4 S\_CHA_{i,j,t}^P + u_{i,j,t} + \varepsilon_{i,j,t} \quad (1.1)$$

In this specification, GVC_{jt} represents the level of GVC participation of industry *j* in year *t*, measured through three indicators: overall GVC participation, backward participation, and forward participation of industry *j* at time *t*. PO_t^P denotes provincial policies that support and promote enterprise development in province *P* in year *t*; in this study, the Provincial Competitiveness Index (PCI) is employed as a proxy for this variable. MA_t^P captures the macroeconomic environment of province *P* in year *t*, for

which the study uses the GDP deflator and provincial GDP growth rate as representative indicators. F_CHA reflects firm-level characteristics, including total factor productivity (TFP), the Herfindahl-Hirschman Index (HHI), and the share of a large firm within the industry. S_CHA represents industry-level characteristics; in this context, the authors use variables related to the contribution of foreign direct investment (FDI), given its substantial role in shaping the manufacturing sector in Vietnam. The indices *i* and *j* denote firm *i* in industry *j* located in province *P* in year *t*, and *P* refers to the province.

Model (1.1) is a static econometric model. However, time lags inherent in the data may influence various economic relationships. Estimating a purely static model risks omitting lagged effects of variables, which can introduce bias into coefficient estimates, as noted by Bond (2002), Baum (2006), Greene (2008), and Baltagi (2008). Therefore, building upon model (1.1), we extend the specification to a dynamic framework that incorporates lagged effects of key variables as follows:

$$GVC_{jt} = \beta_0 + \gamma GVC_{jt-1} + \beta_1 PO_t^P + \beta_2 MA_t^P + \beta_3 F\_CHA_{i,j,t}^P + \beta_4 S\_CHA_{i,j,t}^P + u_{i,j,t} + \varepsilon_{i,j,t} \quad (1.2)$$

In this specification, the coefficient γ captures the effect of the one-year lag of GVC participation on the current level of GVC in year *t*.

Model (1.2) is therefore classified as a dynamic model. However, dynamic panel models often face issues of endogeneity. To address this concern, the study employs instrumental variable techniques introduced by Anderson and Hsiao (1982), commonly known as the Generalized Method of Moments (GMM)(Anderson & Hsiao, 1982). Two estimation approaches are frequently used within the GMM framework: the first is Difference GMM (D-GMM), proposed by (Arellano & Bond, 1991) and further developed by (Ahn & Schmidt, 1995); the second is System GMM (S-GMM), introduced by (Blundell & Bond, 1998). The main distinction between these methods lies in the selection of instruments and the underlying moment conditions they exploit.

3.2 Construction of variables

3.2.1. Measuring GVC participation

This study follows the approach of (Belotti, Borin, & Mancini, 2020). Accordingly, we employ the EORA MRIO database to measure the level of GVC participation as follows:

$$GVC_{sr} = GVCbackward_{sr} + GVCforward_{sr} \quad (2)$$

$$GVCbackward_{sr} = \frac{V_S(I-A_{ss})^{-1}\sum_{j\neq s}^{G} A_{sj}B_{js}E_{sr}+\sum_{t\neq s}^{G} V_t B_{ts}E_{sr}}{V_N E_{sr}} \quad (3)$$

$$GVCforward_{sr} = \frac{V_S(I-A_{ss})^{-1}A_{sr}(I-A_{rr})^{-1}\left(\sum_{j\neq r}^{G} Y_{rj}+\sum_{f\neq r}^{G} A_{rj}\sum_{k}^{G}\sum_{l}^{G} B_{jk}Y_{kl}\right)}{u_N E_{sr}} \quad (4)$$

In this formulation, *s* and *r* denote two countries, referred to as "country s" and "country r." *GVCsr* represents the share of GVC-related trade in total exports from country s to country r; $GVCbackward_{sr}$ measures backward GVC participation between the two countries; and $GVCforward_{sr}$ captures forward GVC participation from country *s* to country *r*. A denotes the OECD Inter-Country Input–Output (ICIO) table, while B is the Leontief inverse matrix derived from A, calculated as B = (I – A)^-1, where *I* is the identity matrix. Vs represents the domestic value added of country *s*, E is the vector of net exports from country *s* to country *r*, and uNE_{sr} denotes the total exports from country *s* to country *r*.

3.2.2 Variables representing the macroeconomic environment and business environment

The macroeconomic environment is measured through the inflation rate (*Lcpi*) and economic growth rate (*Lgdp*). In this model, the inflation-related variable is represented by a deflated indicator, calculated as the ratio of regional GDP at current prices to regional GDP in the base year. The GDP growth variable captures provincial economic growth and is computed using the regional GDP growth rate, measured as the difference between real GDP in the current year and the previous year, divided by real GDP of the previous year.

The business environment is proxied by the Provincial Competitiveness Index (PCI), which reflects the quality of local institutional and administrative conditions. Industry-level competition or concentration is measured using the Herfindahl-Hirschman Index (HHI).

HHI measures market concentration and is calculated as the square root of the sum of squared market shares of all market participants. Higher *HHI* values indicate greater specialization or concentration, whereas lower values imply higher diversification. The index is computed as follows:

$$HHI = \sum_{i=1}^{n} w_{i,j,t}^2 \qquad (5)$$

In this expression, *w* represents the ratio of the revenue of the ith firm in industry *j* in year *t* to the total revenue of industry *j* in the same year.

3.2.3 Measuring FDI spillover effects

This study examines and quantifies FDI spillovers as an industry-level factor influencing investment, production, and trade activities within the manufacturing sector. Following the framework of Aitken and Harrison (1999), FDI generates horizontal spillovers, which include both backward and forward linkages (Aitken & Harrison, 1999). FS_{ijt} denotes the share of capital owned by foreign-invested enterprise *i* in the total capital of all firms operating in industry *j* at time *t*.

Horizontal$_{jt}$ (Hor_{jt}), representing horizontal spillovers, captures the extent of foreign investor participation in the industry and is calculated as follows:

$$Hor_{jt} = \frac{\sum_i FS_{ijt} L_{ijt}}{\sum_i L_{ijt}} \qquad (6)$$

Backward spillovers ($Back_{jt}$) capture the extent to which domestic firms participate in industries that supply intermediate inputs to foreign-invested enterprises, thereby reflecting the degree of linkage and cooperation between domestic firms and FDI firms. This variable is calculated as follows:

$$Back_{jt} = \sum_{k\ if\ k \neq j} \gamma_{ikt} * Hor_{kt} \qquad (7)$$

γ_{jk} denotes the proportion of output from industry *j* supplied to industry *k*, derived from the Input-Output (I–O) matrix. In computing this measure, intra-industry input flows are excluded because they are already captured in the horizontal spillover variable Hor_{jt}.

Forward spillovers (For_{jt}) represent the extent to which foreign-invested firms supply intermediate inputs to domestic firms operating in the same industry. This variable is calculated as follows:

$$For_{jt} = \sum_{lif\ l \neq j} \delta_{ikt} * Hor_{lt} \quad (8)$$

In this formulation, the coefficient δ_{ikt} (derived from the I-O table) represents the share of inputs that firms in industry j purchase from firms in upstream industry l. Inputs purchased within the same industry (l ≠ j) are excluded, as these values are already captured by the horizontal spillover variable Hor_{jt}.

3.2.4 Other variables in the model

- Measuring TFP

(Levinsohn & Petrin, 2003) proposed a semi-parametric method for estimating total factor productivity (TFP), building on the framework originally developed by (Olley & Pakes, 1996). The semi-parametric approach is based on the following production function:

$$y_{it}^{j} = \alpha + \beta_l l_{it}^{j} + \beta_m m_{it}^{j} + \beta_k k_{it}^{j} + \omega_{it}^{j} + \varepsilon_{it}^{j} \quad (9)$$

Here, y_{it}^{j} denotes output, l_{it}^{j} represents labor input, m_{it}^{j} is the quantity of raw materials (intermediate inputs), and k_{it}^{j} is the value of capital inputs and intermediate capital goods. ω_{it}^{j} captures total factor productivity (TFP), while ε_{it}^{j} denotes the stochastic error term. The components ω_{it}^{j} and ε_{it}^{j} are assumed to be standard, homogeneous, and independently distributed. The indices i, j, and t correspond to firm i, industry j, and year t, respectively.

In model (9), TFP is determined by the two unobserved components ω_{it}^{j} and ε_{it}^{j}, such that:

$$TFP_{it} = \omega_{it}^{j} + \varepsilon_{it}^{j}$$

Accordingly, based on model (9), TFP can be computed as follows:

$$TFP_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it} - \hat{\beta}_k k_{it} \quad (10)$$

Firm characteristics: This group of variables includes firm-level attributes that may influence the extent of GVC participation, such as the number of years the firm has been in operation and the size of the enterprise.

3.4 Data Sources

The study uses annual enterprise survey data from the General Statistics Office (GSO), focusing on firms in Vietnam's manufacturing sector during the period 2011–2020. Provincial-level GDP data are obtained from the Provincial Statistical Yearbooks for the years 2011–2020. Information on the Provincial Competitiveness Index (PCI) is taken from the annual PCI reports published by the Vietnam Chamber of Commerce and Industry (VCCI).

GVC-related data are derived from the Eora Global MRIO database. This database provides a time series of high-resolution multi-regional input–output (MRIO) tables accompanied by corresponding social and environmental satellite accounts, covering 190 countries and disaggregated into 26 sectors.

Table 1 presents the variables used in the model, their definitions, and the corresponding data sources.

Table 1

Meaning and Source of Variables

Variables	Meaning	Source
gvc		
tfp	Total factor productivity	Calculation from GSO's VES data
backwardgvc	Backward GVCs participation indicator	Calculation from EORA MRIO
forwardgvc	Forward GVCs participation indicator	Calculation from EORA MRIO
hhi	Herfindahl-Hirschman Index	Calculation from GSO's VES data
firmage	The number of years in operation	Calculation from GSO's VES data
r_l_firm	Total large firm/Total firm by sector	Calculation from GSO's VES data
hori	Horizontal	Calculation from GSO's VES data
back	Backward	Calculation from GSO's VES data
for	Forward	Calculation from GSO's VES data

gdp	Provincial Gross Domestic Product	Provincial Statistic Yearbook
cpi	GDP deflator index	Provincial Statistic Yearbook
pci	Provincial Competitiveness Index	VCCI

Table 2 presents the descriptive statistics of the variables used in the model, including the total number of observations, mean values, standard deviations, and minimum and maximum values.

Table 2

Descriptive statistics of variables used in the model

Variables	No. Obs	Mean	Std. dev.	Min	Max
gvc	387994	1069	1050	121	3616
backwardgvc	387994	953	1004	101	3463
forwardgvc	387994	116	56	17	262
Hhi	387994	0.0049	0.0062	0.0014	0.2379
ratio of LF	387476	0.0553	0.0611	0.0039	0.3333
Firmage	387994	0.2903	1.0299	0.0000	9.0000
tfp	387994	2.9300	0.7818	-4.6669	9.0661
horizontal	387904	0.0172	0.0024	1.0000	0.0000
backward	387904	0.0120	0.0177	0.0022	0.9304
forward	387904	0.0103	0.0139	0.0015	0.5698
Log of gdp	387994	15.1695	0.1801	14.8856	15.4224
Log of d_{gdp}	387994	4.1291	0.0639	3.8093	4.3187

Source: Authors' Calculations, the prefix l before the variables indicates their logarithmic form.

4 RESULTS

The estimation results of the dynamic model are presented in Table 3. Specifically, columns (1), (2), and (3) report the effects of the explanatory variables on overall GVC participation, backward GVC participation, and forward GVC participation, respectively.

In dynamic specifications, the lagged dependent variable is treated as a control variable representing the persistence of GVC participation across periods. The initial level of participation in global value chains affects the subsequent growth rate of such participation. This finding provides evidence of conditional convergence during the integration process, suggesting that each industry within a country will eventually reach its own steady-state level of participation in global value chains. The estimated coefficients indicate that a 1 percent lower initial level of industry participation in GVCs, backward GVCs, and forward GVCs leads to an increase in the subsequent growth rate of participation by approximately 0.27, 0.38, and 0.50 percentage points, respectively.

Table 3

Estimation Results

	Dynamic Model		
Variables	(1) GVC	(2) Backward GVC	(3) Forward GVC
L.lgvc	-0.3602***		
	(0.0086)		
L.lbackwardgvc		-0.5011***	
		(0.0085)	
L.lforwardgvc			-0.2366***
			(0.0181)
Lback	-0.9658***	-0.9173***	-1.0205***
	(0.0964)	(0.0988)	(0.0777)
Lfor	0.0068	-0.0484**	0.3353***
	(0.0190)	(0.0195)	(0.0155)
hhi_dthu	-2.3948***	-2.7741***	-0.6199**
	(0.3869)	(0.4107)	(0.2989)
r_l_firm_mean	4.8076***	5.2484***	2.1552***
	(0.1121)	(0.1166)	(0.0655)
Firmage	0.0166***	0.0199***	0.0139***
	(0.0011)	(0.0012)	(0.0007)
Tfp	0.0058***	0.0067***	0.0054***
	(0.0005)	(0.0006)	(0.0004)
Lhori	0.9361***	0.9337***	0.7200***
	(0.0920)	(0.0941)	(0.0741)
Lgdp	-1.1482***	-1.4983***	0.4255***
	(0.0174)	(0.0187)	(0.0145)
lcpi_i	2.4361***	2.7636***	1.1750***
	(0.0327)	(0.0353)	(0.0194)
Lpci	0.1599***	0.2632***	-0.3056***
	(0.0119)	(0.0133)	(0.0085)
Constant	24.3495***	29.6969***	0.1699
	(0.2280)	(0.2491)	(0.1481)
No of Observations	165,739	165,739	165,739
R-squared			
Id number	48,342	48,342	48,342

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors' estimation results.

Table 3 reports the GMM dynamic estimation results for the three indicators of global value chain participation: overall GVC (column 1), backward GVC (column 2), and forward GVC (column 3). The coefficients of the lagged dependent variables are negative and highly statistically significant, indicating the presence of short-run adjustment dynamics. Specifically, the lagged terms of GVC, backward GVC, and forward GVC have coefficients of -0.3602, -0.5011, and -0.2366, respectively, implying a tendency toward convergence over time. This suggests that industries with initially lower levels of GVC participation tend to experience faster subsequent growth in

participation, consistent with the notion of conditional convergence in global value chains.

The results also indicate that backward GVC participation (*Lback*) exerts a negative and highly significant effect on all three indicators. This suggests that excessive dependence on foreign inputs may weaken an industry's ability to upgrade its position within global value chains. In contrast, forward linkages (*Lfor*) show a strong and positive impact on forward GVC participation (0.3353), while exerting a negative and statistically significant effect on backward GVC, reflecting the distinct supply-chain structures associated with these two modes of GVC integration.

Industry structure and firm characteristics display coefficients with the expected signs and are statistically significant. Specifically, industry concentration (hhi_dthu) has a negative effect, implying that greater market concentration reduces GVC participation, whereas more competitive industries tend to integrate more effectively. Conversely, firm size (r_l_firm_mean), firm age (Firmage), and productivity (TFP) all exert positive impacts on the three forms of GVC participation. This finding aligns with the argument that larger, more established, and more productive firms are better equipped to engage more deeply in global value chains.

Horizontal FDI spillovers (Lhori) exhibit a positive and statistically significant effect across all three models, underscoring the important role of foreign-invested enterprises in strengthening production linkages within the manufacturing sector. This finding is consistent with previous studies that highlight FDI as a key driver of global value chain integration.

GDP growth (Lgdp) exerts a negative effect on overall GVC participation and backward GVC, while showing a positive and significant effect on forward GVC. This pattern suggests that as the economy expands, industries tend to increase their value-added exports to foreign markets (forward linkages) rather than expand their reliance on imported inputs. In contrast, the inflation index (lcpi_i) has a strong and positive impact across all three measures, indicating that rising inflation may encourage firms to seek international markets as a channel to offset increasing domestic production costs.

Finally, provincial business environment quality (Lpci) positively influences overall GVC participation and backward GVC, yet exerts a negative impact on forward GVC. This implies that improvements in local institutional quality may support greater backward linkages (importing inputs) and overall participation, but may still be

insufficient to foster forward linkages associated with higher value-added integration into global value chains

5 DISCUSSION AND POLICY IMPLICATIONS

- ***Discussion***

The dynamic GMM regression results indicate that the structure of GVC participation in Vietnam's manufacturing sector is simultaneously influenced by firm-level characteristics, industry-specific factors, and broader macroeconomic conditions as well as the provincial business environment.

First, the lagged coefficients of all three dependent variables (GVC, backward GVC, and forward GVC) are statistically significant and negative, indicating the presence of conditional convergence across industries. This implies that industries with initially lower levels of GVC participation tend to grow more rapidly in subsequent periods. This finding is consistent with international literature, which suggests that GVC participation is strongly shaped by sectoral adjustment dynamics and spillover effects arising from the integration process (World Bank, 2020; OECD, 2013).

Second, the results indicate that backward linkages (Lback) exert a strong and statistically significant negative effect across all three models. This finding reflects the limitations faced by Vietnamese firms in leveraging imported inputs to enhance domestic value added in exports. Such a pattern is common among many emerging economies, where manufacturing industries remain positioned at the lower segments of GVCs, relying heavily on imported materials and participating only marginally in higher value-added, technology-intensive stages. In contrast, forward linkages (Lfor) show a strong and positive effect on forward GVC participation, suggesting that industries capable of supplying inputs to foreign markets play a prominent role in promoting GVC integration through the export of domestic value added.

Third, industry-level competitive dynamics, measured through the Herfindahl–Hirschman Index (HHI), exhibit a negative and statistically significant effect on all three GVC indicators. This result suggests that high market concentration weakens an industry's degree of integration into global value chains, implying that limited competition reduces incentives for technological upgrading and constrains the potential for moving up the value chain. This finding is consistent with international evidence

indicating that industries operating under stronger competitive pressures tend to participate more effectively in GVCs and achieve better upgrading outcomes (Baldwin & Freeman, 2022).

Fouth, FDI spillovers, as captured by the horizontal spillover variable (Lhori), exhibit positive and statistically significant effects across all three models, highlighting the critical role of FDI in facilitating the integration of domestic firms into global value chains. This finding is fully consistent with the structure of Vietnam's manufacturing sector, in which FDI plays a central role in export activities, particularly in electronics, textiles, and footwear. International evidence, such as that presented by Hoekman and Sanfilippo (2023), similarly emphasizes that FDI spillovers are a key driver enabling domestic firms to participate more effectively in GVCs by fostering technology diffusion and expanding supply–chain linkages.

Fifth, Regarding the macroeconomic context, provincial GDP growth (Lgdp) exhibits a negative effect in the first two models but a positive effect on forward GVC participation. This suggests that economic expansion may not immediately translate into enhanced domestic value-added creation through imported inputs, yet it appears to support the outward transmission of domestic value added. Inflation (lcpi_i), on the other hand, shows a positive and statistically significant effect across all three models, which contrasts with much of the international literature that typically reports adverse impacts. This finding may reflect Vietnam's specific conditions, where moderate inflation often coincides with periods of production expansion and increased investment, thereby temporarily stimulating activities linked to international trade. Nevertheless, caution is warranted in interpreting this result, as such positive effects may not be sustainable in the long run.

The business environment, measured by the Provincial Competitiveness Index (PCI), exerts a positive effect on overall GVC participation and backward GVC participation but a negative effect on forward GVC participation. This pattern suggests that improvements in local institutional quality can facilitate firms' access to imported inputs and support their general engagement in global value chains; however, such improvements do not necessarily translate into deeper integration through forward linkages that embody higher domestic value added. This limitation may stem from continued dependence on multinational enterprises in high-value segments of the chain,

which constrains the ability of domestic firms to upgrade and capture greater value in downstream stages.

These findings reflect the distinctive structure of Vietnam's participation in global value chains: a high dependence on FDI, strong backward linkages but relatively weak forward linkages, and a substantial influence from firms' internal capabilities as well as the quality of the business environment. Compared with the international context, Vietnam is in the process of upgrading its position within GVCs; however, it continues to face challenges related to technological capacity, market competition, and the ability to generate higher domestic value added.

- ***Policy implication***

The empirical findings yield several important policy implications for enhancing the participation of Vietnam's manufacturing sector in global value chains.

First, the negative and statistically significant coefficients of the lagged dependent variables across all models indicate conditional convergence in GVC participation among industries. This suggests that sectors with initially lower levels of GVC integration tend to improve at a faster pace. Accordingly, policy efforts should prioritize supporting industries with weak international linkages, particularly supporting industries, in order to narrow the gap with more globally integrated sectors. Implementing targeted supporting-industry development programs, similar to those adopted in Korea and Thailand, may accelerate the ability of domestic firms to participate in GVCs.

Second, the results highlight the prominent roles of horizontal, backward, and forward linkages in shaping GVC participation. Strong spillover effects from FDI reflect the deep integration of FDI firms into domestic production networks. This implies that FDI policy should shift from quantity-based attraction to quality-based selection, with an emphasis on technology transfer commitments, production-process sharing, and the development of local supplier networks. Evidence from Malaysia and China demonstrates that supplier-matching programs, technical support centers, and standardization schemes are critical for enabling domestic firms to integrate effectively into GVCs.

Third, firm characteristics such as age, size, and productivity (TFP) exhibit strong and positive effects on GVC participation. This underscores the importance of strengthening internal firm capabilities, including technological upgrading, managerial improvement, and human capital investment. Policies such as preferential credit schemes,

innovation funds, and managerial capacity-building programs for SMEs can help Vietnamese firms meet the increasingly stringent requirements of GVCs.

Fourth, the negative impact of market concentration (measured by HHI) indicates that high concentration hampers industry-level integration into GVCs. This suggests that concentrated market structures reduce competitive pressure, dampen innovation incentives, and limit firms' ability to upgrade along the value chain. Strengthening competition policy, enhancing market transparency, and curbing monopolistic practices in specific subsectors, consistent with OECD competition principles, may foster a more dynamic business environment.

Fifth, the mixed effects of macroeconomic variables, including GDP growth, inflation, and the quality of the provincial business environment (PCI), highlight the need for maintaining macroeconomic stability and improving institutional quality. While moderate inflation may temporarily stimulate export-related activities, it also poses risks to long-term stability, whereas slower economic growth can weaken firms' production capacity. Thus, policymakers should prioritize macroeconomic stabilization, administrative reform, regulatory predictability, and reductions in compliance costs. International experience suggests that countries with higher scores in the Logistics Performance Index (LPI) and Doing Business indicators tend to achieve deeper GVC participation.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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