Vietnam's Participation In The Global Value Chain Of The Electronics Industry In The Context Of Digital Transformation

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Abstracts: After the Covid-19 pandemic, the world recorded a change in the wave of shifting production of Chinese enterprises to Vietnam. As a member of ASEAN as well as an attractive destination for FDI capital flows, Vietnam has many opportunities to become one of the factories of both the region and the world, including industry. electronic. The study uses quantitative research methods through Eviews software to identify factors affecting Vietnam's participation in global value chains (GVCs) in the context of digital transformation. The results of the research model are the basis from which to propose solutions to improve Vietnam's position in the international production network in the coming period.

Keywords: Global value chain, electronics industry, Vietnam, digital transformation context

1. Introduction

Industrial revolution 4.0 on the internet platform. The electronics industry is a manufacturing industry with a particularly important key position in the economy and has a strong spillover impact on other industries, especially in the fields of IoT, AI and digital technology. According to a report from the Ministry of Finance, Vietnam's electronics industry currently accounts for 17.8% of the entire industry. With the rapid development of the domestic technology platform, Vietnam's electronics industry has attracted a large number of foreign investors and large corporations around the world to come and invest in Vietnam. This contributes to bringing Vietnam many cooperation opportunities and activities related to technology transfer. The main products of the "Made in Vietnam" electronics industry include electronics, computers, optical products, electronic components... has created a large source of revenue for Vietnam. And the important factor affecting the comprehensive development of the electronics industry is participation in the global value chain. The electronics industry's global value chain is the process of producing, transferring and delivering electronic products from manufacturers to consumers around the world. This value chain includes many different stages, from design, product research and development, component manufacturing, assembly and final product manufacturing, to supply chain management, sales and support. technical assistance. With the development of technology and global connectivity, the electronics industry's global value chain has become more complex than ever, with links between manufacturers, suppliers, distributors and customers. goods around the world. Faced with the effects of the COVID-19 pandemic in recent years and the achievements of the 4.0 industrial revolution, digital transformation has gradually become a mandatory requirement for all organizations and businesses if they want to improve their capacity. compete and break through to succeed. In the context of digital transformation, understanding Vietnam's current situation in the global value chain of the electronics industry will help determine the direction of economic development, improve labor productivity, and create opportunities for businesses and people. labor. Capturing this information also helps the government's policy decisions become more effective in promoting the development of the electronics industry. From the above practical contexts, the research team found that research activities on Vietnam's participation in the global value chain of the electronics industry is a topical content. For that reason, the research activity **"Vietnam's participation in the global value chain of the electronics industry in the context of digital transformation"** is a research content that is more urgent than ever. The results of the research will contribute to providing the current status of Vietnam's position and role when participating in the global value chain, thereby identifying opportunities as well as challenges, thereby proposing solutions. solutions to improve and enhance Vietnam's participation in the global value chain of the electronics industry, especially in the context of today's extremely strong digital transformation.

2. Overview of research situation

2.1. Theory of national participation in the global value chain

GVCs research is a recently developed field related to international trade. Research is mainly practical in country/industry or product-specific cases, theories on GVCs are still quite new and not fully systematized.

Regarding the concept of GVCs, over the years, scholars have provided different terms to define how they are organized and operate such as commodity chains (Selwyn, 2015), supply chains (Connelly et al., 2013; Priem and Swink, 2012) and value networks (de Reuver and Bouwman, 2012)… While the concept of supply chain explains the relationship between businesses with suppliers and customers to provide products or services at lower costs (Christopher, 2005), the concept of GVCs goes one step further, entities can be connected and create certain value and that is their competitive advantage factor. (Al-Mudimigh et al., 2004). Recently, Ponte and colleagues (2019) updated and defined GVCs as a full chain of activities that businesses and employees perform to bring a product from idea to final use, The chain of operations is on a global scale and can be undertaken by one or more businesses.

Regarding participation in GVCs, the initial approach is based on in-depth research into specific products. Some typical studies include: Apple's iPod product (Linden et al., 2009), HP and Lenovo laptops (Dedrick et al., 2010) and Nokia's N95 smartphone (Ali-Yrkko et al., 2011). Based on detailed research and analysis of the reports of these case companies, the researchers sought to identify the source of value added in the cross-border production of a particular good. Although the research results are of high value, their applicability is limited and it is difficult to generalize to other cases.

Koopman and colleagues (2010) inherited and overcame the limitations in the study of Hummels and colleagues (2001). Specifically, Koopman et al. (2010) detailed a country's total exports into five parts: (1) Domestic VAT is reflected in exports of final goods and services that importers absorb. direct absorption; (2) Domestic VAT is reflected in the export of intermediate goods that importers directly use to produce necessary domestic products; (3) Domestic VAT is reflected in exports of intermediate goods that importers directly use to produce goods and export to third countries; (4) Domestic VAT is shown in exports of intermediate goods used directly by the importer to produce the goods and exported back to the source country and (5) Foreign VAT is shown in total exports password.

In particular, Koopman and colleagues (2010) point out that the sum of (1), (2) and (3) will equal each country's export VAT to the world; the sum of (1), (2), (3) and (4) equals the domestic content of a country's total exports; The sum of (4) and (5) is the portion of trade that is counted twice in the total trade statistics. Meanwhile, the model of Hummels et al. (2001) only takes into account two sources of VAT, (3) and (5), therefore, misses a large part of activities in the international production network. Besides, Hummels et al. (2001) also cannot distinguish between trade in simple GVCs (trade in GVCs that only cross borders once – representative of the term (2)) and trade in complex GVCs. (GVCs trade crosses borders multiple times – term representation (3)). In summary, Koopman et al (2010) defined country/industry participation in GVCs as participation in the previous or downstream link in the value chain and is determined by the origin of the value added. increases are reflected in the total exports of a particular country/industry.

Many cited studies follow the approach of Koopman et al. (2010) to initially assess country/industry participation in GVCs. Some typical works include the research of 11 Kowalski and colleagues (2015) analyzing the participation in GVCs of 152 countries, separated into different regions of the world including: Southeast Asia and East Asia, South Asia, Middle East and North Africa, West and Central Africa, and East and Southern Africa. Muradov's (2017) study calculated the status index and level of participation of 61 countries around the world in GVCs in the period 2008-2011. IMF research (2019) evaluates the participation of 189 countries in GVCs. UNCTAD research (2013) analyzed the participation of 58 countries in GVCs through status index, level of participation, and participation in pre- and post-linkages in GVCs. Most recently, the World Bank's regular report on GVCs (2020) also used the index set by Koopman et al. (2010) to review and update the status of participation of different regions in the world in GVCs. It can be said that modern studies on national/industry level participation in GVCs are initially based on the theoretical foundation of Koopman et al. (2010).

One difference between the above studies is the data set used in calculating country/industry participation in GVCs. With the goal of finding value-added trade flows between countries, researchers combined information from customs agencies with national input-output tables to build cross-industry tables. input - output on a global scale. The most widely used is: World Input Output Database (WIOD), a collaborative project by researchers at the University of Groningen. Next is the Trade in Value Added (TiVA) database compiled by the Organization for Economic Cooperation and Development (OECD). Finally, there is the EORA MRIO global supply chain database built by UNCTAD. Although Koopman and colleagues (2010) used WIOD data, this data set has certain limitations, typically the lack of data for some countries such as Vietnam. Therefore, to ensure feasibility and suitability for specific research goals and subjects, research projects have used different data sets although still closely following the index system of Koopman and others. associates (2010).

Research on VAT created during a certain stage in GVCs is most clearly shown in research on the value chain in the smile curve. The concept of the smile curve was first proposed by Stan Shih (1992) - founder of Acer, a technology company headquartered in Taiwan. Accordingly, Shih observed that in the personal computer industry, both ends of the value chain generate higher product VAT than the middle of the value chain. If this phenomenon is presented in graph form with VAT shown on the Y-axis and GVCs (production stages located in different places) shown on the X-axis, the resulting curve will appear as follows: Smile curve. Since then, the logic of the smile curve has been widely used and discussed in the research literature on GVCs (Meng and Ye, 2020). In fact, the economics of the smile curve does not yet have a strict theoretical framework, but the logic of the smile curve has received significant support from practical research (Shin et al., 2012; Milberg and Winkler, 2013). The general conclusion of the smiling curve studies is that the potential for VAT generation varies significantly within segments of a production chain. Specifically, the production stage, including product processing and assembly, often generates relatively little VAT, while pre-production stages and post-production services often generate more VAT (Shin et al., 2012; Milberg and Winkler, 2013). It can be said that, from the perspective of the smiling curve, countries/industries involved in production will often enjoy less VAT than those involved in pre- and post-production stages in GVCs.

2.2. Studies on Vietnam's participation in the global value chain of other industries

Doctoral thesis in international economics "Global value chain of tea industry and Vietnam's participation", author To Linh Huong (2017) factors affecting the value chain and factors affecting the Vietnam's participation in the tea industry. On that basis, a series of proposed solutions are proposed to improve Vietnam's participation in all stages of the agricultural value chain in general and the tea industry in particular.

Author Nguyen Thi Phuong Linh (2017) pointed out the stages of forming the coffee industry value chain as well as the coffee industry's participation in the global value chain with the report "Analyzing the level of participation in the price chain". global governance of the Vietnamese people". coffee industry". Vietnam's coffee value chain. However, this study only focuses on analyzing the short period of 2013-2016.

The research article "Challenges of enhancing the value of Vietnamese coffee in the global value chain" by author Nguyen Minh Hien (2012) pointed out that in the global value chain of coffee, Vietnam focuses on mainly in the cultivation and production stages, while this stage only accounts for about 10% of the value chain. At the same time, the research focused on analyzing challenges from objective factors that prevent Vietnamese coffee from participating deeply in the value chain such as lack of capital for replanting, financial problems for investment. Coffee processing, challenges in taste and enjoyment style. In addition, the author also emphasizes the role of the Government in strictly controlling coffee quality and supporting businesses in researching processing technology to improve product quality.

2.3. Vietnam's participation in the global value chain of the electronics industry

According to research by the author group Dr. Vu Thanh Huong, PhD. Nguyen Duc Bao, PhD. Nguyen Xuan Dong, MSc. Nguyen Thi Phuong Linh, MSc. Tran Thi Mai Thanh (2022) with the topic title "Comparative advantage and participation in Vietnam's global value chain in the electronics and food industry" pointed out that the electronics industry is one of two industries that contribute plays an important role in Vietnam's socio-economy in developing businesses, bringing revenue to workers, the state budget and accounting for a large proportion of Vietnam's exports. That is why, in the future, this industry will have strong development prospects and have the opportunity to make Vietnam "the world's second factory" when large electronics and telecommunications corporations announce their withdrawal. from the Chinese market, shifting gears to attract sharply increased foreign investment capital in the Southeast Asian region.

Using a combination of qualitative and quantitative methods, Nguyen Thi Phuong Linh (2023) conducted research on "Vietnam's participation in the global electronics value chain in the context of digital transformation". Research results show that Vietnam needs to propose development directions to exploit labor advantages and increase efficiency in product processing and assembly for foreign businesses. At the same time, actively participate in more upgrading activities in GVCs, in order to increase the country's added value when participating in international production networks.

Research article "Global value chain and participation ability of Vietnamese electronics enterprises" by Dr. Nguyen Hoang Anh (2009) through the use of quantitative analysis, data collection methods and Data analysis tools have shown that the level of participation in GVCs of Vietnamese electronic enterprises is quite high, especially in transactions with foreign suppliers. Thereby, it reflects the high level of internationalization of the electronics industry, not only at the stage of importing inputs for production but also at the stage of exporting finished products, the main export markets are Japan, Korea and Japan. ASEAN.

"Was the Crisis a Window of Opportunity for Developing Countries?" Sturgeon and Kawakami (2010) described the central characteristics of the global value chain in the electronics hardware sector while also discussing its evolution to incorporate newly developed and developing countries. like Vietnam, about the impact of the 2008 - 2009 economic crisis. In addition, this research article also discusses the development of supplier capacity in many different places in the context of global value chains. electronics industry and predicts that companies in developing countries will soon play a more central role in driving the industry's innovation trajectory by taking full advantage of the additional resources available across the price chain. global rule.

"Strengthening participation of developing countries in dynamic and new sectors of world trade: Trend, issues and policies" của UNCTAD (2005) đã nghiên cứu xu hướng phát triển của ngành điện tử thế giới và vai trò của các nước đang phát triển trong chuỗi giá trị toàn cầu về sản phẩm máy vi tính và linh kiện điện tử. Ngành điện tử là một trong những ngành có tốc độ tăng trưởng cao nhất trong thương mại thế giới, chiếm 10% tổng kim ngạch xuất khẩu hàng hóa. Các nước đang phát triển bao gồm cả Việt Nam đã có những bước tiến đáng kể trong việc tham gia vào chuỗi giá trị toàn cầu về sản phẩm máy vi tính và linh kiện điện tử, tuy nhiên vẫn đối mặt với nhiều thách thức trong việc nâng cao giá trị gia tăng và cạnh tranh sản phẩm, từ đó đề xuất một số chính sách nhằm tăng cường khả năng tham gia vào các lĩnh vực mới và động của thương mại thế giới.

3. Theoretical basis

3.1. Theoretical basis of global value chains

Global Value Chains (GVCs) can be understood as the production chain of globalized companies, in which the factor that plays a key role at each stage of the chain is the company. Companies from different countries participate in the value chain through different stages such as product research and development, input supply, product design, production, distribution... In GVCs, these stages are divided into different, lowest cost countries, emphasizing each country's comparative advantage. In GVCs, due to the flexibility and dynamism in international trade, multinational companies often play a leading role in the chain, attracting investment and cooperation. On the other hand, GVCs open up development opportunities for small and medium-sized enterprises in the global economy by allowing them to become important links in the chain. Additionally, rising labor costs in developing countries make outsourcing and offshoring necessary for multinational companies.

3.2. Theoretical basis for the global value chain of the electronics industry

3.2.1. Characteristics of the global value chain of the electronics industry

The global value chain is the foundation for countries to find their strengths

The global value chain in the electronics industry has a number of important characteristics: Through the value chain, countries can grasp their position and capabilities in the international arena. From there, these countries can have orientations to develop and integrate more deeply, creating motivation for economic development. Specifically, each country can find its strengths to improve efficiency. production in various fields, increase competitiveness and invest effectively in investing in branches in other countries at the lowest cost.

Global value chains have the ability to internationalize the production process

When participating in the global value chain, businesses and countries can avoid trade barriers. Through this form, some countries participate in different segments to produce specific goods.

The global value chain includes all work related to design, production, marketing, distribution as well as customer care services

In other words, the global value chain most fully and objectively describes the cycle of creating a product from the moment it appears in the subconscious, the idea until it reaches the hands of consumers and customers.

The global value chain is an entity that no one business or country can fully own

Each business participating in the global value chain can only own one or more links. Businesses will rely on their strengths to constantly specialize and improve their competitiveness against competitors in the same chain. The world's electronics industry was born and developed in association with the great initiative of semiconductors. Products from industrial electronics to household appliances are derived from this substance, including home entertainment devices, sensors, computers, smartphones, internet infrastructure, and medical equipment. electronics, automobiles and electronic devices in cars... It can be said that today's electromagnetic industry has become the industry of all industries because there is no industry that is not related to electronics.

3.2.2. Activities participating in the global value chain of the electronics industry

Activities participating in the electronics industry's global value chain may include:

3.2.2.1. Providing raw materials, components, equipment and services to electronics manufacturers:

Providing raw materials, components, equipment and services to electronics manufacturers plays an important role in improving the competitiveness, quality and efficiency of the electronics industry. Suppliers can help electronics manufacturers save costs, time and resources, enhance innovation and creativity, expand markets and customers, and create products that meet customer needs. consumer needs and trends. Suppliers can also cooperate with electronics manufacturers to develop new products, improve existing products, share experiences and knowledge, and solve problems and challenges along the way. production process. In Vietnam, there are many companies operating in the field of providing raw materials, components, equipment and services to electronics manufacturers, such as DAEWOO Vietnam Electronic Equipment Co., Ltd., Electricity Co., Ltd. ABECO Vietnam Electronics, Thegioiic, Nguyen Phi Electronics Automation Joint Stock Company, TH5 Electronics Engineering Company Limited, etc. These companies all have reputation, quality and experience in this field, providing diverse products and services, suitable to the needs of domestic and foreign electronics manufacturers.

3.2.2.2. Manufacturing and assembling electronic products, from simple devices such as light bulbs, batteries, to complex devices such as phones, computers, televisions, cameras

The main steps in the production and assembly of electronic products include:

- Design and manufacture printed circuits or electronic circuit boards, which are the foundation for mounting electronic components.
- Select and prepare electronic components, such as light bulbs, capacitors, resistors, microcircuits, ICs, etc.
- Attach and connect electronic components to printed circuits or electronic circuit boards, using various methods, such as soldering, glue, plugging, etc.
- Assemble the assembled circuits into the housing or frame of the electronic product, using different methods, such as screws, hooks, locks, etc.
- Testing and checking the quality of electronic products, using various methods, such as measuring, inspecting, functional testing, etc.

3.2.2.3. Distributing and retailing electronic products in domestic and international markets

Distribution and retail activities may include:

- Select and import electronic products from domestic and foreign manufacturers, according to market needs and trends.
- Transportation, storage, and inventory management of electronic products.
- Market, promote, and sell electronic products to consumers.
- Provide after-sales services to consumers, such as warranty, repair, exchange, recycling, etc. Distributors and retailers need to provide quality, fast, and convenient after-sales services to increase consumer satisfaction and trust.

3.2.2.4. Providing support services for the electronics industry

Support services for the electronics industry may include:

- Design, research and development services: are services that help electronics manufacturers create new products, improve existing products, and meet market needs and trends.
- Testing and certification services: are services that help electronic manufacturers ensure the quality, safety, and compliance with technical standards and legal regulations of electronic products.
- Warranty, repair, and recycling services: are services that help electronic manufacturers, distributors, and retailers care for, support, and handle problems that arise after selling electronic products. death for consumers.

- Training and consulting services: are services that help electronic manufacturers, distributors, and retailers improve their capacity, skills, and knowledge about electronic products, technology, and markets .
- Transportation and logistics services: are services that help electronic manufacturers, distributors, and retailers transport, store, and manage electronic products from the place of production to the place of consumption.
- Marketing, sales, and customer service services: are services that help electronic manufacturers, distributors, and retailers reach, attract, and retain consumers for electronic products.

4. Select research model and data

4.1. Research models

Through the research overview process, the econometric model used in the study is specifically as follows:

$$BL_t = \alpha_0 + \alpha_1 Ln(POP_t) + \alpha_2 Ln(GDP_{pct}) + \alpha_3 MVA_t + \alpha_4 GII_{ext} + \alpha_5 SEC_t + \alpha_6 SIC_t + \alpha_7 TarCha_t + \alpha_8 TarFa_t + \alpha_9 Ln(FDI_t) + e_t$$

$$FL_t = \beta_0 + \beta_1 Ln(POP_t) + \beta_2 Ln(GDP_{pct}) + \beta_3 MVA_t + \beta_4 GII_{ext} + \beta_5 SEC_t + \beta_6 SIC_t + \beta_7 TarCha_t + \beta_8 TarFa_t + \beta_9 Ln(FDI_t) + e_t$$

In particular, the variables selected for use in the model are selectively inherited from previous studies related to factors affecting country/industry participation in GVCs in the context of digital transformation. . The description of these variables is presented specifically in Table 4.1:

Table 4.1: Variables used in the econometric model in the study

Variable type	Variable name	Variable description	Representative factor
Dependent variable	BLt	Vietnam's participation in the latter link in GVCs in the context of digital transformation	
	FLt	Vietnam's participation in pre-linkage in GVCs in the context of digital transformation	
Independent variables	Ln(POPt)	Population of Vietnam in year t	Market size
	Ln(GDPpct)	Vietnam's gross domestic product in year t	Level of economic development and industrial structure
	MVAt	The proportion of VAT of the manufacturing sector in Vietnam's GDP in year t	Level of economic development and industrial structure
	GIIext	Vietnam's global innovation index year t	Technology level
	SECt	The proportion of Vietnam's exports in year t went to 51 countries with RTAs	Commercial policies
	SICt	The proportion of Vietnam's imports in year t from 51 countries with RTAs	Commercial policies
	TarChat	Vietnam's average tax rate in year t is imposed on imports from other countries	Commercial policies
	TarFat	Vietnam's average tax rate in year t must be paid when exporting to other countries	Commercial policies
	Ln(FDIt)	FDI into Vietnam in year t	Open-door policy for FDI
et	Error variance		

(Source: Compiled by the author)

From the theoretical basis and previous practical research, the study builds expectations for the impact of independent variables on the dependent variables of the econometric model as follows:

Table 4.2: Expected impact of variables in the econometric model

Variable name	The expected sign affects the BL variable	The expected sign affects the FL variable	Previous studies have used variables
Ln(POPt)	–	+	Banerjee and Zeman (2020); Urata and Baek (2020); World Bank (2020); Kersan-Skabic (2019); IMF (2019); Kowalski et al (2015); Valve (2015)
Ln(GDPpct)	–	+	Banerjee and Zeman (2020); Kowalski et al (2015); IMF, (2019); Kersan-Skabic (2019); European Central Bank (2019); Vrh (2018); Van (2015); Criscuolo et al (2015); Taglioni and Winkler (2016)
MVAt	+	–	Ana (2020); Kowalski et al (2015); Lopez-Gonzalez (2012); OECD (2013).
GIIext	+	+	Charlies (2017); Banga (2014); Olczyk và Kordalska (2017); Kersan-Skabic (2019)
SECt	+	–	OECD (2013); Kowalski et al (2015); World Bank (2020); Osnago et al (2015)
SICt	+	–	OECD (2013); Kowalski et al (2015); World Bank (2020); Osnago et al (2015)
TarChat	–	–	OECD (2013); Kowalski et al (2015); World Bank (2020); Osnago et al(2015)
TarFat	–	–	OECD (2013); Kowalski et al (2015); World Bank (2020); Osnago et al (2015)
Ln(FDIt)	+	–	Miroudot và Ragussis (2009); Kowalski et al, (2015); IMF (2019); Buelens & Tirpak (2017); Kersan-Skabic (2019); European Centrel Bank (2019) World Bank (2020)

(Source: Compiled by the author)

Regarding the technique used, the study uses Eview 10 software to quantitatively analyze two linear regression models of factors affecting Vietnam's participation in GVCs. To overcome the model's defects, the study sequentially performs tests such as: testing for heteroskedasticity; autocorrelation test and multicollinearity test.

The data of the independent variables and dependent variables in the econometric model used in the study are listed in detail in the Table. Right now, UNCTAD's MRIO data set by economy is only updated until 2018.

Table 4.3: Data sources of the econometric model

Variable type	Variable name	Describe	Unit	Data source	Research time
Dependent variable	FL	Country/industry participation in ex ante linkages in GVCs		UNCTAD- MRIO	2012 - 2022
	BL	Country/industry participation in the following linkages in GVCs		UNCTAD- MRIO	2012 - 2022
Independent variables	POP	Population	Million people	WorldBank	2012 - 2021
	GDPpc	Gross domestic product	USD	WorldBank	2012 - 2021
	MVA	The proportion of VAT of the manufacturing sector in GDP	% of GDP	WorldBank	2012 - 2022
	GIIex	Global innovation index	%	WIPO	2012 - 2022
	TarCha	A country's average tariff rate imposed on imports from other countries	%	Author's calculations based on data from WITS	2012 - 2021
	TarFa	The average tax rate a country must pay when exporting to other countries	%	Author's calculations based on data from WITS	2012 - 2021
	SEC	Share of country's exports to countries with RTAs	%	Author's calculations based on data from WITS	2012 - 2021
	SIC	Share of country's imports from countries with RTAs	%	Author's calculations based on data from WITS	2012 - 2021
	FDI	FDI capital flow	Tỷ USD	WorldBank	2012 - 2022

(Source: Compiled by the author)

4.2. Research model results and discussion

The econometric model is applied to identify factors affecting Vietnam's participation in global value chains (GVCs) in the context of digital transformation. The results of the model will provide many perspectives on the research object in the study, thereby identifying opportunities, challenges and proposing solutions to improve Vietnam's position in the international production network. .

The stepwise regression results are shown in Table 4.4. and 4.5 with two dependent variables:

1. FL (First Linkage): Represents country/industry participation in advance linkage in GVCs in the context of digital transformation.
2. BL (Backward Linkage): Represents the country/industry's participation in backward linking in GVCs in the context of digital transformation.

Independent variables include:

- Logarithm of country i's population in year t, representing the factor of market size.
- Logarithm of country i's gross domestic product in year t, representing factors of economic development level and industrial structure.
- The proportion of VAT of the manufacturing sector in GDP of country i in year t, representing the level of economic development and industrial structure.
- The technological readiness level of country i in year t, represents the technological level factor.
- The average tariff level of country i in year t imposed on imports from other countries, representing the Trade Policy factor.
- The average tax rate of country i in year t must pay when exporting to other countries, representing the Trade Policy factor.
- The proportion of country i's imports in year t from countries with Free Trade Agreements (RTAs), representing a trade policy factor.
- The proportion of country i's exports in year t to countries with RTAs, representing a trade policy factor.
- Logarithm of country i's FDI capital flow in year t, representing the Open Door Policy factor for foreign direct investment.

First, running the Eview model produces the results of a linear regression model with the dependent variable FL as follows:

Table 4.4: Results of linear regression model with dependent variable FL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.70950	6.807012	2.895471	0.1015
LOG(POP)	-4.309769	1.500343	-2.872523	0.1028
LOG(FDI)	0.003900	0.137837	0.028297	0.9800
SEC	0.012265	0.002408	5.093677	0.0364
SIC	-0.010242	0.009795	-1.045689	0.4055

R-squared	0.991735	Mean dependent var	0.203916
Adjusted R-squared	0.975204	S.D. dependent var	0.088428
S.E. of regression	0.013924	Akaike info criterion	-5.534536
Sum squared resid	0.000388	Schwarz criterion	-5.573172
Log likelihood	24.37088	Hannan-Quinn criter.	-6.012065
F-statistic	59.99433	Durbin-Watson stat	2.752205
Prob(F-statistic)	0.016462		

(Source: Authors' own calculations)

According to the results table, R2 = 0.9917, which means 99.17% of the variation in the dependent variable is explained by the independent variable, proving that the independent variable's ability to explain the dependent variable is very good.

To ensure the model is meaningful, the study performed tests for heteroskedasticity, autocorrelation, and multicollinearity. The regression results from Table 4.4 indicate that the factors affecting Vietnam's participation in prior linkages in GVCs in the context of digital transformation include: (1) cumulative FDI inflows into Vietnam, (2) proportion of Vietnam's exports to countries with RTAs. Specifically:

(1) Cumulative FDI inflows into Vietnam, reflecting the open policy factor towards FDI, have a negative impact on Vietnam's participation in previous linkages in GVCs. According to the econometric model, when cumulative FDI inflows increase by 1%, Vietnam's participation in previous linkages in GVCs decreases by 0.016%, meaning foreign FDI reduces Vietnam's value-added exports abroad. Male. This result is consistent with previous research results and the initial expectations of the econometric model. The reason for this result may be that FDI enterprises take advantage of abundant and cheap labor in developing and underdeveloped countries to process and assemble final products. However, trade related to GVCs only accounts for trade in intermediate goods and raw materials input to international production networks. Therefore, the growth of FDI capital flows into Vietnam has not increased the export of intermediate goods abroad, or Vietnam's participation in previous linkages in GVCs. This result shows that Vietnam needs to have a development orientation, both exploiting labor advantages and increasing efficiency in processing and assembling products for foreign businesses. At the same time, actively participate in more upgrading activities in GVCS, in order to simultaneously increase the country's added value when participating in the global production network.

(2) The proportion of Vietnam's exports to countries with RTAs, representing trade policy factors, also causes a negative impact on the country's participation in prior linkages in GVCs. Specifically, when the proportion of Vietnam's exports to countries with RTAs increases by 1%, Vietnam's participation in the previous link increases by 0.01%. That means when Vietnam expands international trade, especially exports to partner countries in RTAs, Vietnam's export of intermediate goods decreases. This result is consistent with previous research results and the model's initial expectations. The reason for this result may be that in bilateral and multilateral trade with partner countries in RTAs,

Vietnam mainly takes advantage of agreements to expand final product consumption markets, without Focus on cooperation in production and product improvement with partner countries. Therefore, although Vietnam's traditional export turnover to these countries increased, the proportion of intermediate goods exports did not increase. Production cooperation between countries with bilateral and multilateral trade agreements can also be a potential future development direction that countries, especially developing and underdeveloped countries, can consider. review. In fact, participating, especially acting as a supplier to international businesses, is very difficult and challenging. For example, in the electronics industry, although Vietnam is one of the leading countries in international trade, in reality very few domestic enterprises become suppliers of raw materials and goods. intermediary for international businesses. Vietnam is mainly involved in processing and assembling final products for foreign brands. The main reason is due to the weak supply capacity of domestic enterprises, but also due to the selection habits of suppliers. Therefore, domestic businesses can penetrate deeper into the international production network of foreign brands. Therefore, strengthening trade cooperation with countries with bilateral and multilateral trade... will improve VAT when participating in GVCs.

(3) In the results table of the econometric model, there are two other variables: the POP variable, which represents the factor of market size, and the SIC variable, which represents the trade policy factor which is the import proportion of the country. Vietnam to countries with RTAs. However, these two variables are not statistically significant for the dependent variable FL. Likewise, other variables do not appear in the results table because they are not statistically significant when running the econometric model. The reason is that the data of some variables affected the statistical significance of the model, so the variables had to be removed. The reason for this phenomenon may be that the data set from 2012 to 2018 is not enough for the variables to be statistically significant, affecting the dependent variable of the econometric model.

Second, running the eview model produces the results of a linear regression model with the dependent variable BL as follows:

Table 4.5: Results of linear regression model with dependent variable BL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.307493	2.702061	1.964239	0.1885
LOG(GDP)	-1.291432	0.254000	-5.084370	0.0366
SEC	0.031817	0.010181	3.124983	0.0890
SIC	0.001652	0.033969	0.048621	0.9656
GII	-0.001338	0.019910	-0.067223	0.9525

R-squared	0.979024	Mean dependent var	0.374660
Adjusted R-squared	0.937071	S.D. dependent var	0.192510
S.E. of regression	0.048293	Akaike info criterion	-3.047266
Sum squared resid	0.004664	Schwarz criterion	-3.085902
Log likelihood	15.66543	Hannan-Quinn criter.	-3.524795
F-statistic	23.33621	Durbin-Watson stat	1.499389
Prob(F-statistic)	0.041513		

(Source: Authors' own calculations)

According to the results table, R2 = 0.979, which means 97.9% of the variation in the dependent variable is explained by the independent variable, a way to rewrite the paragraph could be:

The independent variable has good explanatory power for the dependent variable. To ensure the model is meaningful, the study performed tests for heteroskedasticity, autocorrelation, and multicollinearity. Regression results from Table 4.5 show that factors affecting Vietnam's participation in the following linkages in GVCs in the context of digital transformation include: (1) GDP; and (2) the proportion of Vietnam's exports to countries with RTAs. Specifically:

(1) Gross domestic product, GDP, represents a factor in the level of economic development, which has a negative impact on Vietnam's participation in the following links in GVCs. According to the econometric model, when GDP increases by 1%, Vietnam's participation in the latter link in GVCs decreases by 0.26%. This result is consistent with the model's initial expectations. The reason for this result may be that as Vietnam's GDP increased, the advanced level of economic development helped domestic enterprises improve their production capacity and supply of input materials for production. reduce the import proportion of intermediate goods and limit Vietnam's participation in downstream linkages in GVCs. This is a sign of positive development in economic development in general and the production and supply capacity of Vietnamese enterprises in particular.

(2) The proportion of Vietnam's exports to countries with RTAs, representing trade policy factors, has a positive impact on Vietnam's participation in GVCs. According to the econometric model, when the proportion of Vietnam's exports to countries with RTAs increases by 1%, Vietnam's participation in the latter link in GVCs increases by 0.03%. This result is consistent with the model's initial expectations. The reason for this result may be because when Vietnam established bilateral and multilateral relations through free agreements, domestic enterprises also increased the import of inputs for domestic production. The reason may be that raw materials imported from partner countries have lower prices or better quality than the domestic market. At the same time, free trade agreements have gradually reduced trade barriers, creating favorable conditions for the

circulation of goods between member countries. Domestic enterprises can benefit in the production and business process when importing input materials at low prices or with higher quality. However, this reality puts strong pressure on domestic suppliers when having to compete with imported goods, affecting the development and growth of the national supporting industry. In addition, increasing the import share of intermediate goods can directly affect the country's ability to improve overall value added when participating in global supply chains (GVCs). In fact, as the proportion of value-added imports increases, the potential to gain more added value when participating in GVCs may decrease. Therefore, strengthening the establishment and building of free trade agreements is something that should be encouraged, but policies and solutions to support and develop the supply capacity of domestic enterprises are still needed to cope. with fierce competition from imported goods.

5. Some solutions and recommendations

5.1. Assessing Vietnam's opportunities and challenges when participating in the global electronics value chain in the context of digital transformation

To evaluate the strengths, weaknesses, opportunities and challenges of Vietnam when participating in the global electronics value chain in the context of digital transformation, the authors used the SWOTS model to evaluate Effectively, from there, the best and most appropriate measures can be proposed.

S – Strengths: Strengths	**W – Weaknesses: Weaknesses**
Firstly, the electronics industry plays an important role in Vietnam's socio-economy in developing businesses, Second, bring revenue to workers and the state budget, Third, promoting exports and creating relatively high added value and nearly 2 times higher than the food industry. Since 2012, the Electronics industry has surpassed the Textile and Garment industry to become the industry with the largest export turnover in Vietnam. Within 10 years from 2010 to 2020, Vietnam's ranking in the world in terms of electronics export value also continuously increased and rose to 6th position in the world in 2020.	Firstly, it shows that Vietnam's electronics industry still depends heavily on foreign supplies. Second, Vietnam's position index in the global electronics value chain (EGVC) is negative, proving that the country is located downstream of the chain. Vietnam tends to participate less in EGVC due mainly to the reduction in foreign value-added imports to produce electronic goods for export.
O - Opportunities: Opportunities	**T – Threats: Challenges**
First, the state of sustainable development of the electronics industry compared to other economic sectors in the world has created positive opportunities for the growth of Vietnam's electronics industry and the participation of foreign countries. Join EGVC. Second, the trend of shifting production models from China to Southeast Asian countries including Vietnam has created opportunities for countries to participate more deeply and broadly in EGVC. Third, the strong internal development of Vietnam's electronics industry will create sustainable growth opportunities for the industry and attract a sharp increase in foreign investment capital in the electronics sector, affirming its position and brand. of the country in the international market. Fourth, Vietnam has more diversity in the export market for intermediate goods in general and the electronics industry in particular, creating opportunities to expand the scope of influence and minimize risks when participating in EGVC in the context of today's complex changes in the world.	First, the challenge of consolidating and improving the production capacity of the supporting industry serving Vietnam's electronics industry. Second, the challenge is to increase the connection between foreign electronics businesses and domestic businesses to improve the production capacity of domestic businesses. Third, the challenge of improving Vietnam's position and role in the EGVC. Fourth, the challenge of diversifying input import markets to serve the production and export of Vietnam's electronics industry. Fifth, the challenge of taking advantage of and exploiting free trade agreements and the increase in market size for trade development related to Vietnam's GVCs. Sixth, there is competitive pressure in the domestic market when the competitiveness of Vietnamese businesses is currently weak, and the pressure to train high-quality human resources is increasingly weighing on the system. Vietnamese universities and the intelligence of Vietnamese businesses are attracted to transnational companies; The stature and scale of Vietnamese businesses in the international playground are mostly quite small.

5.2. Micro solution group

Vietnam has great potential to participate in the global value chain of the electronics industry in the context of digital transformation. Some micro solutions to improve the effectiveness of Vietnam's participation in this field are as follows:

First, it is necessary to invest in digital infrastructure platforms. Developing information technology and telecommunications infrastructure including: internet network and electronic infrastructure to create favorable conditions for the production and consumption of electronic products. This includes the development of industrial parks and modern information technology parks.

Second, training and developing human resources. Invest in education and skills training for workers in the fields of information technology and electronics. This includes building high-quality training programs, along with promoting research and technology development.

Third, strengthen industrial cooperation. Create conditions for businesses in the electronics industry in Vietnam to cooperate with international partners, from providing

components to participating in joint research and development projects.

Fourth, promote innovation and creativity. Encourage businesses to seek opportunities for innovation and creativity in the production and consumption of electronic products. This can be done through financial support and incentives for new research and development activities.

Fifth, strengthen product quality management. Ensuring that electronic products manufactured in Vietnam meet international quality standards, from raw material management to production and final quality inspection.

Sixth, build a support system for businesses. Create a favorable business environment for e-businesses, including improving administrative procedures, financial support and encouraging foreign investment outside.

Seventh, tax policy and support. Develop supportive and encouraging tax policies for businesses operating in the electronics industry, and provide financial and technical support programs to promote the development of this industry.

Eighth, promote exports and access to global markets. Support e-businesses in accessing international markets through export and product introduction programs as well as support in building commercial relationships with global partners.

5.3. Macro solution group

Besides micro solutions, applying macro solutions can help effectively improve Vietnam's participation in the global value chain of the electronics industry in the context of digital transformation. Some macro solutions are as follows:

First, industrial and export policy. Create support and incentive policies for the development of the electronics industry in Vietnam, including providing financial and tax support packages to attract investment in the industry. At the same time, develop a strong export policy to help Vietnamese businesses effectively access the global market.

Second, international cooperation. Strengthen cooperation with international partners in the field of research and development of new technologies, and promote the signing of free trade agreements to expand export markets for Vietnam's electronic products. Vietnam.

Third, invest in research and development. Increase investment in research and development activities to create value-added electronic products and services, and improve the competitiveness of Vietnam's electronics industry in the global market .

Fourth, develop multinational supply chains. Build and develop multinational supply chains in the electronics industry, connecting Vietnamese businesses with global manufacturers, suppliers and business partners to optimize production efficiency and reduce production costs. expense.

Fifth, policies on information technology and data security. Ensure the application of information technology and data security policies and regulations to protect consumer information and rights, while creating favorable conditions for the development of services and applying information technology in the electronics industry.

Sixth, support startups and small and medium-sized enterprises. Develop special support policies and programs for startups and regional businesses in the electronics industry to encourage innovation and creativity, as well as enhance the industry's competitiveness in the market. international School.

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