

## Tariffs and Vietnam’s exports of Mach and Elec products to CPTPP partners

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### ARTICLE INFO

### ABSTRACT

DOI:10.46223/HCMCOUJS.  
econ.en.14.1.2800.2024

Received: June 04<sup>th</sup>, 2023

Revised: July 17<sup>th</sup>, 2023

Accepted: July 31<sup>st</sup>, 2023

JEL classification code:  
F14; C21; O57

#### Keywords:

applied tariff; Comprehensive  
and Progressive Agreement for  
Trans-Pacific Partnership  
(CPTPP); export; Mach and  
Elec products; Vietnam

Mach and Elec is a vital sector greatly contributing to Vietnam’s economic growth and the trade liberalization mechanism in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) has further enhanced our opportunities to boost exporting these products. Hence, in this paper, we made the first attempt to analyze the impact of tariffs on Vietnam’s export of Mach and Elec products to partners within CPTPP. This study utilized a modified gravity model and simultaneous quantile regression to analyze Vietnam’s export turnover of machinery and electronic products to 10 CPTPP member countries from 2005 to 2020 on different quantiles of the export distribution. The primary variable of interest was the applied tariffs (AHS). The results indicate that the most preferential tariff available still has a significantly detrimental impact on Vietnam’s export turnover. Also, exports of Mach and Elec products to larger markets in CPTPP tend to be more affected by tariffs than smaller ones. Our research findings have important implications for Vietnam enterprises and the government exporting machinery and electronic products to make the most of the preferential tariff under the CPTPP agreement.

### 1. Introduction

The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is a new wave of free trade agreements, and Vietnam is one of the eleven members. As presented at the 6<sup>th</sup> CPTPP Commission Meeting held in October 2022, the agreement has created the largest free trade area in the world, with a total GDP of over USD 10,567 billion, or roughly 13.5% of the world’s GDP, encompassing sizable markets spread across numerous continents.

Vietnam’s growing openness to foreign business and trade, as well as its strategic location in Southeast Asia, have attracted multinational corporations and made it a desirable export destination within ASEAN. According to the General Statistics Office of Vietnam, with a population of over 97 million and a burgeoning middle class, Vietnam offers a substantial market for imports. The Vietnam Ministry of Industry and Trade commented that Vietnam’s trade with CPTPP member countries has gradually increased, accounting for about 20% of its overall trade. Key trade partners include Japan, Australia, Singapore, Malaysia, and Canada, with Vietnam experiencing a trade deficit with most countries in this group, except for Canada. Trade with Mexico, Brunei, Chile, New Zealand, and Peru remains relatively minor, but Vietnam consistently maintains a trade surplus.

Vietnam’s machinery and electronic industry has emerged as a crucial export commodity, exhibiting significant expansion recently. As per the report released by Vietnam’s General

Department of Customs, the export revenue generated by machinery and electronic commodities in the initial six months of 2021 amounted to \$57.7 billion, indicating a notable surge of 32.6% in comparison to the corresponding duration of the preceding year. This significant growth in the industry's exports has contributed significantly to Vietnam's total export turnover, accounting for 42.6% in the first half of 2021. Vietnam's machinery and electronic sector expansion can be ascribed to many factors, including the nation's advantageous investment regulations and strategic positioning within the Southeast Asian region. Vietnam has emerged as an ideal destination for foreign investment in the industrial sector, as evidenced by numerous multinational corporations' establishment of production facilities.

Before the implementation of CPTPP, tariffs significantly impacted Vietnam's export situation. The country faced high tariff barriers on its exports when trading with developed nations. Under the agreement, Vietnam has gained access to reduced or eliminated tariffs on its exports to member countries. This has improved the competitiveness of Vietnamese goods by making them more affordable in international markets. Vietnamese businesses have greatly benefited from the reduced trade barrier since their membership in the CPTPP. This has allowed them to explore new markets and expand their export performance. While this has been true for many industries, the same cannot be said for the machinery and electronic products sector. Despite its potential growth, Vietnam's machinery and electronic products sector still faces challenges. Additionally, the industry is highly competitive, with many established players from other member countries of the CPTPP. Hence, in this paper, we investigated the negative relationship between the applied tariff and machinery and electronics export turnover.

We acknowledge that the machinery and electronics sector plays a crucial role in driving Vietnam's economic growth, and the trade liberalizing measures outlined in the CPTPP agreement have significantly amplified Vietnam's prospects for expanding exports in this industry. Therefore, we hereby make the first attempt to research the topic of the influence of tariffs on Vietnam's export turnover of Mach and Elec products to other CPTPP members from 2005 - 2020. We applied the modified gravity model and offered a robust set of findings using simultaneous quantile regression, which allowed us to examine tariffs' impact on different export distribution quantiles. In addition, we focus on applied tariffs (the most preferential offered tariff) within the CPTPP agreement, providing insights into the potential gains from trade that Vietnam can realize. This research aims to address the following questions:

- 1) What is the impact of tariffs on Vietnam's export turnover of Machinery and Electronic (Mach and Elec) products to CPTPP members before and after the agreement is signed (2005 - 2020)?
- 2) How do tariffs affect different quantiles of the export distribution of Mach and Elec products?
- 3) What implications do these findings have for enterprises and authorities in exporting machinery and electronic products to make the most out of the preferential tariff provisions under the CPTPP agreement?

## **2. Theoretical basis**

In this section, we will give a brief introduction of classical and recent studies that will explain factors stimulating export performances, especially focusing on tariffs and in relation to trade agreements such as the CPTPP.

Apparently, Free Trade Agreements (FTAs) and tariff reductions helped countries to promote trade. Vu et al. (2020) analyzed the impacts of the European Union - Vietnam Free Trade Agreement (EVFTA) on Vietnam's exports of electronics products by using the gravity model.

The results showed an increase in the export volume of electronics when the EU imposed a 0% tariff rate on products imported from Vietnam. However, the positive change was minimal because a sizable portion of Vietnam's electronics industry's exports to Europe before the EVFTA went into effect were extremely low or even no taxes. According to Zheng, Zhou, Li, Padula, and Martin (2023), under the Trump era, tariffs on trade volumes by commodity and sector. There was a dramatic decline in China's industrial exports, mainly including oilseed, transport equipment, and electronics. When the tariff is eliminated, it is estimated that the total exports of electronics of the US and China would increase by 9.9% and 3.2%, respectively. Between 1995 and 2007, the value of electronics tripled to \$30.3 billion, making it the largest produced sector in the nation. Aichele, Felbermayr, and Heiland (2014) conducted research on the trade effects of Germany under the Transatlantic Trade and Investment Partnership (TTIP), which was signed between the EU and the US. According to the research, machinery is Germany's most significant export to the US. The TTIP has increased all export sectors across the board, although there is a high sectoral heterogeneity. Some industries are seeing very high growth rates, such as the electronics industry at 628%. Li, Balistreri, and Zhang (2020) applied the disaggregated data to the CGE model to analyze the impacts of tariffs during the US-China trade war. By September 2019 and December 2019, the average trade-weighted U.S. tariff rise on Chinese exports was around 21.7% and 30.5%, respectively. Machinery was the hardest hit among significant Chinese exports with a greater than 5% trade-weighted tariff rise, followed by lumber (20.6%) and electronic devices (18.8%). The threat of tariffs would result in a 72.5% drop in Chinese exports to the US.

In addition to FTAs and tariffs, there are still some factors that have great influences on the trade balance, specifically in exports between countries. In accordance with the Heckscher's theory (1919) and Ohlin's theory (1933) of international trade, it was assumed that nations with a high population density would focus on manufacturing exports; while those with a low one would concentrate on primary exports. In other words, when the population of the partner countries increases, the number of goods imported will also grow as a result of increasing product consumption. Therefore, theoretically, the population of the exporting country and its trading partners may have a favorable impact on the number of exports from that country to its trading partners. Mai and Huynh (2018), when conducting a case study in Vietnam, also found that the population of importing countries and Vietnam's bilateral export value correlated positively. However, according to Allayarov, Mehmed, Arefin, and Nurmatov (2018), the partners' population proved to have a negative effect on the bilateral trade of Kyrgyzstan. This also means that the importers' population is conversely correlated with exports from Kyrgyzstan.

The study of Mila, Mukhtar, and Nikensari (2022) stated that inflation has a significantly negative effect on exports in the ASEAN Region. When inflation increases, it will also result in an increase in prices. This will be accompanied by a decrease in production costs caused by rising production costs which will reduce the number of exports. Purusa and Istiqomah (2018) studied the effect of inflation on exports in five ASEAN countries (Indonesia, Malaysia, Philippines, Thailand, and Vietnam) using data between 2000 and 2015. The result indicated that inflation has a negative and significant effect on exports in these countries. 3.77 billion US dollars worth of exports will drop for every 1% increase in inflation.

A nation's ability to access the world market is largely dependent on its transport infrastructure, particularly on regular shipping services to export manufactured commodities. Han and Li (2022) found that the impact of transportation infrastructure on international trade is greater compared to its effect on domestic trade. Through a detailed quantitative analysis, their research revealed that a 10% increase in transportation infrastructure leads to a significant 3.9% increase in real income. Moreover, the study highlighted that over 95% of the economic benefits are

concentrated within the country that has made improvements to its infrastructure. Furthermore, it is apparent that increased transportation costs have a negative effect on global trade. Using a gravity model, Fugazza and Hoffmann (2017) pointed out that the lack of a direct maritime connection with a trade partner leads to decreased values of exports. A 5% higher value of bilateral exports can result from an additional common direct destination. The largest ship operating on any leg of a maritime route increases by 1,000 TEU resulting in a 1% rise in the value of bilateral exports. Nevertheless, according to Trinh, Pham, and Nguyen (2017), freight rates do not have a significant influence on international trade as much.

The table below presents the summary of the significant and most recent previous studies.

**Table 1**

Summary of previous studies

Author(s)	Countries	Period	Objectives	Method	Findings
Allayarov et al. (2018)	Kyrgyzstan and its 35 major trading partners	2000 - 2016	Analyze the variables influencing the bilateral trade flows between Kyrgyzstan and its major trading partners and forecast future trade opportunities.	Gravity model	GDP has a beneficial impact on commerce. However, distance and the populations of the partners have been shown to have a negative impact. Significant commercial possibilities are offered by China, Kazakhstan, Uzbekistan, Tajikistan, and Russia.
Vu et al. (2020)	Vietnam and EU countries	2016 - 2020	Analyze the impacts of the European Union - Vietnam Free Trade Agreement (EVFTA) on Vietnam's exports of electronics products.	Gravity model	The exports of electronics products from Vietnam to the EU witnessed a slight increase in value.
Aichele et al. (2014)	the EU and the United States	2013 - 2014	Evaluate The Trade and Welfare Effects of TTIP.	Ricardian trade model	The GVC is vital in understanding the effects of the TTIP on outsiders and the global economy.
Fugazza and Hoffmann (2017)	All countries	2006 - 2013	Examine the connection between containerized goods exports and bilateral marine liner shipping connectivity.	Gravity model	Lower export values are linked to a lack of direct maritime connections with trading partners, and lower bilateral export values are linked to more transshipment.
Han and Li (2022)	South Asian countries	1990 - 2017	Interpret the estimate of country-specific variable - transportation infrastructure.	Gravity model	Internal trade benefits more from improved transportation infrastructure than external trade. Real income improvement primarily occurs through internal trade cost reduction.

Author(s)	Countries	Period	Objectives	Method	Findings
Li et al. (2020)	The United States and China	2020	Examine the US and China Trade war impacts.	GTAP model	As a result of the trade flow between the United States and China being diverted to their major trading partners, many Asian nations' welfare will increase.
Mila et al. (2022)	ASEAN region	2017 - 2021	Analyze how exports are affected by manufacturing items, exchange rates, and inflation rates.	MLR analysis	Manufacturing products, exchange rate, and inflation have a positive, positive, and negative effect on exports in the ASEAN Region, respectively.
Purusa and Istiqomah (2018)	Indonesia, Malaysia, Philippines, Thailand, and Vietnam	2000 - 2015	Investigate the impact of FDI, COP, and inflation on exports.	GLS method	FDI and the price of crude oil have a favorable impact on exports, but inflation has a negative impact.
Trinh et al. (2017)	Vietnam	2012 - 2014	Investigate and evaluate the effect of transport costs on export.	2SLS method	Increased transportation costs, distance, and tariffs severely impede commerce.
Mai and Huynh (2018)	Vietnam and 70 of its major importers	2001 - 2013	Investigate the impact of trade costs on exports.	Gravity model	Trade cost plays a crucial role in the Vietnamese bilateral export performance.
Zheng et al. (2023)	The United States and China	2018	Consider the benefits from a hypothetical elimination of the tariff increases made by the US and China during the trade war of the Trump administration.	GTAP Model	The tariff increases during the trade dispute led to significant economic losses for both countries.

Source: Author's compilation

In the review of diverse past research papers, our group concluded that there has yet to be any study investigating the impact of tariffs on Vietnam's exports of Mach and Elec products within the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Therefore, we hereby make the very first attempt to conduct research on this topic. We employ the modified gravity model and simultaneous quantile regression to analyze the influence of tariffs on Vietnam's export turnover of Mach and Elec to other CPTPP members from 2005 to 2020. Our research provides valuable insights into how export turnover of Mach and Elec products from Vietnam can be influenced by the preferential tariff provisions under the CPTPP agreement. This study contributes significantly to the literature and has important implications for enterprises exporting machinery and electronic products, enabling them to maximize the benefits of CPTPP's preferential tariffs.

### 3. Methodology

#### 3.1. Gravity model

The gravity model is one of the most successful empirical approaches in explaining international trade. The gravity model was inspired by Newton's famous law of universal gravity, developed in 1687 and first used by Tinbergen (1962) to analyze international trade. The model of gravity in its simplest form takes the form:

$$F^{ij} = \alpha \frac{Y_i Y_j}{D_j} \quad (\text{Equation 1})$$

Where  $F^{ij}$  is the bilateral trade value between country  $i$  and country  $j$ ;  $Y_i$  and  $Y_j$  are the real GDPs of countries  $i$  and  $j$ ;  $D_j$  is the distance between two countries; and  $\alpha$  is a constant.

Usually, the size of an economy is represented by its real GDP variable. However, in Linnemann's (1966) model, the size of an economy is expressed by two variables, population and real GDP per capita, where population represents the number of potential buyers and real GDP per capita represents the purchasing power of each citizen. This approach has been widely accepted and has been experimentally successful. These attractive forces explain international trade flows and repulsive forces are represented by the distances between countries participating in trade. The greater the distance between countries is, the higher the costs of transportation and insurance are and, therefore, the lower the efficiency of international trade is. In that sense, distance is seen as a drag that has a negative effect on trade between countries.

Since the late 1970s, many authors such as Anderson (1979), Bergstrand (1985, 1989), and Helpman and Krugman (1985) have begun to develop the theoretical basis for the gravity model. In addition, some authors have reconciled traditional international trade theories with the gravity model. Eaton and Kortum (1997) extended the gravity model based on Ricardo's theory of relative advantage, while Deardoff (1998) developed a gravity model based on the Heckscher-Ohlin approach. Since then, the gravity model has become a widely used standard tool for analyzing the determinants of international trade.

Experimental econometrics studies have significantly contributed to the refinement and diversification of the gravitational equation. Noteworthy authors like Matyas (1998), Chen and Wall (1999), Egger (2000) have made improvements to the estimation equation of the gravity model. Similarly, Hummel (1999, 2001), Limao and Venables (1999) have enhanced the explanatory variables and introduced new variables into the estimation equation. Consequently, apart from conventional factors like population, real GDP, and geographical distance, many other variables such as tariffs, inflation rates, and transport efficiency are now incorporated into the equations used to estimate the extended gravity model.

#### 3.2. Empirical model and estimations method

##### 3.2.1. Empirical baseline model

We acknowledge that the gravity model is a widely used economic model that provides a rationale for examining the effects of tariffs on trade between countries. By applying this model, we can estimate the elasticity of trade with respect to tariffs, which quantifies the percentage change in trade volume resulting from a 1% change in tariffs. This elasticity can help to deeply understand the potential effects of tariff changes on Vietnam's Mach and Elec exports to CPTPP partners. Therefore, on the basis of theory and research overview, the author proposes an empirical model to estimate the factors affecting the export volume of Vietnam Mach and Elec products, specifically as follows:

$$EXP = \beta_0 + \beta_1TRFcptpp + \beta_2POPcptpp + \beta_3IFRcptpp + \beta_4LSCIceptpp + ui \quad (\text{Equation 2})$$

Where,

**lnEXP:** The export value of electronics and machinery from VietNam to the CPTPP partner in year t;

**TRFcptpp:** Weighted applied tariffs on electronics and machinery in CPTPP countries in year t;

**POPcptpp:** The population of CPTPP countries in year t;

**LSCIceptpp:** Transport Connection index of CPTPP countries in year t.

Our empirical model makes some adjustments compared to previous studies that used the gravity model to investigate the factors affecting Vietnam’s exports. First, instead of the real GDP of the partner countries, we use the population variable to measure market size. We utilize the population variable to indicate the size of the economy in order to avoid cross-correlation between GDP and population and to make novel discoveries if possible.

Second, the distance variable is replaced by the Linear Shipping Connectivity Index (LSCI). According to Metulini (2013), using distance as a proxy for transportation costs in panel data can lead to biases. Furthermore, the distance remains constant during the period, which might lead to collinearity. Recently, several attempts have been made in the past studies to remove the distance. The variable **LSCIceptpp**, on the other hand, reflects the level of logistics development of partner countries, which also relates to transport costs and is updated annually. For a country with higher logisticians performance, the import turnover rate will increase, and the total transport cost will decrease. Hence, we use LSCI as the proxy instead of geographical distance.

Also, following the study of Mila et al. (2022) and other international studies, we add the variable of the inflation rate of the partner countries.

**Table 2**

Data description

Variables	Description	Unit	Source	Expected Signs
<b>MACH_ELEC</b>	Export turnover of machinery and electrics from Vietnam to CPTPP countries	Thousand USD	WITS	
<b>TRFcptpp</b>	Applied tariffs CPTPP countries impose on Vietnam’s Mach and Elec products	%	WITS	-
<b>POPcptpp</b>	The population of CPTPP countries	Million people	World Bank	+
<b>IFRcptpp</b>	The inflation rate of CPTPP countries	%	World Bank	-
<b>LSCIceptpp</b>	Linear shipping connectivity index of CPTPP countries	Index	World Bank	+

Source: Author’s compilation

### 3.2.2. Data

This study utilizes a sample panel dataset examining export turnover of Mach and Elec products from Vietnam to other countries participating in the CPTPP agreement from 2005 to 2020. Data on all variables was collected from official and prestigious sources, including World Trade Integrated Solutions (WITS) and World Bank. The data was thoroughly scrutinized by the research team to spot possible missing or unreasonable values via data visualization by establishing graphs in SPSS. By conducting comprehensive data processing, the research team ensures the reliability, accuracy, and usability of the data for examination.

Specific information about the set of variables used in our data is presented in Table 2 above, while their statistical summary is shown in Table 3 below. Also, Table 4 is the correlation matrix of independent variables and their Variance Inflation Factor (VIF) index. The data proves no present multicollinearity among explanatory variables; thus, the dataset is now ready for analysis.

**Table 3**

Data summary

Variables	Obs	Mean	Std. Dev.	Min	Max
<b>MACH_ELEC</b>	160	896,842.9	1,332,980	136.5748	7,047,747
<b>TRFcptpp</b>	160	1.314	2.24	0	10.693
<b>POPcptpp</b>	160	38.92	43.214	0.367	128.07
<b>IFRcptpp</b>	160	1.073	1.671	-1.353	8.716
<b>LSCIceptpp</b>	160	45.239	29.247	3.465	113.775

Source: Author's calculations

**Table 4**

Correlation matrix of independent variables

	<b>TRFcptpp</b>	<b>POPcptpp</b>	<b>IFRcptpp</b>	<b>LSCIceptpp</b>	<b>VIF</b>
<b>TRFcptpp</b>	1				1.19
<b>POPcptpp</b>	- 0.08	1			1.05
<b>IFRcptpp</b>	0.25	0.05	1		1.1
<b>LSCIceptpp</b>	- 0.36	0.19	- 0.2275	1	1.22
<b>Mean VIF</b>					1.14

Source: Author's calculations

### 3.2.3. Estimation method

This study examines ten countries within CPTPP that fall into different income categories (high, middle, and low income), each with distinct societal structures and cultural attributes. We have employed quantile regression as our chosen method to account for these variations. Unlike conventional regression, which focuses on the mean, quantile regression allows us to analyze the entire conditional distribution of the dependent variable. This aspect is particularly valuable when a more comprehensive understanding of the relationship between variables is necessary, and it also helps test the robustness of our model. Specifically, we solely employ simultaneous quantile regression as our estimation method in this paper.

We use the **sqreg** command in STATA 14 for establishing a simultaneous quantile regression method to estimate the modified gravity model using yearly data spanning from 2005 to 2020 for a panel dataset to examine export turnover of Mach and Elec from Vietnam to 10 countries in CPTPP. We aim to include lower, middle, and upper quantiles (mainly 40th, 50th, and 60th quantiles) for the investigation of the subject matter.

**4. Result and discussion**

**4.1. Simultaneous quantile regression**

This study’s empirical findings and discussion are based on the application of simultaneous quantile regression at the 40th, 50th, and 60th quantiles. By examining these specific quantiles, we gain insights into how various factors affect the outcome of interest across different distribution levels. The results of our estimation are presented in Table 5 below.

**Table 5**

Empirical results using Simultaneous quantile regression

Variables	q40	q50	q60
	(1)	(2)	(3)
<b>TRFcptpp</b>	- 26,650.94*	- 42,199.54***	- 45,219.19***
	[13,948.93]	[10,587.78]	[14,449.43]
<b>POPcptpp</b>	8,254.829***	11,902.99***	16,936.36***
	[2,614.492]	[3,596.756]	[3,450.676]
<b>IFRcptpp</b>	- 108,226.6***	- 116,190.1***	- 105,144.2***
	[40,195.19]	[40,947.37]	[44,761.26]
<b>LSCicptpp</b>	13,597.79***	16,286.04***	14,382.78***
	[3,680.142]	[2,353.852]	[2,096.851]
<b>const</b>	- 165,636.3	- 143,563.2	- 41,817.56
	[160,080.9]	[123,771.3]	[105,617.9]
<b>Obs</b>	160	160	160
<b>R-squared</b>	0.2380	0.2995	0.3796

Source: Author’s calculations (\*\*\*/\*\*/\* denoting the statistical significance at 1%, 5%, and 10%; the numbers in brackets are standard errors)

First, regarding the primary variable of interest **TRFcptpp**, the coefficients associated with this factor were statistically significant in all three quantiles. Specifically, the coefficient estimates were -26,650.95 in q40, -42,199.54 in q50, and -45,219.19 in q60. These results indicate that an increase in the tariff on machinery and electronics is associated with a significant decrease in the export turnover across all three quantiles. Also, even when the tariff is the most preferential available within the agreement, the negative sign of the coefficients suggests a considerably inverse relationship between the tariff and export turnover, indicating that higher tariffs on machinery and electronics are highly associated with lower levels of export turnover. It is plausible that higher tariffs create barriers to market access, making Vietnamese products less competitive and less attractive for consumers in the importing countries. This shift in market dynamics may prompt consumers to seek alternative suppliers from countries with more favorable prices, further reducing the demand for Vietnamese machinery and electronics. Ultimately, the high tariff burden

contributes to a decline in Vietnam's export volumes and negatively impacts export turnover in the machinery and electronics sector.

Also, as we move up to higher quantiles, we witness an increase in the magnitude of **TRFcptpp** coefficients. This implies that higher tariffs on machinery and electronics in Vietnam could have a disproportionately more significant impact on the export performance of the country's machinery and electronics sector in terms of higher-value exports. The sector's competitiveness in higher-value markets may be more adversely affected by tariffs than in lower-value markets.

Secondly, the analysis reveals that the relationship between population (**POPcptpp**) and the export of machinery and electrical products from Vietnam to CPTPP partners is statistically significant at all quantiles. The coefficient outcomes indicate that a one-unit increase of 1 million in population is associated with an estimated increase of 8,254.829, 11,902.99, and 16,936.36 thousand USD of export turnover at the respective quantiles. Comparing the quantiles, we observe that the coefficient outcomes increase as we move from the 40th quantile to the 60th quantile, which suggests a strongly positive relationship between population and the export of machinery and electrical products from Vietnam to CPTPP partners as we move towards higher quantiles. The result aligns with the Heckscher's theory (1919) the Ohlin's theory (1933) and past empirical research (e.g., Mai & Huynh, 2018).

Thirdly, by analyzing the variable **IFRcptpp**, we found statistically significant results in all quantiles, indicating a strong nexus between the inflation rate and the export of machinery and electrical products from Vietnam to CPTPP partners. The coefficients were consistently negative and significant, indicating that higher inflation rates have a detrimental effect on Vietnam's export performance at various points along the export distribution. The relationship is tested to align with past research, e.g., from Purusa and Istiqomah (2018). Specifically, a 1% increase in the inflation rate led to a decrease in exports by 108,226.6, 116,190.1, and 105,144.2 thousand USD at the 40th, 50th, and 60th quantiles, respectively. These findings emphasize the importance of controlling inflation to support Vietnam's export sector and maintain competitiveness in the CPTPP market.

Lastly, the statistically significant coefficients indicate that a higher liner shipping connectivity index (**LSCIcptpp**) positively impacts Vietnam's machinery and electrical products export to CPTPP partners at various quantiles. Specifically, an increase in the LSCI by one unit leads to an increase in exports of machinery and electrical products by 13,597.79, 16,286.04, and 14,382.78 thousand USD at the 40th, 50th, and 60th quantiles, respectively. This suggests that improving and enhancing shipping connectivity can increase export opportunities and competitiveness in the CPTPP market. Also, we can observe some variations in the results when comparing the coefficient outcomes for the variable LSCI at the three quantiles. At the 50th quantile, we see the highest coefficient outcome. This indicates that when exporting to nations that generate the median level of turnover, an increase in LSCI by one unit leads to the highest increase in the export of machinery and electrical products.

#### **4.2. Check for robustness**

Based on the analysis using simultaneous quantile regression to investigate the impact of the tariff, inflation rate, LSCI index, and population on Vietnam's export of machinery and electrical products to CPTPP partners, the consistent outcomes across quantiles indicate robust and statistically significant findings. The results suggest that all variables significantly and consistently influence Vietnam's exports across different levels of export performance. These findings highlight the importance of considering trade costs, market conditions, and economic factors in understanding the dynamics of Vietnam's export of machinery and electrical products to CPTPP partners. The consistent effects across quantiles support our hypotheses that these variables play a

crucial role in shaping export patterns. Thus, through these findings, we hope to provide valuable insights for policymakers and businesses in Vietnam that are seeking to enhance trade performance within the CPTPP framework, which will be discussed in the next section.

## **5. Conclusion & recommendations**

### **5.1. Conclusion**

In this paper, we attempted the very first research on the impact of tariffs on Vietnam's export of machinery and electronics products to members of the CPTPP. By applying simultaneous quantile regression to the modified gravity model, we have been able to build a robust set of results that enables us to investigate how tariffs affect various export distribution quantiles to gain a multifaceted conclusion. The preliminary findings reveal that across various levels of export performance, tariff rates, inflation rate, logistics performance, and population all significantly and consistently affect Vietnam's machinery and electronics exports.

According to the results, a strong and negative correlation exists between machinery and electronics tariffs and the sector's export turnover in Vietnam. Higher tariffs on machinery and electronics are strongly associated with lower levels of export turnover, even if the tariff is the most favorable applied under the agreement being examined. Thus, it is necessary to apply favorable tariff policies to increase Vietnam's market competitiveness under the CPTPP. Also, we found that tariffs tend to exert more impact on countries belonging to the upper quantiles, such as partners importing more Mach and Elec from Vietnam than others.

On the contrary, the population's effect on Vietnam's machinery and electronics exports to CPTPP partners is positive. It is more significant when we export Mach and Elec to countries offering median turnover value. Also, at various points along the export distribution, the performance of Vietnam's machinery and electronics exports to CPTPP nations was consistently negatively impacted by inflation. In order for Vietnam to remain competitive in the CPTPP market, inflation must be tightly controlled. Lastly, at different levels of export distribution, the effect of shipping connectivity on export turnover may be varied. However, they all suggest that improved liner shipping connectivity can increase Vietnam's competitiveness in the CPTPP market and its potential for exporting machinery and electronics products.

One limitation to consider within our research is the temporal constraint of our research, which is based on data limited up until only 2020. For instance, the impact of the Covid-19 pandemic and subsequent adjustments to importing tariffs or trade closures in other countries may have affected Vietnam's Mech and Elec products export under the CPTPP Agreement. However, our assessment may only partially capture these recent developments due to the lack of access to up-to-date data. Hence, a crucial suggestion for future research is to expand the study's temporal scope by conducting a longitudinal analysis. By tracking trends and changes in the export of Mech and Elec products under the CPTPP, future studies can yield insights into the long-term implications of applied tariffs.

### **5.2. Recommendations for Vietnam enterprises and the government**

To optimize the advantages of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), Vietnamese enterprises must implement various measures that guarantee adherence to the regulations and conditions of the agreement, as well as increase their competitiveness within the worldwide marketplace. Moreover, the government should also provide support and assistance for businesses. This can include financial aid, resources for research and development, and assistance with communication between companies and potential customers in other member nations.

### ***Recommendations for Vietnam enterprises exporting Mach and Elec products***

Vietnamese companies can foster strong connections with their customers and suppliers while exporting machinery and electronics by considering the distinctive attributes of the target market. In the case of aiming at the German market, which is known for its appreciation of precision and quality, it is recommended that Vietnamese companies prioritize the delivery of products that adhere to the stringent requirements and regulations of the said market while maintaining a high level of quality. Additionally, investing in research and development is a viable approach for Vietnamese companies to enhance their product quality and design. This entails performing a comprehensive market analysis to ascertain the requirements and inclinations of clientele in other member nations. By doing so, businesses can effectively respond to the needs and expectations of their target demographic. Vietnamese enterprises can acquire product certifications such as ISO or CE, which serve as evidence of their adherence to global standards and quality, in addition to allocating resources towards research and development. For example, a corporation producing electronic gadgets may acquire CE certification as evidence of its compliance with the safety and ecological standards set forth by the European Union. Moreover, Vietnam companies can invest in technology and automation by adopting new machinery, software, and equipment to enhance their manufacturing processes. Vietnamese enterprises can reduce the likelihood of human error, enhance quality management, and augment production output by implementing automation in their manufacturing procedures.

### ***Recommendations for the Vietnam government***

Financial support via the Export-Import Bank of Vietnam is a potential avenue for governmental aid. The aforementioned financial establishment offers a range of loan alternatives, including short-term, medium-term, and long-term options, characterized by flexible repayment terms and advantageous interest rates. Organizations can utilize these loans to finance their export activities, acquire machinery and equipment, and cover additional expenditures. Furthermore, governments can provide research and development resources to assist enterprises in improving their products' quality and design. The government's provision of financial assistance and resources may encourage research by enabling companies to gather information on competitors, identify potential areas of distinctiveness, and gain a competitive advantage. The government can also assist companies with communication and networking with potential customers in other member nations. To achieve this objective, the Ministry of Industry and Trade provides export counseling, training, and trade promotion activities. The Ministry can offer counseling and training services to support corporations in complying with international standards and regulations, including those mandated by the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Finally, the government can work to streamline regulations and procedures to make it easier for companies to export their products. One potential strategy is to streamline bureaucratic procedures and simplify export protocols to enhance cross-border trade efficiency.

### **ACKNOWLEDGEMENTS**

We thank Dr. Nguyen Thu Hang (Lecturer at Vietnam Foreign Trade University) for valuable feedback and support throughout the conduction of this research.

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### **References**

- Abidin, I. S. Z., Bakar, N. A., & Sahlan, R. (2013). The determinants of exports between Malaysia and the OIC member countries: A gravity model approach. *Procedia Economics and Finance*, 5, 12-19. doi:10.1016/s2212-5671(13)00004-x
- Aichele, R., Felbermayr, G. J., & Heiland, I. (2014). *Going deep: The trade and welfare effects of TTIP* (CESifo Working Paper, No. 5150). Munich, Germany: Center for Economics Studies and IFO Institutes.

- Allayarov, P., Mehmed, B., Arefin, S., & Nurmatov, N. (2018). The factors affecting Kyrgyzstan's bilateral trade: A gravity model approach. *Journal of Asian Finance, Economics and Business*, 5(4), 95-100. doi:10.13106/jafeb.2018.vol5.no4.95
- Anderson, J. E. (1979). A theoretical foundation for the gravity equation. *American Economic Review*, 69(1), 106-116.
- Bergstrand, J. H. (1985). The gravity equation in international trade: Some microeconomic foundations and empirical evidence. *The Review of Economics and Statistics*, 67(3), 474-481.
- Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade. *Review of Economics and Statistics*, 71(1), 143-153.
- Cantwell, J., Helpman, E., & Krugman, P. R. (1986). Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy. *The Economic Journal*, 96(381), 243-245. doi:10.2307/2233450
- Chen, I. H., & Wall, H. J. (1999). *Controlling for heterogeneity in gravity models of trade* (Federal Reserve Bank of St. Louis Working Paper 99-010A). St. Louis, MO: Federal Reserve Bank of St. Louis.
- Deardorff, A. V. (1998). Determinants of bilateral trade: Does gravity work in a neoclassical world? In J. A. Frankel (Ed.), *The regionalization of the world economy* (pp. 7-32). Chicago, IL: University of Chicago Press.
- Deardorff, A. V. (2011). *Determinants of bilateral trade: Does gravity work in a neoclassical world?* Woodstock, Vermont: World Scientific.
- Eaton, J., & Kortum, S. (1997). *Technology and bilateral trade* (NBER Working Paper Series). Cambridge, MA: National Bureau of Economic Research.
- Egger, P. (2000). A note on the proper econometric specification of the gravity equation. *Economics Letters*, 66(1), 25-31. doi:10.1016/S0165-1765(99)00183-4
- Fisk, P. R., & Linnemann, H. (1967). An econometric study of international trade flows. *Journal of the Royal Statistical Society. Series A (General)*, 130(1), Article 132. doi:10.2307/2344068
- Fugazza, M., & Hoffmann, J. (2017). Liner shipping connectivity as determinant of trade. *Journal of Shipping and Trade*, 2(1). doi:10.1186/s41072-017-0019-5
- Han, Z., & Li, H. (2022). Transportation infrastructure and trade. *Japan and the World Economy*, 64, Article 101162.
- Heckscher, E. (1919). The effect of foreign trade on the distribution of income. *Ekonomisk Tidskrift*, 21, 1-32.
- Helpman, E. (1987). Imperfect competition and international trade: Evidence from fourteen industrial countries. *Journal of The Japanese and International Economies*, 1(1), 62-81. doi:10.1016/0889-1583(87)90027-X
- Helpman, E., & Krugman, P. R. (1985). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*. Cambridge, MA: MIT Press.
- Hummel, D. (1999). *Towards a geography of trade costs* (Davis Working Paper No. 99-07). Oakland, CA: University of California.
- Hummel, D. (2001). Have international transportation costs declined? *Purdue University*, 21(2001), 131-154.

- Leibenstein, H., & Tinbergen, J. (1966). Shaping the world economy: Suggestions for an international economic policy. *The Economic Journal*, 76(301), 92-95. doi:10.2307/2229041
- Li, M., Balistreri, E. J., & Zhang, W. (2020). The U.S.-China trade war: Tariff data and general equilibrium analysis. *Journal of Asian Economics*, 69. doi:10.1016/j.asieco.2020.101216
- Limao, N., & Venables, A. J. (1999). *Infrastructure, geographical disadvantage and transport costs* (Policy Research Working Paper No. 2257). Washington, D.C.: The World Bank.
- Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *World Bank Economic Review*, 15(3), 451-479. doi:10.1093/wber/15.3.451
- Linnemann, H. (1966). *An econometric study of international trade flows*. Western Netherlands, Amsterdam: North-Holland Publishing Company.
- Mai, T. T. C., & Huynh, G. T. T. (2018). Estimating the impact of trade cost on export: A case study Vietnam. *Journal of Asian Finance, Economics and Business*, 5(3), 43-50. doi:10.13106/jafeb.2018.vol5.no3.43
- Matyas, L. (1997). Proper econometric specification of the gravity model. *The World Economy*, 20(3), 363-368.
- Matyas, L. (Ed.) (1998). *The econometrics of panel data: A handbook of the theory with applications*. Dordrecht, South Holland: Kluwer Academic Publishers.
- Metulini, R. (2013). *Spatial gravity models for international trade: A panel analysis among OECD countries*. Alicante, Spain: European Regional Science Association.
- Mila, E. Z., Mukhtar, S., & Nikensari, S. I. (2022). The influence of manufacturing products, exchange rate and inflation rate on exports to the asean region for the 2017-2021 period. *International Journal of Current Economics & Business Ventures*, 2(1).
- Ohlin, B. (1933). *Interregional and international trade*. Cambridge, MA: Harvard University Press.
- Purusa, N. A., & Istiqomah, N. (2018). Impact of FDI, COP, and Inflation to export in five ASEAN countries. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi Dan Pembangunan*, 19(1), 94-101. doi:10.23917/jep.v19i1.5832
- Tinbergen, J. (1962). *Shaping the world economy: Suggestions for an international economic policy*. New York, NY: The Twentieth Century Fund.
- Trinh, H. T. T., Pham, H. T., & Nguyen, L. T. N. (2017, March 10). *Impact of transport costs on Vietnamese textile exports*. Retrieved October 10, 2022, from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2929937](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2929937)
- Vu, A. T. T., Tran, A. N., Vu, H. V., Nguyen, M. T. N., Le, N. H., Tran, P. M., ... Nguyen, T. D. (2020). *The effect of the EVFTA on Vietnam's exports of electronic products*. Hanoi, Vietnam: Foreign Trade University.
- Wei, S. (1996). *Intra-national versus international trade: How stubborn are nations in global integration?* (Nber Working Paper Series). Retrieved October 10, 2022, from [http://papers.ssrn.com/sol3/delivery.cfm/nber\\_W5531.pdf?abstractid=4196](http://papers.ssrn.com/sol3/delivery.cfm/nber_W5531.pdf?abstractid=4196)
- Zheng, J., Zhou, S., Li, X., Padula, A. D., & Martin, W. (2023). Effects of eliminating the US-China trade dispute tariffs. *World Trade Review*, 22(2), 212-231.

