IMPACTS OF GREEN LOGISTICS ON VIETNAM'S FOOTWEAR EXPORTS TO THE EU

Nguyen My Hong Thi* - Nguyen Thi Minh Hoang**

Abstract: ***The study assesses the impact of green logistics on Vietnamese footwear exports to the 27 European Union member states. It employs a quantitative approach using panel data covering the period 2010-2023, with observations drawn from selected years corresponding to updates of the Logistics Performance Index (LPI) and Green Logistics Performance Index (GLPI). By examining these indicators, the study provides empirical evidence on the relationship between sustainable logistics practices in EU member states and Vietnam's export performance in the footwear sector, thereby suggesting implications for enhancing export competitiveness through green logistics integration.***

• Keywords: *green logistics, footwear exports, Vietnam, the EU.*

Date of receipt: 06th Feb., 2026
Date of receipt revision: 26th Mar., 2026
Date of delivery revision: 28th Feb., 2026
Date of approval: 29th Apr., 2026
DOI: https://doi.org/10.71374/jfar.v26.i3.55

Introduction

In recent years, the European Union (EU) has introduced several ambitious green policies, aiming to achieve carbon neutrality by 2050 and strengthen environmental responsibility across global supply chains. These policies have made green logistics increasingly essential for exporters, including Vietnam, to comply with strict environmental requirements and enhance competitiveness in the EU market. This transition is also aligned with Vietnam's commitment to achieving net-zero emissions by 2050.

For the Vietnamese footwear industry, environmental performance and supply chain transparency have become critical factors for market access and long-term partnerships in the EU. While green logistics can improve export efficiency, reduce carbon emissions, and enhance brand reputation, it also increases compliance costs due to stricter environmental standards. Despite growing international research on green logistics and trade performance, empirical studies in the Vietnamese footwear sector remain limited. Therefore, this study investigates the impact of green logistics in EU countries on Vietnam's footwear exports, aiming to provide policy and managerial implications for improving competitiveness and promoting sustainable export logistics development.

Theoretical framework and research model

Theoretical framework and research hypotheses

The economic strengths of trading partners, which are usually determined by their Gross Domestic Product (GDP), are at the core of determining the direction and magnitude of bilateral trade flows (Huong et al., 2024). GDP as an economic performance measure not only measures the productivity but also the general economic health of a nation and hence can be used to be a good proxy of the purchasing power and importation ability of a nation. The economies that have more GDP tend to be larger, more diversified and capable of absorbing a large range of imported commodities (Sarmad et al, 2025).

Consequently, an increase in GDP in the importing countries in the EU is likely to have a favorable and significant impact on the performance of the Vietnamese footwear exports, as an increase in income, increased purchasing power and a growing consumer base will inherently be accompanied by increased demand of imported footwear products. Based on the above theoretical frameworks, the study proposes the following hypothesis:

H1: Gross Domestic Product (GDP) of importing EU countries has a positive impact on Vietnam's footwear exports to EU markets

According to the supply side view, the GDP of the exporting nation gives the general economic strength, industrial production capacity and competitiveness in the global markets. The growth in GDP generally indicates not only the growth in domestic output, but also in the level of technological capacity, the quality of infrastructure and labor productivity and all these factors

** La Trobe University; email: 22159801@students.latrobe.edu.au*
*** Foreign Trade University - Ho Chi Minh City Branch*

are a strengthening export base (Krugman and Obstfeld, 2018). Therefore, the GDP of Vietnam will have a positive impact on its footwear exports to EU markets as it will be an indicator of better production capacity, competitiveness and capacity to supply the needs of highly sophisticated and high standard consumers. Accordingly, the following hypothesis is proposed:

H2: Gross Domestic Product (GDP) of Viet Nam has a positive impact on Vietnam's footwear exports to EU markets

Xin and Momoh (2024) believe that the fast growth of the population may strain the economic situation of the country, undermining the purchasing power and diminishing the possibilities of importing products. These findings indicate that the effects of population on trade flows can be more complex than traditionally assumed. Nevertheless, as the majority of prior studies conclude that population tends to have a positive effect on trade, this study follows existing literature in hypothesizing a positive association between the population size of EU countries and Vietnam's footwear export turnover.

H3: Population of importing EU countries has a positive impact on Vietnam's footwear exports to EU markets

Huong et al. (2024) proves that trade openness as well as the population of partner countries, positively affects the export values. The study has emphasized the importance of open market environments to facilitate cross-border trade. In the framework of the footwear export of Vietnam to EU, greater trade openness among the importing nations can enhance the results of exports by partners. An open trade regime usually leads to a smoother customs clearance process, reduced bureaucracy and more predictable regulatory processes. As a result, in cases where EU member states are liberal in their trade systems, Vietnamese footwear exporters are in a better position to enter the market, minimize administrative delays and increase their competitiveness in general. Accordingly, the following hypothesis is proposed:

H4: Trade openness of importing EU countries has a positive impact on Vietnam's footwear exports to EU markets

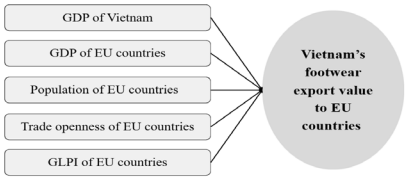
Tran Ngoc Mai (2024) pointed out that the enhancement of green logistics has a positive correlation with the performance of international trade, which brings about economic and environmental positive impacts. Based on this already existing literature, the current study expects that the GLPI of the EU importing countries will have a positive impact on the Vietnam footwear exports.

H5: Green Logistics Performance Index (GLPI) of importing EU countries has a positive impact on Vietnam's footwear exports to EU markets

Proposed research model

Based on findings from previous domestic and international studies and the hypotheses, the authors propose an empirical model as Figure.

Figure: Proposed research model



Source:Wang et al(2018), Fan et al(2022), Huong et al (2024), Tran Ngoc Mai (2024)

In research model, exploratory variables include:

- Gross Domestic Product (GDP) of importing EU countries
- Gross Domestic Product (GDP) of Viet Nam
- Population of importing EU countries
- Trade openness of importing EU countries
- Green Logistics Performance Index (GLPI) of importing EU countries

Research method

The study uses a quantitative approach with panel data of 162 observations for 27 EU countries over 2010-2023, sourced from Trademap, the World Bank, Our World in Data, and Climate Watch. The Green Logistics Performance Index (GLPI) is constructed via PCA from 20 sub-indicators. The analysis employs Pooled OLS, Fixed Effects (FEM), and Random Effects (REM), with model selection based on diagnostic tests. Feasible Generalized Least Squares (FGLS) is applied to ensure robust estimates of the impact of green logistics on Vietnam's footwear exports to the EU.

Research results

Model testing

This study estimates three models: Pooled OLS, Fixed Effects Model (FEM) and Random Effects Model (REM) to analyze the determinants of Vietnam's footwear export value to EU countries.

Table 1: OLS estimation result

lnEXP	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
GLPI	0.1318141	0.0475444	2.77	0.006	0.0378809	0.2257473
lnGDP	2.03605	0.1921874	10.59	0.000	1.656346	2.415753
lnGDPVN	0.4777098	0.3508567	1.36	0.175	-0.2154757	1.170895
lnPOP	-0.6999133	0.2046568	-3.42	0.001	-1.104253	-0.295574
OPEN	1.122648	0.3170967	3.54	0.001	0.4961618	1.749134
_cons	-28.66982	6.913383	-4.15	0.000	-42.32855	-15.01109

Source: The author (2025)

The OLS estimation provides a preliminary assessment of the factors influencing Vietnam's

footwear export value to EU markets. As shown in Table 1, the coefficient of lnGDP is large and positive (2.03605) with a p-value of 0.000, confirming that wealthier EU economies tend to import higher footwear volumes from Vietnam. Trade openness (OPEN) also shows a positive and significant effect (1.122648, p-value = 0.001), suggesting that more liberal and outward-oriented EU markets facilitate smoother trade flows. lnPOP has a negative and significant coefficient (-0.6999133, p-value = 0.001) which implies that larger EU member states can cause a negative influence on the importation of footwear products. GLPI also shows a positive coefficient (0.1318141) and is statistically significant at the 1 percent level, which means that the EU markets with a higher green logistics performance will be more favorable to the export activity of Vietnam. At the same time lnGDPVN is statistically insignificant (p-value=0.175) because GDP of Vietnam does not change among importing countries and thus does not account for cross country variation in export values.

The Breusch-Pagan test of heteroskedasticity was conducted to determine whether OLS is an adequate estimation technique. The test examines whether the variance of the error terms is constant across observations. The null hypothesis assumes homoscedasticity, meaning the residuals exhibit constant variance, while the alternative hypothesis indicates the presence of heteroskedasticity. The Stata results indicate a chi-square value of 22.72 with a p-value of 0.0000, providing strong evidence to reject the null hypothesis at any conventional significance threshold. This confirms that the variance of the error terms is not constant and that heteroskedasticity is indeed present in the OLS specification. Heteroskedasticity is significant in implication to the reliability of models. Consequently, the standard errors can be biased and the estimates based on OLS might be inefficient, which decreases the accuracy of statistical inferences.

Table 2: FEM and REM estimation results

	(1) FEM lnEXP	(2) REM lnEXP
GLPI	0.2916***	0.2174***
	(2.73)	(3.02)
lnGDP	1.4056*	1.7890***
	(1.86)	(5.21)
lnGDPVN	0.3532	0.4509
	(0.81)	(1.56)
lnPOP	3.7301	-0.5005
	(1.52)	(-1.33)
OPEN	-0.1040	0.4830
	(-0.11)	(0.94)
_cons	-83.0993**	-26.0185***
	(-2.12)	(-4.33)
adj. R-sq	0.109	
N	158	158

Source: The authors (2025)

Since this has a limitation, there is need to apply panel-data estimators like the Fixed Effects Model (FEM) or the Random Effects Model (REM) that would be more effective in capturing heteroskedasticity and unobserved heterogeneity between the countries of EU which will guarantee more reliable and effective parameter estimates that will be used in the analysis as in Table 2.

In the Random Effects Model (REM), GLPI shows a positive and significant effect, with a coefficient of 0.2174 and a p value of 0.002, indicating that higher green logistics performance in EU is linked with increased footwear imports. lnGDP is also significant at the 1 percent level with a coefficient of 1.7890, reaffirming that larger and wealthier economies tend to absorb greater export volumes. lnGDPVN carries a positive sign (0.4509) but remains statistically insignificant, suggesting that Vietnam's own economic growth does not explain cross-country variation in exports under REM. lnPOP has a negative coefficient (-0.5005) yet is insignificant, while OPEN is positive (0.4830) but also statistically insignificant.

The effect of GLPI in the Fixed Effects Model (FEM) is clearly and statistically significant with a coefficient of 0.2916 and p-value of 0.007 and lnGDP has a positive coefficient of 1.4056 and a p-value of 0.010. Conversely, lnGDPVN (0.3532) and lnPOP (3.7301) are not statistically significant though they are positive which means that they cannot explain a lot in the within-country dimension. The coefficient of OPEN is negative and insignificant -0.1040 (p-value =0.913), indicating that there is no significant relationship under the FEM specification.

In order to determine the appropriateness and credibility of the panel models more strictly, some extra diagnostic tests were introduced. The Fixed Effects Model was the first to be subjected to the Modified Wald test of groupwise heteroskedasticity. The null hypothesis is that the model is homoskedastic, meaning the variance of the error terms is the same in all the cross sectional units whereas the alternative hypothesis is heteroskedastic. The test gave a p-value of 0.0000 and chi square statistic of 13227.69, which had a decisive rejection of the null hypothesis. This result shows that the FEM is heteroskedastic and the residual variances vary greatly among the EU member states. This variability compromises the reliability of the traditional FEM standard errors making them bias and inconsistent and eventually decreasing the accuracy of the statistical inference made out of the model.

In the next step, the Hausman specification test was carried out in order to identify which one between Fixed Effects Model (FEM) and Random Effects Model (REM) is the more suitable estimator applied to

the panel data. The null hypothesis is that the REM is consistent and that the coefficients differences between the FEM and REM do not have a systematic nature. On the contrary, the other hypothesis reveals that REM is not consistent, which means that FEM should be used. The result from Stata is stated as follows:

chi2(5) = 8.40

prob>chi2 = 0.1356

Thus, the null hypothesis is not rejected which shows that the difference in coefficients between FEM and REM is not systematic. The REM is therefore considered to be the more appropriate estimator to this data.

Model results

The FGLS estimation results shown in the Table 3 provide robust evidence on the determinants of Vietnam's footwear export value to EU countries.

Table 3: FGLS estimation result

lnEXP	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]	
GLPI	0.1201498	0.0265645	4.52	0.000	0.0680844	0.1722152
lnGDP	1.931148	0.1106947	17.45	0.000	1.714191	2.148106
lnGDPVN	0.4849648	0.1508171	3.22	0.001	0.1893688	0.7805609
lnPOP	-0.6189476	0.1162706	-5.32	0.000	-0.8468339	-0.3910614
OPEN	1.134646	0.2038558	5.57	0.000	0.7350961	1.534196
_cons	-28.03522	3.057055	-9.17	0.000	-34.02694	-22.04351

Source: The authors (2025)

The coefficient of GLPI is positive (0.1201) and it is significant at the 1 percent level, meaning that, the more efficient and greener logistics system in the EU makes stronger footwear import flows in Vietnam possible. Quantitatively, a one-unit improvement in GLPI is associated with an approximate 12 percent increase in Vietnam's export value.

The impact of the EU countries in terms of their economic size InGDP is also very high and significant. The estimates with a coefficient of 1.9311 and a significance of 1 percent level indicate that wealthier markets of the EU import more Vietnamese footwear. This elasticity suggests that a 1 percent expansion in an importing country's GDP translates into roughly a 1.93 percent rise in export value.

The GDP (InGDPVN) of Vietnam, however, has a positive coefficient of 0.4849 which is statistically significant at the 1 percent level. This observation indicates that there is a positive relationship between the growth of the Vietnamese economy and the growth of the footwear industry in terms of increasing its production capacity, efficiency in export and capacity of the industry to satisfy foreign demand. In contrast with the FEM or the results of the REM, the FGLS estimates demonstrate that the domestic economic growth in Vietnam makes a significant contribution to the maintenance and the reinforcement of the export performance.

The InPOP coefficient is negative and important (-0.6189, p-value=0.00), which means that, larger EU markets are the ones, which import less Vietnamese footwear holding other factors constant. Whereas this result is contrary to the popular belief that large populations have high demand, it aligns with the existing literature of the fact that population levels can decrease importation under specific structural factors. Powerful domestic manufacturing abilities and high intra-EU sourcing systems in most of the very populated EU nations replace the exports of other foreign allies such as Vietnam.

One of the remarkable positive impacts in the model is trade openness (OPEN). The results obtained with a coefficient of 1.1346 with statistical significance level at the 1 percent point show that more liberal and globally integrated EU markets import significantly more Vietnam footwear. This underscores the need to have clear customs practices, minimal barriers to trade and good involvement in global supply chains.

Finally, the constant term (-28.0352) captures structural and unobserved factors not included in the regression. These may include industry-specific regulatory conditions, historical trade linkages, consumer preferences and EU import requirements relating to quality, safety and sustainability. Its large magnitude suggests that these structural elements exert substantial influence on Vietnam-EU footwear trade dynamics and should be considered in future sector-level analyses.

Conclusions and recommendations

Conclusions

This study examines the impact of green logistics performance and key economic characteristics of EU importing countries on Vietnam's footwear exports over the period 2010-2023. By constructing the Green Logistics Performance Index (GLPI) using PCA and applying an FGLS estimation, the study provides robust evidence on the role of sustainability-oriented logistics in shaping trade outcomes.

Overall, green logistics performance across EU member states shows a generally improving trend, despite some disparities. Advanced economies such as Germany, Belgium, Sweden, and Denmark consistently exhibit high GLPI levels, reflecting well-developed infrastructure and early adoption of environmental standards. Other countries demonstrate gradual improvements driven by increased investment and policy alignment, although structural constraints persist in some cases.

The empirical results indicate that GLPI, GDP (of both Vietnam and EU partners), and trade openness positively influence Vietnam's footwear exports,

while population size shows a negative relationship. Notably, GLPI emerges as a key determinant, suggesting that more efficient and environmentally sustainable logistics systems enhance trade reliability and facilitate export growth.

These findings highlight the importance of aligning with EU sustainability standards and strengthening green logistics capabilities to improve Vietnam's export competitiveness in an increasingly sustainability-driven global market.

Recommendations

For Government

The government should go beyond the old school of thought of trade facilitation and embrace a holistic strategy that focuses on the development of green logistics, sustainability governance, technological modernization, human-capital upgrading, institutional coordination, attraction of investments and further integration of trade.

The government should focus on investing in multimodal transport networks, inland container depots, energy-saving freight corridors and all-digitalized customs operations.

To assist companies in fulfilling these expectations, the government ought to come up with national databases of emissions reporting and provide standardized carbon accounting especially to the energy consuming and export oriented manufacturing sectors. Moreover, a full package of policy instruments, including green financing programs, tax credits on adoption of clean-technology, low- interest loans on adoption of clean-technology and subsidies on environmental auditing should be implemented to reduce the financial burden of the shift to low-carbon production and logistics.

The Government support should focus on raising awareness, strengthening supply-chain mapping, improving traceability systems and assisting firms in establishing sustainability commitments consistent with EU expectations.

The technological modernization is required to make Vietnam competitive in the EU footwear market. The government should urge the manufacturers to use digital supply-chain management tools, energy-efficient machines, automation solutions and smart-manufacturing technologies.

The development of human capital is also core. The government should respond to this demand by increasing the number of training centers, facilitating university - industry interactions and creating green logistics, carbon accounting, supply-chain transparency and EU regulatory compliance certification programs.

The growing complexity of EU sustainability regulations requires stronger institutional coordination in Vietnam. Relevant agencies should align EVFTA implementation, carbon measurement, and green trade facilitation, supported by a centralized information platform to enhance exporters' responsiveness to policies.

At the same time, attracting FDI into sustainable manufacturing and green logistics, through green industrial parks, renewable energy, and advanced logistics systems, will strengthen compliance capacity and generate technological spillovers.

For Vietnamese footwear exporters

Firstly, exporters should adopt evidence-based market selection strategies that reflect structural differences across EU economies.

Second, Vietnamese companies should embrace cleaner technologies, invest in more energy-efficient systems and more water-saving systems and move towards circular materials, including recycled polyester, rubber sourced, bio-based materials or new leather solutions.

Third, The Vietnamese companies need to implement digitalized logistics systems like live shipment tracking, forecasting demand and inventory analysis and electronic customs documents to enhance accuracy and minimize delays.

*Fourth, t*o check the compliance of suppliers and trace the origins, exporters are advised to develop digital traceability systems. Internal audits, supplier reviews and end-to-end recordkeeping should also be done to prevent compliance failures that may lead to loss of tariff or rejection of shipments.

Fifth, the human capital and supply-chain governance must be strengthened to achieve the changing EU requirements. Exporters ought to establish specialized teams whose role is sustainability management, quality assurance, digital supply-chain operations and regulatory compliance.

Sixth, the enhancement of brand equity and communication is highly important to gain trust among the EU retailers and consumers.

References:

Huong, V.T.T., Kiem, P.V., Thuy, N.T., Trang, V.T.H. and Ha, H.T.T. (2024). Assessing the impact of green logistics performance on vietnam's export trade to regional comprehensive economic partnership countries. International Journal of Innovative Research and Scientific Studies, [online] 7(2), pp.742-754. doi:https://doi.org/10.53894/ijirss.v7i2.2882.

Krugman, P.R. and Obstfeld, M. (2018). International Economics: Theory & Policy. 11th ed. Harlow, England: Pearson.

Kumar, A. (2015). Green Logistics for sustainable development: an analytical review. IOSRD International Journal of Business, 1(1).

Sarmad, M.S.A., Wakeel, N., Dilawar, S., Tufail, J., Gul, S. and Ramzan

Tran, M.N. (2024). Impact of green logistics on Vietnam's regional trade. The Asian Journal of Shipping and Logistics, [online] 40(2), pp.126-132. doi:https://doi.org/10.1016/j.ajsl.2024.04.001.

Ulrich, N., xin, N.W. and Momoh, N.B. (2024). The impact of population growth on international trade in Europe. EPRA International Journal of Economic Growth and Environmental Issues, pp.1-5. doi:https://doi.org/10.36713/epra16699.

Wang, D.-F., Dong, Q.-L., Peng, Z.-M., Khan, S. and Tarasov, A. (2018). The Green Logistics Impact on International Trade: Evidence from Developed and Developing Countries. Sustainability, 10(7), p.2235. doi:https://doi.org/10.3390/su10072235.