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EFECT OF LOGISTICS PERFORMANCE ON VIETNAM'S IMPORTS

ẢNH HƯỞNG CỦA HIỆU QUẢ LOGISTICS TỚI NHẬP KHẨU CỦA VIỆT NAM

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Abstract

While the relationship between logistics and Vietnam's exports has been documented in the literature, the impact on the imports only gets limited attention. This study aims to empirically measure the effect of logistics performance on Vietnam's imports based on the trade gravity model. Using panel data of bilateral trade between Vietnam and 116 trading partners during the period 2007-2018, we find a significantly positive effect of logistics on Vietnam's imports. The finding is robust to heteroscedasticity, the choice of specification and estimator. Therefore, we recommend the government to further develop Vietnam's logistics capability to support the imports and economic growth.

Keywords: *Logistics, imports, gravity model, logistics performance index.*

Tóm tắt

Trong khi mối quan hệ giữa logistics và hoạt động xuất khẩu của Việt Nam đã được nghiên cứu, tác động của logistics tới hoạt động nhập khẩu lại chưa được chú ý tới. Nghiên cứu này nhằm đánh giá ảnh hưởng của hiệu quả hoạt động logistics tới nhập khẩu của Việt Nam, dựa trên mô hình lực hấp dẫn trong thương mại. Sử dụng dữ liệu bảng về thương mại song phương giữa Việt Nam và 116 đối tác trong giai đoạn 2007-2018, chúng tôi xác định được ảnh hưởng tích cực có ý nghĩa thống kê của logistics tới nhập khẩu của Việt Nam. Kết quả nghiên cứu này có tính vững trước các vấn đề về phương sai không đồng nhất, thay đổi về biến kiểm soát và phương pháp ước lượng. Do đó, chúng tôi đề xuất chính phủ phát triển năng lực logistics của Việt Nam hơn nữa để hỗ trợ cho nhập khẩu và tăng trưởng kinh tế.

Từ khóa: *Logistics, nhập khẩu, mô hình lực hấp dẫn, chỉ số hiệu quả hoạt động logistics.*

1. Introduction

International trade plays a crucial role in economic development [1] wherein domestic firms import advanced technology and machinery, cost-effective inputs to produce products and services, serving domestic and foreign demands. In the case of Vietnam, international trade significantly contributed to the economic growth for decades [2]. Vietnam's economy is highly open to the world market and has been trading with more than 200 nations and territories [3].

Logistics is widely considered an important factor to facilitate international trade [4]. On the one hand, efficient logistics can significantly support trade. However, on the other hand, if logistics is inefficient, it adversely affects trade. Therefore, many studies have investigated the relationship between logistics and international trade.

Some efforts have been put to analyze the relationship between logistics and Vietnam's exports [5]–[8], however, there is no attempt to evaluate the potential effect of logistics on the imports. The Vietnam government's Decision 493/QD-TTg has approved the strategy for exporting and importing activities up to 2030, recognizing both the importance of exports and imports. In this study, we aim to explore the effect of logistics on Vietnam's imports. The underlying relationship is understudied but has great potential to fill the theoretical gap and provide a suggestion for policymakers.

Our study is organized as follows: Section 2 reviews the related literature. Section 3 describes the research model and data. Section 4 explains the analysis and results. Finally, section 5 concludes the study.

2. Literature review

In the extant literature, the linkage between logistics and international trade in Vietnam has been documented. However, most of these studies only investigated the effects of logistics performance on exports [5]–[8]. Imports have the same importance to

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KHOA HỌC CÔNG NGHỆ HÀNG HẢI
JOURNAL OF MARINE SCIENCE AND TECHNOLOGY

economic development in comparison to exports, especially in the case of Vietnam. Imports took account of a 30% enhancement in total factor productivity in Hungary during the 1990s [9]. There was a positive impact of imports on manufacturing exports in Italy in the 2000-2004 period [10]. Peirola et al. [11] also found a similar linkage between imports and exports in Peru. Using the fixed effects model with the application of different corrections of standard errors, Le and Nguyen [1] concluded free trade agreements consistently affected Vietnam's imports from 1997 to 2019, while other factors, such as income level difference, institutional distance, and transport costs, varied according to the trading partners' heterogeneity. However, the authors did not consider the role of logistics in the study.

The trade gravity model is the most frequently used lens in empirical studies on international trade [12]. In its basic form, it is formulated in a similar way to Newton's law of gravity [13]. Particularly, it postulates that bilateral trade between two countries is proportional to the size of the two economies and diminishes with geographical distance. The trade gravity model has strong theoretical foundations, such as Heckscher-Ohlin theory, monopolistic competition, Ricardian framework, and heterogenous firms [14]. Other important advantages of the trade gravity model include ease of development, flexibility, and applicability [15]. It is considered a proper tool to analyze logistics and trade flows [16]. Huynh [6] employed the trade gravity model to assess the effects of logistics on Vietnam's exports and found both the logistics performances of Vietnam and the importing countries positively affected trade. The other empirical studies of the logistics-exports relationship in Vietnam [5], [7], [8] also opted to use the trade gravity model in their analyses.

As the highly limited studies on logistics and Vietnam's imports, the objective of our study is to provide empirical evidence, significantly contributing to the current literature. As suggested by the related studies, we adopt the trade gravity in the current study. Details of our research design will be presented in the next session.

3. Research methodology

3.1. Model specifications

Following Song and Lee [16], we specify the following equation to analyze the effect of logistics performance on Vietnam's imports based on the trade gravity model.

$$lnIM_{ij,t} = \alpha_0 + \beta_1 lnLP_{ij,t} + \beta_2 lnDIST_{ij} + \beta_3 lnGDP_{ij,t} + \beta_4 CBOR_{ij} + \beta_5 RTA_{ij,t} + \lambda_t + \varepsilon_{ij,t} \quad (1)$$

Where:

- i, j, t: Exporting country, importing country (Vietnam) and year respectively;
- ln: Natural logarithm;
- α_0: Intercept;
- βs: Coefficients of parameters;
- $LP_{ij,t}$: Total logistics performance, equals sum of exporting and importing countries' logistics performance. $LP_{ij,t} = LP_{i,t} + LP_{j,t}$;
- $DIST_{ij}$: Geographical distance between country of origin and country of destination;
- $GDP_{ij,t}$: Total economic size, equals sum of GDPs of exporting and importing countries. $GDP_{ij,t} = GDP_{i,t} + GDP_{j,t}$;
- $CBOR_{ij}$: Common border. It takes value of 1 if exporting countries and Vietnam share a common border, and 0 otherwise;
- $RTA_{ij,t}$: Regional trade agreement. It equals 1 if two trading countries share membership of at least one common regional trade agreement, and 0 otherwise;
- λ_t: Year dummy;
- $\varepsilon_{ij,t}$: Error term.

To control unobserved time-invariant effects that potentially affect both dependent and independent variables, we further decompose the error terms. Particularly, $\varepsilon_{ij,t} = \mu_{ij} + \upsilon_{ij,t}$ in which μ_t refers to pair-country fixed effects and $\upsilon_{ij,t}$ is stochastic disturbance term [17]. Therefore, equation (1) turns into the following equation:

$$lnIM_{ij,t} = \alpha_0 + \beta_1 lnLP_{ij,t} + \beta_2 lnDIST_{ij} + \beta_3 lnGDP_{ij,t} + \beta_4 CBOR_{ij} + \beta_5 RTA_{ij,t} + \lambda_t + \mu_{ij} + \upsilon_{ij,t} \quad (2)$$

3.2. Data

We collect trade data from the BACI CEPII dataset [18] and the logistics performance index (LPI) from the World Bank (WB) Logistics Performance Reports. The sampling panel data covers 116 trading partners of Vietnam in the years 2007, 2010, 2012, 2014, 2016, and 2018. The time dimensions are not equally distributed due to the availability of the LPI.

The LPI is a survey-based measure of countries' trade logistics performance. The WB considers six core performance components, consisting of customs

clearance, transport infrastructure, international shipment, logistics service, tracking and tracing, and timeliness. While none of these components separately ensure a good measure, by combining them and using principal component analysis, the overall LPI score can be a multi-dimensional proxy for assessing countries' logistics performance. Various studies on international trade have adopted LPI [4], [16], [19]. In this paper, we select the overall LPI score because of its representative capability.

In terms of control variables, geographical distance, GDPs, and RTAs are obtained from the CEPII, the WB World Development Indicators, and the World Trade Organization (WTO) respectively. Except for two binary variables, common border, and regional trade agreement, the other variables are logarithm-transformed to mitigate the skewness of the data and to estimate elasticity (log-log relationship) of the dependent variable on the regressors. Table 1 exhibits general information about the variables in our models, while Table 2 shows the pairwise correlation.

According to the correlation matrix in Table 2, we observe positive relationships between the dependent variable and logistics performance, economic size, common border, and regional trade agreements. By contrast, geographical distance is negatively correlated with Vietnam's imports because it presents transport costs. These post-estimation examinations show that the variables in the study behave initially in accordance with our expectations.

Table 1. Data description

Variables	Unit	Observations	Mean	Standard Deviation	Min	Max
$IM_{ij,t}$	10^3 US$	663	1245827	5395264	2.433	77200000
$LP_{ij,t}$		696	6.018723	0.615082	4.1	7.47
$DIST_{ij}$	Km	696	8863.931	4601.679	480	19076
$GDP_{ij,t}$	10^3 US$	688	7.8E+08	1.94E+09	77900000	2.08E+10
$CBOR_{ij}$		696	0.025862	0.158838	0	1
$RTA_{ij,t}$		696	0.123563	0.329319	0	1

Source: The authors' calculations based on the CEPII, the WB, and the WTO data

Table 2. Correlation matrix

	$lnIM_{ij,t}$	$lnLP_{ij,t}$	$lnDIST_{ij}$	$lnGDP_{ij,t}$	$CBOR_{ij}$	$RTA_{ij,t}$
$lnIM_{ij,t}$	1.0000					
$lnLP_{ij,t}$	0.6467	1.0000				
$lnDIST_{ij}$	-0.2869	-0.0578	1.0000			
$lnGDP_{ij,t}$	0.7249	0.6760	-0.0613	1.0000		
$CBOR_{ij}$	0.2123	-0.0507	-0.4571	0.0849	1.0000	
$RTA_{ij,t}$	0.4806	0.1438	-0.6190	0.2443	0.4324	1.0000

Source: The authors' calculations based on the CEPII, the WB, and the WTO data

4. Empirical analysis

First, we estimate equation (1) using Pooled Ordinary Least Squares (POLS). When all the assumptions hold, POLS can produce the unbiased and most efficient estimates [20].

According to column (1) in Table 3, logistics performance, economic size, common border, and regional trade agreement are statistically significant variables that positively influence the dependent variable. The only exception is geographical distance. We check the Variance Inflation Factor (VIF) values for multicollinearity. As the maximum VIF is 1.78 which is far below the cautious threshold of 10, we do not have multicollinearity problem in the estimation. The null hypothesis of Breusch-Pagan/Cook-Weisberg (BP/CW) test is rejected at 1% level, indicating the presence of heteroscedasticity. Therefore, we re-estimate with application of robust standard errors to address heteroscedasticity issue. Using robust standard errors does not alter the previous estimation and the results are presented in column (2).

TẠP CHÍ ISSN: 1859-316X
KHOA HỌC CÔNG NGHỆ HÀNG HẢI
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Table 3. POLS regressions

VARIABLES	POLS (1)	POLS (2)
$lnLP_{ij,t}$	9.294***	9.294***
	(0.890)	(0.879)
$lnDIST_{ij}$	-0.178	-0.178
	(0.117)	(0.151)
$lnGDP_{ij,t}$	1.270***	1.270***
	(0.0885)	(0.0761)
$CBOR_{ij}$	0.838*	0.838**
	(0.449)	(0.335)
$RTA_{ij,t}$	2.358***	2.358***
	(0.251)	(0.266)
Robust SE		Yes
BP/CW test	53.51***	
Max VIF	1.78	1.78
Observations	655	655

Note: Year dummies are included. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: The authors' calculations

Table 4. FE and RE regressions

VARIABLES	FE (1)	RE (2)
$lnLP_{ij,t}$	2.930*	5.618***
	(1.536)	(1.350)
$lnDIST_{ij}$		-0.498
		(0.345)
$lnGDP_{ij,t}$	0.195	1.276***
	(0.267)	(0.131)
$CBOR_{ij}$		1.713**
		(0.827)
$RTA_{ij,t}$	-0.123	0.604**
	(0.180)	(0.251)
Pool-ability test	19.33***	
BPLM test		668.04***
Hausman test	37.40***	
Observations	655	655
No. of exporters	116	116

Note: Year dummies are included. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: The authors' calculations

Second, to control unobserved time-invariant country-specific effects, we estimate equation (3) using fixed effects (FE) and random effects (RE) models. Additionally, robust standard errors are applied to deal with the potential presence of heteroscedasticity. Because the FE model removes all time-invariant factors, both geographical distance and common border variables are canceled out as shown in column (1) of Table 4.

Our key variable, logistics performance, is found statistically significant across Table 4, regardless of applied estimators. It is also important to identify the most appropriate estimation method and the associated estimates, we rely on a set of specification tests. The pool-ability test provides a basis for comparison between POLS and FE models, while Breusch and Pagan Lagrangian multiplier (BPML) test signifies the appropriateness of POLS or RE models. As both null hypotheses of the pool-ability test and BPML test are strongly rejected at 1% level, our estimates in Table 4 are superior to those provided by POLS in Table 3. To compare FE and RE models, we implement Hausman's specification test [21]. Because we can reject the null hypothesis that favors the RE model at 1% level, the FE model is more appropriate. Hence, as shown in column (1) of Table 4, at 10% level, a 1% improvement in logistics performance leads to a 2.93% increase in Vietnam's imports.

Table 5. Robustness check

VARIABLES	PPML (1)	PPML (2)
$lnLP_{ij,t}$	7.015***	6.799***
	(0.698)	(0.722)
$lnDIST_{ij}$	-0.930***	-0.933***
	(0.0566)	(0.0561)
$lnGDP_{ij,t}$	0.803***	0.799***
	(0.0497)	(0.0502)
$CBOR_{ij}$	0.0246	0.0365
	(0.190)	(0.190)
$RTA_{ij,t}$	1.351***	1.333***
	(0.151)	(0.153)
$WTO_{i,t}$		1.021**
		(0.432)
Observations	655	655

Note: Year dummies are included. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: The authors' calculations

Lastly, we continue to check the consistency of our finding by using an alternative estimator. Poison Pseudo-Maximum Likelihood (PPML) is a popular estimation technique in the trade gravity empirical studies because it can address zero trade issues [22]. As there is not such issue in our data (presented in Table 1), we only use PPML to check robustness rather than baseline estimation. Moreover, we also change the model specification by adding exporting country's WTO membership. According to the results exhibited in Table 5, the effect of logistics performance on Vietnam's imports remains significant, hence indicating that our finding is highly consistent. In other words, the significance of the key variable is not sensitive to both the choice of estimator and model specification.

5. Conclusion

In this study, we find a positive and consistent effect of logistics performance on Vietnam's imports from 116 trading partners over the period between 2007 and 2018, contributing significantly to the literature in terms of this understudied linkage. In addition to Decision 493/QD-TTg which has already designated the role of logistics in supporting exports, this study recommends developing logistics to facilitate imports. Improvement in logistics performance can become a viable channel to enhance Vietnam's imports, hence positively influencing the country's exports and economic growth. As the current study only considers the overall logistics performance and estimates the average effect on the country's imports from all trading partners, future studies may analyze the effects of the specific logistics components and take the exporting countries' heterogeneity into account.

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