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Impacts of free trade agreements on Vietnam's export efficiency: Efficiency enhancement or compliance cost?

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Abstract

This study aims to answer whether joining Free Trade Agreements (FTAs) increases or decreases Vietnam's export efficiency, taking into account the role of institutional similarity. It is the first study to analyze the moderating role of institutional similarity in the relationship between FTAs and export efficiency. Using Stochastic Frontier Analysis (SFA), the study finds several important results. First, FTAs improve Vietnam's export efficiency, including total, agricultural, and non-agricultural exports. This finding supports the efficiency-enhancing hypothesis. Second, institutional similarity has a moderating effect. It strengthens the positive and significant impact of FTAs on export efficiency in all product categories. The findings support the institutional complementarity view under the framework of transaction cost

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economics. Institutional similarity enhances the benefits of FTAs by reducing uncertainty, enforcement risks, and compliance costs in international trade.

Keywords: FTA, institutional similarity, export efficiency, transaction cost theory, stochastic frontier analysis, Vietnam.

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I. Introduction

In the context of globalization, Free Trade Agreements (FTAs) have become increasingly important tools for developing countries to promote trade.[1] Beyond tariff reductions, modern FTAs tend to include broader commitments related to institutions, the environment, and intellectual property. In practice, they facilitate smoother trade flows by reducing trade barriers,[2] encourage domestic reforms,[3] and support deeper integration into global value chains.[4] However, they also pose challenges

[1] Athanasia Stylianou Kalaitzi and Trevor W. Chamberlain, "Exports and Economic Growth: Some Evidence from the GCC," *International Advances in Economic Research* 26, no. 2 (2020), https://doi.org/10.1007/s11294-020-09786-0.

[2] Neha Jain and Sandeep Kumar, "Examining the impact of India–USA free trade agreement on agriculture sector: an ex-ante partial equilibrium analysis," *Journal of Economic and Administrative Sciences* 41, no. 1 (2022), https://doi.org/10.1108/jeas-12-2021-0272; Yichen Yang and Wen Liu, "Free trade agreements and domestic value added in exports: An analysis from the network perspective," *Economic Modelling* 132 (2024), https://doi.org/10.1016/j.econmod.2024.106656.

[3] Masahiro Kawai and Ganeshan Wignaraja, "Asian FTAs: Trends, prospects and challenges," *Journal of Asian Economics* 22, no. 1 (2011), https://doi.org/10.1016/j.asieco.2010.10.002; Aaditya Mattoo, Alen Mulabdic, and Michele Ruta, "Trade creation and trade diversion in deep agreements," *Canadian Journal of Economics/Revue canadienne d'économique* 55, no. 3 (2022), https://doi.org/10.1111/caje.12611.

[4] Dongin Kim, Sandro Steinbach, and Carlos Zurita, "Deep trade agreements and agri-food global value chain integration," *Food Policy* 127 (2024), https://doi.org/10.1016/j.foodpol.2024.102686; Mattoo, Mulabdic, and Ruta, "Trade creation and trade diversion in deep agreements," 55,3.

concerning costs and the ability to comply with FTA commitments.[5]

Empirical studies reveal conflicting evidence regarding the impact of FTA membership on export efficiency. On one hand, FTAs are considered effective tools for improving export performance by removing trade barriers,[6] a perspective often referred to as the efficiency-enhancing hypothesis. Ravishankar and Stack shows that CEFTA and BAFTA enabled Eastern European countries to move actual trade closer to their maximum potential.[7] Similarly, Vietnam's accession to AFTA reflects this trend, with an estimated export coefficient of 0.3219.[8] In addition, Noviyani et al. confirms that FTAs have a positive effect on

[5] Gabriel Felbermayr, Feodora Teti, and Erdal Yalcin, "Rules of origin and the profitability of trade deflection," *Journal of International Economics* 121 (2019), https://doi.org/10.1016/j.jinteco.2019.07.003; Stefan Legge and Piotr Lukaszuk, "The firm-level costs of utilizing free trade agreements," *International Economics* 178 (2024), https://doi.org/10.1016/j.inteco.2024.100484.

[6] Jain and Kumar, Examining the impact of India–USA free trade agreement on agriculture sector: an ex-ante partial equilibrium analysis."; Yang and Liu, "Free trade agreements and domestic value added in exports: An analysis from the network perspective."

[7] Geetha Ravishankar and Marie M. Stack, "The Gravity Model and Trade Efficiency: A Stochastic Frontier Analysis of Eastern European Countries' Potential Trade," *The World Economy* 37, no. 5 (2014), https://doi.org/10.1111/twec.12144.

[8] Hai, Nguyen Thi Hong, and Doan Ngoc Thang. "The Asean Free Trade Agreement and Vietnam’s Trade Efficiency." *Asian Social Science* 13, no. 4 (2017). https://doi.org/10.5539/ass.v13n4p192.

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export efficiency through the reduction of bilateral barriers.[9] The case of India further supports this argument, as Kaushal reports an efficiency level of 73% under bilateral agreements such as the ASEAN-India FTA.[10]

Beyond tariff elimination, FTAs also function as "institutional anchors" that promote domestic reforms. For instance, the CUFTA agreement stimulated administrative and legal reforms through binding "WTO-plus" commitments.[11] In Ghana, the depth of PTAs helped reduce export inefficiencies in manufacturing and mineral sectors,[12] attributed to a firm-selection mechanism based on the Melitz model.[13] Moreover, Stack et al. reports high bilateral trade efficiency

[9] Dewi Solikhah Noviyani, Widyastutik Na, and Tony Irawan, "Indonesian Export Efficiency : A Stochastic Frontier Gravity Model Approach," *International Journal of Scientific Research in Science, Engineering and Technology* (2019), https://doi.org/10.32628/ijsrset1196190.

[10] Leena Ajit Kaushal, "Impact of regional trade agreements on export efficiency – A case study of India," *Cogent Economics & Finance* 10, no. 1 (2022), https://doi.org/10.1080/23322039.2021.2008090.

[11] Iryna Bogdanova, "Turning Crisis into Opportunity: Unfolding Ukraine's Trade Potential with the Canada-Ukraine Free Trade Agreement," *East/West: Journal of Ukrainian Studies* 8, no. 2 (2021), https://doi.org/10.21226/ewjus561.

[12] Camara K. Obeng, Michael Tutu Boadu, and Ewura-Adwoa Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?," Research in Globalization 6 (2023), https://doi.org/10.1016/j.resglo.2023.100112.

[13] Marc J. Melitz, "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica* 71, no. 6 (2003), https://doi.org/10.1111/1468-0262.00467.

between Western European countries and new members during the period 1995–2022.[14] Similarly, Masunda and Mhonyera finds that the FTA under the Common Market for Eastern and Southern Africa (COMESA) positively influenced the export efficiency of member states from 1997 to 2021.[15] Recently, Cheng et al. shows that the implementation of RCEP contributed to higher export efficiency across China's agricultural value chain.[16]

On the other hand, FTA participation has been found to reduce export efficiency, a view known as the compliance cost hypothesis. This suggests that joining FTAs does not always lead to improved trade performance.[17] For example, Drysdale et al. indicates that both the EU and NAFTA had adverse effects on trade efficiency.[18] Likewise, Kumar and Prabhakar reports that

[14] Stack, Marie M, Eric J Pentecost, and Geetha Ravishanka. "A Stochastic Frontier Analysis of Trade Efficiency for the New Eu Member States: Implications of Brexit." Economic Issues 23 (2018): 35-53.

[15] Stein Masunda and Gabriel Mhonyera, "Effects of free trade on export efficiency of COMESA member-states," *Journal of Shipping and Trade* 9, no. 1 (2024), https://doi.org/10.1186/s41072-024-00164-1.

[16] Haiwen Cheng, Yang Sun, and Wen Liu, "Unlocking the efficiency and potential of China's agricultural exports to RCEP member countries: perspectives on the entire agricultural industry chain," *China Agricultural Economic Review* (2025), https://doi.org/10.1108/caer-10-2024-0342.

[17] C. Abreo, R. Bustillo, and C. Rodriguez, "The role of institutional quality in the international trade of a Latin American country: evidence from Colombian export performance," *J Econ Struct* 10, no. 1 (2021), https://doi.org/10.1186/s40008-021-00253-5, https://www.ncbi.nlm.nih.gov/pubmed/34815926.

[18] P. Drysdale, Y. Huang, and K. P. Kalirajan, "China's trade efficiency: measurement and determinants," in *APEC and Liberalization of the Chinese*

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India's export efficiency with SAFTA members (41%) was significantly lower than with non-member partners (61%).[19] In addition, Doan and Xing highlights that complex rules of origin (RoO) within FTAs can unintentionally create new trade barriers.[20] This may apply in cases of similar export structures, such as between Vietnam and China, which can reduce trade efficiency.

In addition, inconsistent implementation of FTAs and the inclusion of non-trade obligations may have unintended negative effects. Trung et al. finds that Vietnam's trade efficiency declined sharply after the ASEAN FTAs took effect, due to underutilization of emerging opportunities.[21] Obeng et al. shows that environmental clauses in PTAs increased compliance costs, which hindered Ghana's export performance.[22] Notably, Cheng et al. points out that a large and overlapping number of FTAs has led to

Economy, ed. P. Drysdale, Z. Yunling, and L. Song (Canberra: ANU E Press, 2012).

[19] Surender Kumar and Prerna Prabhakar, "India's Trade Potential and Free Trade Agreements: A Stochastic Frontier Gravity Approach," *Global Economy Journal* 17, no. 1 (2017), https://doi.org/10.1515/gej-2016-0074.

[20] Thang N. Doan and Yuqing Xing, "Trade efficiency, free trade agreements and rules of origin," *Journal of Asian Economics* 55 (2018), https://doi.org/10.1016/j.asieco.2017.12.007.

[21] Nguyen Xuan Trung, Nguyen Duc Hung, and Nguyen Thi Hien, "Exploiting the Trade Potential from Integration: Analysing the Impact of Free Trade Agreements between ASEAN and India and China," *China Report* 54, no. 4 (2018), https://doi.org/10.1177/0009445518795999.

[22] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?," 100112.

a "spaghetti bowl" effect.[23] This raised administrative costs and reduced the export efficiency of China's agricultural sector. Thus, without accompanying institutional reforms and well-designed policies, FTAs may act as barriers rather than drivers of trade growth.

As the two effects mentioned above tend to offset each other, the impact of FTAs on export efficiency depends on several intermediary conditions.[24] First, Obeng et al. finds that in Ghana, FTAs show clear positive effects only when accompanied by strong domestic regulatory quality.[25] Similarly, Masunda and Mhonyera confirms that each 1% improvement in governance quality reduces export inefficiency under the COMESA FTA by 0.16%.[26] At the same time, Xiao and Abula notes that firms tend to favor trade with countries that have stable institutional environments. Second, economic crises such as the GFC or GEC may weaken the effectiveness of FTAs.[27] Chatzilazarou and

[23] Cheng, Sun, and Liu, "Unlocking the efficiency and potential of China's agricultural exports to RCEP member countries: perspectives on the entire agricultural industry chain."

[24] Lazaros Antonios Chatzilazarou and Dimitrios Dadakas, "Trade potential in European Union manufacturing," *Journal of Economic Studies* 51, no. 5 (2023), https://doi.org/10.1108/jes-06-2023-0292.

[25] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?," 100112.

[26] Masunda and Mhonyera, "Effects of free trade on export efficiency of COMESA member-states," 9,1.

[27] Yuting Xiao and Buwajian Abula, "Examining the Impact of Digital Economy on Agricultural Trade Efficiency in RCEP Region: A Perspective Based on Spatial Spillover Effects," *Journal of the Knowledge Economy* 15, no. 3 (2023), https://doi.org/10.1007/s13132-023-01484-6.

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Dadakas indicates that crises force firms to restructure supply chains, shift toward lower-cost partners, and delay market expansion.[28] Third, the digital economy serves as a catalyst, especially in the RCEP region. According to Xiao and Abula, it helps lower transaction costs, upgrade trade value chains, and enhance agricultural export efficiency.[29]

Based on the above findings, it is evident that the role of institutional similarity in the relationship between FTAs and export efficiency remains underexplored, especially in the context of Vietnam. At present, Vietnam is a member of various bilateral and multilateral FTAs, such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the EU-Vietnam Free Trade Agreement (EVFTA), and the Regional Comprehensive Economic Partnership (RCEP). Despite the substantial benefits brought by regional economic integration, Vietnam's exports have not yet reached their full potential in many partner markets.[30] The gap between actual and potential export levels highlights the need to examine the conditions under

[28] Chatzilazarou and Dadakas, "Trade potential in European Union manufacturing," 1144-63.

[29] Xiao and Abula, "Examining the Impact of Digital Economy on Agricultural Trade Efficiency in RCEP Region: A Perspective Based on Spatial Spillover Effects," 9907 - 34.

[30] Doan and Xing, "Trade efficiency, free trade agreements and rules of origin," 33-41; Nguyen Khanh Doanh, Linh Tuan Truong, and Yoon Heo, "Impact of institutional and cultural distances on ASEAN's trade efficiency," *Journal of Economic Studies* 49, no. 1 (2020), https://doi.org/10.1108/jes-07-2020-0343.

which FTA membership can be transformed into optimal export efficiency. Recognizing this knowledge gap, the objective of this paper is to address the following questions:

- What is the current level of Vietnam's bilateral export efficiency with its trading partners?
- How do free trade agreements (FTAs) affect Vietnam's export efficiency?
- Does institutional quality similarity play a role in enhancing the impact of FTAs on Vietnam's export efficiency?

This study contributes to strengthening and extending the transaction cost theory originally proposed by Coase (1937) and expanded by Williamson (1985).[31] Specifically, our findings support the argument that institutions play a critical role in reducing transaction costs. When two countries share similar institutional frameworks, costs related to information search, contract negotiation, regulatory compliance, and dispute resolution decline significantly. This enables Vietnamese firms to improve their export efficiency. Moreover, our study extends the theory by incorporating institutional similarity into the

[31] R. H. Coase, "The Nature of the Firm," Economica 4, no. 16 (1937), https://doi.org/10.1111/j.1468-0335.1937.tb00002.x; Oliver E. Williamson, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting* (New York: The Free Press, 1985).

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effectiveness of FTA implementation. The role of FTAs in enhancing export efficiency is not automatic. Instead, it is amplified when member countries share a high degree of institutional similarity. This contributes to the development of a new research avenue on the interaction between FTAs and institutional complementarity.

The remainder of this paper is structured as follows. Section 2 presents the theoretical framework for analyzing the impact of FTAs on export efficiency, along with the role of institutional similarity in this relationship. Section 3 introduces the analytical model and data sources. Section 4 provides the empirical results, discussion, and policy implications. Section 5 concludes the paper and suggests directions for future research.

II. Theoretical framework

According to Kumbhakar et al., there are two main approaches to estimating export efficiency. The output-oriented approach operates under the assumption of fixed inputs and assesses the maximum level of exports a country can achieve if existing resources are used most efficiently.[32] Under this approach, export efficiency is defined as the ratio of actual export volume to potential export volume (i.e., the maximum attainable

[32] Subal C. Kumbhakar, Hung-Jen Wang, and Alan P. Horncastle, *A practitioner's guide to stochastic frontier analysis using Stata* (NY: Cambridge University Press, 2015).

exports under ideal conditions). This method is widely applied in empirical studies at the national level.[33]

In contrast, the input-oriented approach focuses on answering the question: "Given the current level of exports, how much of the existing resources could a country save if it operated at maximum efficiency?"[34] This approach is commonly applied in industry-level or firm-level studies. Under this framework, export efficiency is viewed as a form of technical efficiency that reflects the ability to optimize the use of production inputs.[35]

Since our study aims to assess the factors affecting Vietnam's export inefficiency at the national level, we adopt the output-oriented approach. Under this framework, export inefficiency is defined as the gap between Vietnam's potential export volume and its actual export volume. In other words, it represents the "untapped export potential" caused by barriers that hinder the free flow of trade.[36]

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[33] Doan and Xing, "Trade efficiency, free trade agreements and rules of origin," 33-41; Drysdale, Huang, and Kalirajan, "China's trade efficiency: measurement and determinants," 259-71; Masunda and Mhonyera, "Effects of free trade on export efficiency of COMESA member-states," 9,1.

[34] Kumbhakar, Wang, and Horncastle, A practitioner's guide to stochastic frontier analysis using Stata.

[35] Hakimah Nur Ahmad Hamidi et al., "Technical Efficiency and Export Potential of the World Palm Oil Market," *Agriculture* 12, no. 11 (2022), https://doi.org/10.3390/agriculture12111918.

[36] Stack, Pentecost, and Ravishankar, "A Stochastic Frontier Analysis of Trade Efficiency for the New EU Member States: Implications of Brexit," 35-53; H. Xu, D. T. Nghia, and N. H. Nam, "Determinants of Vietnam's potential for

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A. Impact of FTAs on trade efficiency

Theoretically, joining FTAs can lead to two opposing effects on export efficiency. On the positive side, FTAs contribute to improved trade efficiency.[37] One of the main objectives of FTAs is to reduce trade barriers. Tariff reductions not only lower direct costs but also help firms use resources more efficiently.[38] At the same time, non-tariff barriers impose significant indirect costs on businesses. These barriers extend processing times and generate substantial compliance costs.[39] In fact, FTAs have attempted to address these issues by harmonizing regulations and standards among member countries and by enhancing the transparency of technical and sanitary measures.[40]

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agricultural export trade to Asia-Pacific economic cooperation (APEC) members," *Heliyon* 9, no. 2 (Feb 2023), https://doi.org/10.1016/j.heliyon.2023.e13105, https://www.ncbi.nlm.nih.gov/pubmed/36755617; Guimei Zhao et al., "Measuring trade efficiency of antimony products in China," *Journal of Cleaner Production* 486 (2025), https://doi.org/10.1016/j.jclepro.2024.144440.

[37] Doan and Xing, "Trade efficiency, free trade agreements and rules of origin," 33-41; Masunda and Mhonyera, "Effects of free trade on export efficiency of COMESA member-states."; Nguyen and Doan, "The ASEAN Free Trade Agreement and Vietnam's Trade Efficiency," 192-200.

[38] Mary Amiti and Jozef Konings, "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," *American Economic Review* 97, no. 5 (2007), https://doi.org/10.1257/aer.97.5.1611.

[39] Olivier Cadot and Julien Gourdon, "Non-tariff measures, preferential trade agreements, and prices: new evidence," *Review of World Economics* 152, no. 2 (2016), https://doi.org/10.1007/s10290-015-0242-9.

[40] Ilaria Fusacchia, Jean Balié, and Luca Salvatici, "The AfCFTA impact on agricultural and food trade: a value added perspective," *European Review of*

In addition, FTAs help promote the pro-competitive effect.[41] Preferential treatment for intra-bloc products lowers the cost of entering foreign markets.[42] This encourages more firms to engage in export activities. According to Crowley et al., the increase in the number of firms competing in the same market intensifies rivalry among exporters.[43] To maintain market share under pressure, firms are forced to optimize operations, logistics, and services.[44] As a result, FTAs enhance overall export efficiency both in scale and in depth.

Moreover, the export efficiency gains from FTAs are often reflected through a gradual and positive adjustment process toward greater efficiency. Empirical studies show that the impact of FTAs does not usually emerge immediately after the agreements take

Agricultural Economics 49, no. 1 (2022), https://doi.org/10.1093/erae/jbab046; Mussie Mindaye, Carlo Migliardo, and Tadele Ferede, "Heterogeneous effects of free trade areas (FTAs) on trade in Africa," *SN Business & Economics* 5, no. 6 (2025), https://doi.org/10.1007/s43546-025-00822-x.

[41] Meredith A. Crowley, Lu Han, and Thomas Prayer, "The pro-competitive effects of trade agreements," *Journal of International Economics* 150 (2024), https://doi.org/10.1016/j.jinteco.2024.103936.

[42] Masunda and Mhonyera, "Effects of free trade on export efficiency of COMESA member-states."; Mussie Mindaye, Carlo Migliardo, and Tadele Ferede, "Heterogeneous effects of free trade areas (FTAs) on trade in Africa,"

[43] Felipe Brugués et al., "The impact of NAFTA on prices and competition: Evidence from Mexican manufacturing plants," *Journal of International Economics* 155 (2025), https://doi.org/10.1016/j.jinteco.2025.104085; Crowley, Han, and Prayer, "The pro-competitive effects of trade agreements," 103936.

[44] Crowley, Han, and Prayer, "The pro-competitive effects of trade agreements," 103936.

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effect.[45] One reason is that government agencies need time to implement enforcement mechanisms and support domestic firms in accessing foreign markets.[46] At the same time, firms require time to adapt to trade policy changes, restructure supply chains, and meet the demands of export markets.[47] Active participation in this adjustment process allows both firms and the state to accumulate experience and maintain high performance standards. Over time, this fosters a culture of efficiency.

On the negative side, joining FTAs may reduce export efficiency due to various barriers and additional costs. First, RoO can impose heavy administrative burdens.[48] According to Legge and Lukaszuk, in order to receive preferential treatment, firms

[45] Peter H. Egger, Mario Larch, and Yoto V. Yotov, "Gravity Estimations with Interval Data: Revisiting the Impact of Free Trade Agreements," *Economica* 89, no. 353 (2021), https://doi.org/10.1111/ecca.12394; Fredrik Gisselman, Erik Merkus, and Nils Norell, "Boosting trade in environmental goods. Evidence from provisions in free trade agreements," *World Development Sustainability* 6 (2025), https://doi.org/10.1016/j.wds.2024.100195; Kim, Steinbach, and Zurita, "Deep trade agreements and agri-food global value chain integration."; Yang and Liu, "Free trade agreements and domestic value added in exports: An analysis from the network perspective."

[46] Chae-Deug Yi, "The United Kingdom-Korea-Japan free trade agreement with the reduction in tariffs and non-tariff measures on trade and welfare," *Asia Europe Journal* 23, no. 1 (2025/03/01 2025), https://doi.org/10.1007/s10308-025-00722-7, https://doi.org/10.1007/s10308-025-00722-7.

[47] Egger, Larch, and Yotov, "Gravity Estimations with Interval Data: Revisiting the Impact of Free Trade Agreements."; Daniel Trefler, "The Long and Short of the Canada-U.S. Free Trade Agreement," *American Economic Review* 94, no. 4 (2004), https://doi.org/10.1257/0002828042002633.

[48] Felbermayr, Teti, and Yalcin, "Rules of origin and the profitability of trade deflection," 103248.

must complete paperwork, obtain certifications, and adjust supply chains to meet intra-bloc requirements.[49] In addition, technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures in new-generation FTAs require strict compliance in terms of technology investment, quality management, and product inspection. Obeng et al. argues that complying with these extensive rules and standards demands strong state commitment, effective institutions, and adequate infrastructure.[50] Particularly when FTAs differ significantly in such requirements, firms seeking access to multiple markets may face substantial costs.

In many cases, joining an FTA may lead countries or firms to over-concentrate on intra-bloc markets, overlooking extra-bloc markets that offer greater cost advantages.[51] This results in higher input costs due to not sourcing from the most efficient external suppliers. Furthermore, as Crowley et al. argues, FTAs increase competitive pressure through market liberalization.[52] If domestic firms are forced out of the market, the economy may bear significant social costs and face the need for structural adjustment.

[49] Legge and Lukaszuk, "The firm-level costs of utilizing free trade agreements."
[50] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?" 100112.
[51] Fusacchia, Balié, and Salvatici, "The AfCFTA impact on agricultural and food trade: a value added perspective."; Shanping Yang and Inmaculada Martinez-Zarzoso, "A panel data analysis of trade creation and trade diversion effects: The case of ASEAN–China Free Trade Area," *China Economic Review* 29 (2014), https://doi.org/10.1016/j.chieco.2014.04.002.
[52] Crowley, Han, and Prayer, "The pro-competitive effects of trade agreements."

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Finally, participation in multiple FTAs creates overlapping regulations, often referred to as the "spaghetti bowl effect."[53] This places firms in a maze of procedures and standards that require substantial resources to navigate.[54] Most developing countries lack the institutional capacity and infrastructure needed to manage these agreements effectively.

B. The moderating effect of institutional similarity on the relationship between FTAs and export efficiency

Institutional similarity plays a critical moderating role in the impact of FTAs on export efficiency between two countries.[55] This role is best understood through the lens of transaction cost theory.[56] The theory has received strong empirical support, highlighting how transaction costs hinder trade flows. It is especially relevant in this context, where firms face not only production, transport, and administrative costs but also transaction

[53] Fusacchia, Balié, and Salvatici, "The AfCFTA impact on agricultural and food trade: a value added perspective."; Scott L. Baier et al., "Do Economic Integration Agreements Actually Work? Issues in Understanding the Causes and Consequences of the Growth of Regionalism," *The World Economy* 31, no. 4 (2008), https://doi.org/10.1111/j.1467-9701.2008.01092.x.

[54] Legge and Lukaszuk, "The firm-level costs of utilizing free trade agreements."; Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?"

[55] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?."; Doanh, Truong, and Heo, "Impact of institutional and cultural distances on ASEAN's trade efficiency."

[56] Coase, "The Nature of the Firm."; Williamson, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting.*

costs shaped by the institutional environments of their trade partners. Institutional similarity refers to the alignment in laws, regulations, governance systems, business practices, and cultural norms between two trading countries. Such alignment promotes a more compatible, predictable, and trustworthy environment, thereby reducing both adaptation and transaction costs.

First, FTAs primarily focus on removing tangible barriers such as tariffs and quotas. However, complex issues, hidden costs, and potential risks often arise from differences in business environments.[57] When two FTA member countries have similar institutional systems, they are more likely to share compatible legal frameworks, administrative procedures, business environments, and contract enforcement mechanisms.[58] According to de Groot et al. and Liu et al. , this compatibility allows traders from both countries to become familiar with each other's business

[57] Robert Z. Lawrence, *Regionalism, Multilateralism, and Deeper Integration (Integrating National Economies: Promise & Pitfalls)* (Washington, D. C.: The Brookings Institution, 1996); Henri L. F. de Groot et al., "The Institutional Determinants of Bilateral Trade Patterns," *Kyklos* 57, no. 1 (2004), https://doi.org/10.1111/j.0023-5962.2004.00245.x, https://onlinelibrary.wiley.com/doi/abs/10.1111/j.0023-5962.2004.00245.x; Henri L. F. de Groot, Gert-Jan M. Linders, and Piet Rietveld, "Institutions, Governance and International Trade," *IATSS Research* 29, no. 2 (2005), https://doi.org/10.1016/s0386-1112(14)60130-8.

[58] Gene M. Grossman, Phillip McCalman, and Robert W. Staiger, "The "New" Economics of Trade Agreements: From Trade Liberalization to Regulatory Convergence?," *Econometrica* 89, no. 1 (2021), https://doi.org/10.3982/ecta17536.

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environments.[59] It enhances predictability in trade relations,[60] builds mutual trust,[61] and reduces transaction costs.[62] As a result, the implementation of FTA commitments becomes more feasible both technically and administratively. This ease of implementation encourages firms to invest in meeting FTA standards to access preferential treatment. Such efforts are particularly important as they enable businesses to optimize export operations and engage more deeply in global supply chains,[63] thereby improving export efficiency.

Second, when an FTA is formed among countries with differing institutional qualities, the cost of adjustment tends to rise,[64] and the impact of the FTA varies across member states.[65]

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[59] Yang Chen et al., "Make friends, not money: How Chinese enterprises select transport infrastructure investment locations along the Belt and Road," *Transport Policy* 101 (2021), https://doi.org/10.1016/j.tranpol.2020.12.005; de Groot et al., "The Institutional Determinants of Bilateral Trade Patterns."; Ailan Liu, Cuicui Lu, and Zhixuan Wang, "The roles of cultural and institutional distance in international trade: Evidence from China's trade with the Belt and Road countries," *China Economic Review* 61 (2020), https://doi.org/10.1016/j.chieco.2018.10.001.

[60] de Groot et al., "The Institutional Determinants of Bilateral Trade Patterns," 103-23.

[61] de Groot et al., "The Institutional Determinants of Bilateral Trade Patterns," 103-23.

[62] Talles Girardi de Mendonça et al., "Institutions and Bilateral Agricultural Trade," *Procedia Economics and Finance* 14 (2014/01/01/ 2014), https://doi.org/10.1016/s2212-5671(14)00699-6, http://www.sciencedirect.com/science/article/pii/S2212567114006996.

[63] Kim, Steinbach, and Zurita, "Deep trade agreements and agri-food global value chain integration," 102686.

[64] Liu, Lu, and Wang, "The roles of cultural and institutional distance in international trade: Evidence from China's trade with the Belt and Road

Countries with stronger institutional frameworks often find it easier to comply with and implement FTA regulations.[66] This is one reason why Kim et al. shows that developed countries benefit the most from integration into global value chains.[67] In contrast, countries with weaker institutions often lack the capacity and infrastructure to fulfill commitments and manage FTAs effectively.[68] As Kawai and Wignaraja points out, these countries require financial and technical assistance to bridge development gaps, especially in areas such as customs modernization, SME development, governance reform, and capacity building.[69] These needs increase adjustment costs and reduce trade efficiency.

Third, an FTA can only be effective if it is implemented efficiently through coordination among member countries. According to Martínez-Zarzoso and Arregui Coka; Wang and

countries."; Leonardo Baccini, "Cheap talk: Transaction costs, quality of institutions, and trade agreements," *European Journal of International Relations* 20, no. 1 (2012), https://doi.org/10.1177/1354066112443272; Štefan Bojnec and Imre Fertő, "The institutional determinants of bilateral Agricultural and food trade," *Applied Studies in Agribusiness and Commerce* 3, no. 3-4 (2009), https://doi.org/10.19041/apstract/2009/3-4/12.

[65] Mattoo, Mulabdic, and Ruta, "Trade creation and trade diversion in deep agreements," 1598-637.

[66] Baccini, "Cheap talk: Transaction costs, quality of institutions, and trade agreements," 80-117.

[67] Kim, Steinbach, and Zurita, "Deep trade agreements and agri-food global value chain integration," 102686.

[68] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?," 100112.

[69] Kawai and Wignaraja, "Asian FTAs: Trends, prospects and challenges," 1-22.

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Wang, countries with institutional similarity tend to coordinate more easily in developing coherent implementation mechanisms.[70] When government agencies across member states share similar administrative mindsets and procedures, they can avoid inconsistencies in interpreting and applying FTA provisions. Moreover, institutional similarity enhances perceptions of partner reliability and predictability,[71] while also reducing the cost of cooperation.[72] This creates a foundation for more effective coordination and information sharing among regulatory authorities in FTA member states. Mutual recognition of technical inspections, harmonization of customs procedures, and trade data exchange help shorten processing times, reduce administrative costs, and improve the practical enforcement of FTAs.[73] Thus, institutional

[70] Inmaculada Martínez-Zarzoso and Daniela Arregui Coka, "Do trade agreements contribute to technology internationalization?," *The Journal of International Trade & Economic Development*, https://doi.org/10.1080/09638199.2025.2482549, https://doi.org/10.1080/09638199.2025.2482549; Y. Wang and J. Wang, "Institutional distance, trade agreements, and intellectual property trade networks: Evidence from cross-border data," *PLoS One* 20, no. 2 (2025), https://doi.org/10.1371/journal.pone.0309009, https://www.ncbi.nlm.nih.gov/pubmed/39899526.

[71] Asif Efrat and Abraham L. Newman, "Divulging data: Domestic determinants of international information sharing," *The Review of International Organizations* 13, no. 3 (2017), https://doi.org/10.1007/s11558-017-9284-1.

[72] Jiayue Xu et al., "Estimating the efficiency and potential of China's steel products export to countries along the "Belt and Road" under interconnection: An application of extended stochastic frontier gravity model," *Resources Policy* 75 (2022), https://doi.org/10.1016/j.resourpol.2021.102513.

[73] Wang and Wang, "Institutional distance, trade agreements, and intellectual property trade networks: Evidence from cross-border data."

similarity serves as a necessary condition for transforming FTA commitments into tangible outcomes in the market.

III. Methodology

A. Research model

The gravity model, initially introduced by Tinbergen (1962),[74] has become a standard analytical framework in international trade literature for assessing the impact of fundamental determinants such as economic size and transportation costs on bilateral trade flows. This model posits that the volume of trade between two countries is positively related to their respective GDPs and negatively related to the geographical distance between them. The basic structure of the gravity equation is expressed as follows:

$$lnExport_{ij,t} = \alpha + \beta_1 lnGDP_{i,t} + \beta_2 lnGDP_{j,t} + \beta_3 DIST_{ij} + \varepsilon_{ij,t} \quad (1)$$

In which: ln is lograthim, i is exporting country (Vietnam), j is importing country and t is year t.

[74] Jan Tinbergen, *Shaping the World Economy; Suggestions for an International Economic Policy, Books* (Jan Tinbergen), (Twentieth Century Fund, New York, 1962). hdl.handle.net/1765/16826.

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- $Export_{ij,t}$ is total export from country i to country j in year t (unit: million USD).
- $GDP_{i,t}$ and $GDP_{j,t}$ is gross domestic product of country i and country j in year t, respectively (unit: billion USD).
- $DIST_{ij}$: is the geographical distance between country i to country j (unit: km).

Over time, in response to structural changes in global trade and the rise of institutional economics, the basic model has been extended to incorporate additional explanatory variables such as population, institutional factors, colonial history, language, and bilateral or multilateral trade agreements.[75] The extended gravity specification can be expressed as:

$$lnExport_{ij,t} = \alpha + \beta_1 lnGDP_{i,t} + \beta_2 lnGDP_{j,t} + \beta_3 POP_{i,t} + \beta_4 POP_{j,t} + \beta_5 DIST_{ij} + \beta_6 Colony_{ij} + \varepsilon_{ij,t} \quad (2)$$

[75] Yulin Hou, Yun Wang, and Wenjun Xue, "What explains trade costs? Institutional quality and other determinants," *Review of Development Economics* 25, no. 1 (2020), https://doi.org/10.1111/rode.12722; Fatima Olanike Kareem and Inmaculada Martínez-Zarzoso, "Are EU standards detrimental to Africa's exports?," *Journal of Policy Modeling* 42, no. 5 (2020), https://doi.org/10.1016/j.jpolmod.2020.04.006.

In which: $POP_{i,t}$ and $POP_{j,t}$ is total population of country *i* and country *j* in year *t*, respectively (unit: people). $Colony_{ij}$ is dummy varible that equals 1 if country *i* was colonized by country *j*, and 0 otherwise.

$\varepsilon_{ij,t}$ is the error term.

However, the error term $(\varepsilon_{ij,t})$ is not merely composed of random disturbances $(v_{ij,t})$ but also includes trade inefficiency $(u_{ij,t})$, which reflects the gap between observed and potential export performance. Hence, the total error term is decomposed as:

$$\varepsilon_{ij,t} = v_{ij,t} - u_{ij,t}$$

Here, $v_{ij,t}$ represents symmetric statistical noise, assumed to follow a normal distribution $N(0, \sigma_v^2)$, while $u_{ij,t}$ denotes the non-negative inefficiency component, assumed to follow a half-normal distribution $N^+(\mu, \sigma_u^2)$, capturing unobserved barriers or institutional frictions in export performance. To account for this dual structure of the error term, the Stochastic Frontier Gravity Model (SFGM) is employed, following Armstrong (2007)[76]. The re-specified model is as follows:

[76] Shiro Patrick Armstrong, "Measuring Trade and Trade Potential: A Survey," *SSRN Electronic Journal* (2007), https://doi.org/10.2139/ssrn.1760426.

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$$lnExport_{ij,t} = \alpha + \beta_1 lnGDP_{i,t} + \beta_2 lnGDP_{j,t} + \beta_3 POP_{i,t} + \beta_4 POP_{j,t} + \beta_5 DIST_{ij} + \beta_6 Colony_{ij} + v_{ij,t} - u_{ij,t} \quad (3)$$

As follow theorical framework, the inefficiency component u_(ij,t) is further modeled as a linear function of country-specific institutional and economic variables:

Where,

$$u_{ij,t} = \delta_0 + \delta_1 INS_{i,t} + \delta_2 INS_{j,t} + \delta_3 EF_{j,t} + \delta_4 FTA_{ij,t-1} + \delta_5 \left(FTA_{ij,t-1} \times INS\_SIMI_{ij,t}\right)$$

In which:

- $INS_{i,t}\ and\ INS_{j,t}$ is the institutional quality of country i and country j in year t, respectively. This index is measured by factoc analysis approach through six dimensions of governance including Voice and Accountability; Political Stability and Absence of Violence/Terrorism; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption.
- $EF_{j,t}$ is economic freedom country j in year t.

- $FTA_{ij,t-1}$ is FTA that is signed and effected between country i to country j in year t-1.
- $INS\_SIMI_{ij,t}$ is the institutional similarity between country i to country j in year t.

This specification enables a refined decomposition of observed trade performance into its efficient and inefficient components, which aligns with the new institutional economics paradigm. It recognizes that institutional frictions, regulatory asymmetries, and lack of governance convergence may account for substantial underperformance in trade.

B. Estimation Strategy and Treatment of Fixed Effects

The use of the maximum likelihood estimation (MLE) technique within the stochastic frontier framework allows simultaneous estimation of both technical efficiency and its determining factors. However, a well-documented limitation of standard SFGM is its inability to account for unobserved fixed effects, particularly time-invariant bilateral trade costs such as historical ties, geographic contiguity, and cultural affinity. To address this, the study incorporates the concept of multilateral resistance terms, as proposed by Anderson and van Wincoop

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(2003),[77] to capture omitted variable bias related to multilateral trade frictions. These are approximated using a first-order Taylor expansion:

$$MR_{TC_{ij}} = ln(TC_{ij}) - \frac{1}{N_m}\sum_{m=1}^{N_m} ln(TC_{i,m}) + \frac{1}{N_m}\frac{1}{N_{paj}}\sum_{m=1}^{N_m}\sum_{n=1}^{N_n} ln(TC_{m,n}) - \frac{1}{N_n}\sum_{n=1}^{N_n} ln(TC_{j,n}) \quad (4)$$

In which, trade costs are symmetric ($TC_{ij} = TC_{ji}$); P indicates multilateral resistance terms. *m* is trading partner of country *i*, and *n* is trading partner of country *j*. N is number of countries.

This approach allows for the adjustment of bilateral trade costs by incorporating global trade resistance effects, yielding an adjusted distance metric MR_DIST_{ij} that better reflects the true

[77] James E. Anderson and Eric van Wincoop, "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review* 93, no. 1 (2003), https://doi.org/10.1257/000282803321455214.

economic frictions. Accordingly, the final model is re-estimated as:

$$lnExport_{ij,t} = \alpha + \beta_1 lnGDP_{i,t} + \beta_2 lnGDP_{j,t} + \beta_3 POP_{i,t} + \beta_4 POP_{j,t} + \beta_5 MR\_DIST_{ij} + \beta_6 Colony_{ij} + v_{ij,t} - u_{ij,t} \quad (3)$$

With:

$$u_{ij,t} = \delta_0 + \delta_1 INS_{i,t} + \delta_2 INS_{j,t} + \delta_3 EF_{j,t} + \delta_4 FTA_{ij,t-1} + \delta_5 \left(FTA_{ij,t-1} \times INS\_SIMI_{ij,t}\right)$$

The application of the stochastic frontier gravity model with institutional variables and multilateral resistance terms provides a comprehensive and theoretically grounded approach for assessing Vietnam's export performance. The efficiency scores derived from this model allow for cross-country comparisons and benchmarking, offering concrete insights into the extent of unrealized trade potential. A low efficiency score implies the existence of institutional or policy-related frictions that hinder full trade realization, whereas higher scores signal more optimal trade configurations. The export efficiency is calculated as follows:

$$TE_{ij,t} = \frac{Export_{ij,t}}{Potential\_Export_{ij,t}} = \frac{\exp\left(x_{ij,t}\beta + v_{ij,t} - u_{ij,t}\right)}{\exp\left(x_{ij,t}\beta + v_{ij,t}\right)}$$

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$$= exp(-\hat{u}_{ij,t})$$
$$\in (0,1) \quad (3)$$

The export efficiency score ($TE_{ij,t}$) ranges from 0 (where actual exports fall significantly short of their potential level) to 1 (where actual export volume fully matches the potential export level).

Accordingly, the findings from this methodological framework hold important policy implications. If inefficiencies are found to stem primarily from institutional asymmetries or lack of regulatory convergence, policy responses could include governance reforms, alignment of trade-related regulations, or targeted renegotiations of trade agreements. Moreover, this framework offers a robust empirical foundation for strategic trade policy aimed at unlocking untapped export potential through institutional harmonization and regional integration.

C. Data collection

In this study, we use a panel dataset on Vietnam's exports to 82 partner countries during the period from 2002 to 2022. First, data on Vietnam's export values to each destination country are obtained from the World Integrated Trade Solution (WITS) database (https://wits.worldbank.org/). Next, information on gross domestic product (GDP) for both Vietnam and its trading partners

is retrieved from the official World Bank database (https://data.worldbank.org/). The geographical distance between Vietnam and each importing country is taken from the Centre d´ Etudes Prospectives et d'Informations Internationales (CEPII) (https://www.cepii.fr/). Indicators reflecting institutional quality are collected from the Worldwide Governance Indicators (WGI) published by the World Bank. Data on economic freedom is obtained from Fraser Institute (www.fraserinstitute.org). Finally, the information on FTA is collected from VCCI (https://trungtamwto.vn/).

IV. Empirical results

D. Unit root test

Before proceeding with regression analysis, we employed the Levin–Lin–Chu (LLC) panel unit root test to examine the stationarity of the variables used in the empirical model. The LLC test is particularly appropriate for balanced panel data and allows for homogeneous autoregressive roots across cross-sectional units. This approach helps us ensure that the data are stationary, which is essential to avoid spurious results and to maintain the reliability of the estimated coefficients in subsequent models.

Table 1 presents the LLC unit root test results for all variables. As shown, the adjusted t-statistics for each variable are strongly negative, and all associated p-values are below the 5%

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level of significance. These results indicate that the null hypothesis of a unit root is rejected for all variables at conventional levels of statistical significance. Thus, the data do not exhibit non-stationary behavior, and the panel series are suitable for regression analysis without the need for first differencing or transformation.

Table 1 presents the LLC unit root test results for all variables. As shown, the adjusted t-statistics for each variable are strongly negative, and all associated p-values are below the 5% level of significance. These results indicate that the null hypothesis of a unit root is rejected for all variables at conventional levels of statistical significance. Thus, the data do not exhibit non-stationary behavior, and the panel series are suitable for regression analysis without the need for first differencing or transformation.

Table 1: Levin–Lin–Chu Unit Root Test Results

Variable	Unadjusted t	Adjusted t*	p-value
$lnExport_{ij,t}$	-17.976	-14.350	0.000
$lnGDP_{i,t}$	-30.363	-28.559	0.000
$lnGDP_{j,t}$	-17.850	-12.106	0.000
$lnPOP_{i,t}$	-20.071	-20.508	0.000
$lnPOP_{j,t}$	-12.138	-11.840	0.000
$INS_{i,t}$	-27.529	-12.910	0.000
$INS_{j,t}$	-10.909	-2.040	0.021
$EF_{j,t}$	-15.958	-5.507	0.000
$FTA_{ij,t-1}$	-23.279	-6.481	0.000

Source: Authors' calculation

E. Determinants of export

The results of the stochastic frontier model are presented in Table 2. The estimation results for the core gravity equation highlight several statistically significant and theoretically consistent determinants of Vietnam's bilateral exports.

First, both the GDP of Vietnam ($\ln GDP_{i,t}$) and that of its trading partners ($\ln GDP_{j,t}$) exert a positive and highly significant influence on bilateral export flows, with coefficients of 0.873 and 0.782, respectively ($p < 0.01$). These results reinforce the foundational premise of the gravity model—larger economies trade more—and indicate that economic scale remains a primary driver of Vietnam's export performance.

Second, the population of the importing country ($\ln POP_{j,t}$) also contributes positively to export flows ($\beta = 0.144$, $p < 0.01$), suggesting that markets with larger consumer bases are more likely to import goods from Vietnam. Conversely, Vietnam's own population size ($\ln POP_{i,t}$) does not show a statistically significant effect ($\beta = 0.184$, $p = 0.925$), implying that the domestic demographic factor is not a constraint or key determinant in this context, possibly due to the outward-oriented nature of Vietnam's export strategy.

Third, in terms of trade cost, the coefficient on multilateral resistance-adjusted economic distance (MR_DIST_{ij}) is negative

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and highly significant ($\beta = -0.748$, $p < 0.01$), consistent with the theoretical expectation that greater distance (in economic terms) increases trade costs and reduces export flows. By using multilateral resistance terms, the model captures a more accurate representation of underlying trade frictions than traditional geographic distance alone.

In addition, the colonial tie variable ($Colony_{ij}$) is positive but statistically insignificant ($\beta = 0.070$, $p = 0.718$), suggesting that historical colonial relationships no longer exert a measurable influence on Vietnam's current export patterns. This result reflects the diminished role of legacy ties in an era characterized by institutional modernization and strategic diversification of trade partnerships.

Table 2: The empirical results of SFA model

Variable	β	SE	z	P>z
Total Export				
$lnGDP_{i,t}$	0.873	0.182	4.790	0.000
$lnGDP_{j,t}$	0.782	0.022	35.890	0.000
$lnPOP_{i,t}$	0.184	1.948	0.090	0.925
$lnPOP_{j,t}$	0.144	0.027	5.260	0.000
MR_DIST_{ij}	-0.748	0.031	-24.110	0.000
$Colony_{ij}$	0.070	0.195	0.360	0.718
Constant	-35.982	31.113	-1.160	0.247
Export inefficiency				
$INS_{j,t}$	-0.940	0.227	-4.140	0.000
$INS_{i,t}$	-0.205	0.126	-1.620	0.105
$EF_{j,t}$	-0.376	0.139	-2.700	0.007
$FTA_{ij,t-1}$	-1.878	0.452	-4.150	0.000
$FTA_{ij,t-1} \times INS\_SIMI_{ij,t}$	-1.121	0.482	-2.330	0.020
Constant	0.931	0.988	0.940	0.346
Vsigma				
Constant	-0.346	0.049	-7.060	0.000
Number of obs		1722		

Source: Authors' calculation

F. Determinants of export inefficiency

* *Export efficiency*

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Before analyzing factors impacts on Vietnam's export inefficiency, we illustrate export efficiency. Figure 1 shows that Vietnam's export efficiency followed a generally upward trajectory during the period 2002 to 2022, increasing from 0.780 in 2002 to 0.837 in 2022. In the early years, the efficiency index fluctuated moderately, with a slight decline observed between 2006 and 2010, which may reflect structural constraints and the adverse effects of the global financial crisis. From 2010 onward, export efficiency began to improve gradually, particularly after 2014, in parallel with Vietnam's broader participation in regional and global trade agreements. The notable acceleration from 2018 to 2022 corresponds to the implementation of new-generation FTAs such as the CPTPP and EVFTA, along with growing institutional reforms and trade facilitation measures. Although this trend is encouraging, the efficiency score remaining below unity indicates that Vietnam has not yet fully realized its export potential, underscoring the importance of sustained institutional improvements and more effective FTA implementation.

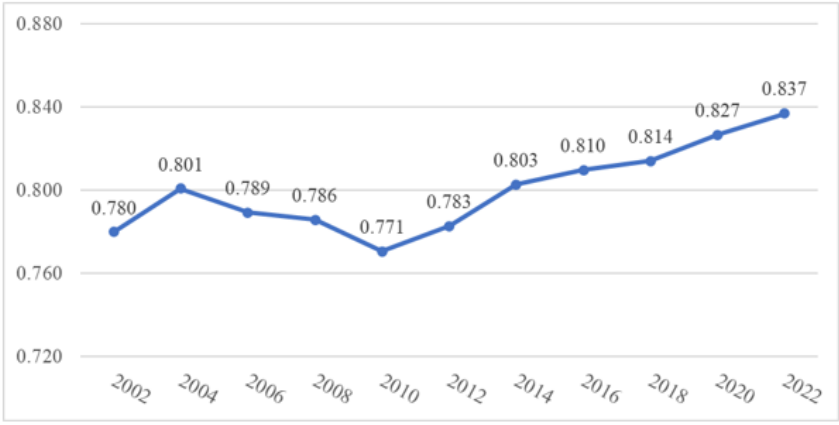

Figure 1: The export efficiency of Vietnam

Source: Authors' calculations

More specifically, Table 2 reveals a clear disparity in Vietnam's export efficiency between agricultural and non-agricultural products during the 2002–2022 period. Non-agricultural goods consistently demonstrate higher and more stable efficiency levels, ranging from 0.764 to 0.813, reflecting strong capacity to seize trade opportunities and integrate into global value chains. In contrast, agricultural exports exhibit significantly lower efficiency, fluctuating between 0.546 and 0.677, indicating substantial untapped potential likely constrained by limitations in quality standards, logistics, and processing capabilities. While non-agricultural sectors have evidently benefited from recent FTAs such as the CPTPP and EVFTA, the agricultural sector continues to struggle in converting potential into realized exports. These findings underscore the need for

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institutional reform, capacity-building, and technical support to bridge the efficiency gap in Vietnam's agricultural trade.

Table 3: Export efficiency of Vietnam across type of products

Year	Agricultural Materials			Non_Agricultural Materials		
	Actual Export (Billion USD)	Export efficiency	Potential export (Billion USD)	Actual Export (Billion USD)	Export efficiency	Potential export (Billion USD)
2002	3.842	0.583	6.586	7.437	0.774	9.610
2003	4.609	0.600	7.684	9.869	0.791	12.478
2004	5.452	0.597	9.136	12.821	0.790	16.236
2005	6.656	0.566	11.764	15.037	0.778	19.321
2006	8.428	0.576	14.639	19.050	0.776	24.543
2007	10.286	0.595	17.291	24.766	0.775	31.950
2008	12.833	0.589	21.802	31.810	0.764	41.630
2009	11.894	0.597	19.919	31.877	0.776	41.063
2010	14.936	0.546	27.338	44.064	0.770	57.261
2011	19.878	0.567	35.044	59.125	0.773	76.451
2012	20.928	0.559	37.470	74.719	0.778	96.009
2013	21.177	0.560	37.848	93.071	0.782	119.046
2014	23.301	0.590	39.510	108.366	0.791	137.012
2015	22.105	0.605	36.519	125.890	0.799	157.539
2016	24.424	0.625	39.092	140.489	0.800	175.658
2017	28.035	0.640	43.821	171.667	0.799	214.907
2018	29.243	0.642	45.537	196.733	0.796	247.138
2019	28.629	0.637	44.925	215.925	0.795	271.708
2020	28.360	0.659	43.055	235.491	0.801	294.080
2021	32.221	0.677	47.594	281.474	0.813	346.104
2022	36.415	0.676	53.905	308.556	0.810	380.755

Source: Authors' calculations

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**** The effects of various factors on the reduction of export inefficiency***

The second stage of the stochastic frontier gravity model provides insights into the factors contributing to Vietnam's export inefficiency, defined as the gap between actual and potential export performance. According to Table 4, the results emphasize the central role of institutional and policy-related variables in shaping trade efficiency.

The institutional quality of the importing country (INSj,t) exhibits a negative coefficient (-0.940) and is statistically significant at the 1% level ($p < 0.01$). This suggests that when Vietnam's trading partners possess stronger institutional environments—characterized by stable legal systems, transparent regulations, and good governance—the associated transaction costs are reduced, thereby narrowing the gap between actual and potential exports. This finding is consistent with transaction cost theory and aligns closely with empirical results from Obeng and Boadu,[78] who found that institutional factors were key to explaining export inefficiency reductions in Ghana. It also resonates with Yang and Martinez-Zarzoso and de Groot et al.,

[78] Obeng, Boadu, and Ewusie, "Deep preferential trade agreements and export efficiency in Ghana: Do institutions matter?."

who emphasized the importance of institutional compatibility for effective trade integration.[79]

However, the institutional quality in Vietnam (INSi,t) also has a negative coefficient (-0.205), but it is not statistically significant ($p = 0.105$). While the sign suggests that improved domestic institutions tend to reduce export inefficiency, the lack of statistical significance implies that institutional reforms in Vietnam may not yet have been broad-based or effective enough to fully impact export performance during the period under study.

In addition, the economic freedom of the importing country (EFj,t) is found to significantly reduce export inefficiency ($\beta = -0.376$, $p = 0.007$). This supports the view that Vietnam's exports are more efficient when directed toward open economies, where market access is more liberal, institutional constraints are lower, and policy environments are conducive to trade.

Importantly, participation in Free Trade Agreements (FTAij,t-1) is associated with a strong and statistically significant reduction in export inefficiency ($\beta = -1.878$, $p < 0.01$). This finding confirms the theoretical argument that FTAs act as institutional anchors that promote trade facilitation, reduce non-tariff barriers, and enhance competitiveness. These support

[79] de Groot et al., "The Institutional Determinants of Bilateral Trade Patterns."; Yang and Martinez-Zarzoso, "A panel data analysis of trade creation and trade diversion effects: The case of ASEAN–China Free Trade Area."

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the conclusions of Noviyani et al.[80] and Stack et al., who also found that FTAs improve export efficiency by easing structural bottlenecks and enhancing competitiveness. However, the effectiveness of FTAs is not uniform across all trading relationships.

This is further illustrated by the statistically significant and negative coefficient of the interaction term between FTA and institutional similarity (FTAij,t-1 X INS_SIMIij,t), which stands at -1.121 (p = 0.020). This result indicates that the efficiency gains from FTAs are magnified when member countries share similar institutional environments (eg. legal systems, regulatory quality, and administrative capacity). Accordingly, higher institutional compatibility lowers compliance costs, shortens processing times, and enhances the implementation of trade commitments.

[80] Noviyani, Na, and Irawan, "Indonesian Export Efficiency : A Stochastic Frontier Gravity Model Approach."; Stack, Pentecost, and Ravishankar, "A Stochastic Frontier Analysis of Trade Efficiency for the New EU Member States: Implications of Brexit."

Table 4: The empirical results of SFA model

Variable	β	SE	z	P>z
Total Export				
....	0.873	0.182	4.790	0.000
Export inefficiency				
$INS_{j,t}$	-0.940	0.227	-4.140	0.000
$INS_{i,t}$	-0.205	0.126	-1.620	0.105
$EF_{j,t}$	-0.376	0.139	-2.700	0.007
$FTA_{ij,t-1}$	-1.878	0.452	-4.150	0.000
$FTA_{ij,t-1} \times INS\_SIMI_{ij,t}$	-1.121	0.482	-2.330	0.020
Constant	0.931	0.988	0.940	0.346
Vsigma				
Constant	-0.346	0.049	-7.060	0.000
Number of obs		1722		

Source: Authors' calculation

According to Table 5, institutional quality of importing country significantly reduces export inefficiency in both sectors, yet its effect is slightly stronger for agricultural products ($\beta = -0.631$, $p < 0.01$) compared to non-agricultural products ($\beta = -0.586$, $p < 0.01$). This result suggests that agricultural exports are more sensitive to the institutional environment of the importing country, likely due to stricter regulatory standards and the perishable nature of agricultural goods, which demand higher transparency and reliability in customs, certification, and logistics.

Institutional quality of Vietnam significantly reduces export inefficiency in agricultural trade ($\beta = -0.242$, $p < 0.01$), while

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having no statistically significant effect in the non-agricultural sector ($\beta = -0.092$, $p > 0.1$). This contrast highlights the greater dependence of agricultural exports on domestic regulatory capacity, especially in areas such as food safety, traceability systems, and certification for international standards. In contrast, non-agricultural exporters may already possess stronger institutional resilience or benefit from more standardized processes less reliant on state facilitation.

The role of economic freedom differs sharply across sectors. It is statistically insignificant for agricultural exports ($\beta = -0.070$), but has a strong and significant effect in reducing inefficiency in the non-agricultural group ($\beta = -0.639$, $p < 0.01$). This finding suggests that manufactured or industrial products are more sensitive to liberal economic environments, where fewer regulatory distortions, greater protection of contracts, and investor-friendly conditions reduce trade costs and barriers to entry.

Table 5: The effects of factors on export inefficiency across products

Variable	Agricultural Materials	Non_Agricultural Materials
Export		
$\ln GDP_{i,t}$	1.851**	0.670**
	(0.225)	(0.190)
$\ln GDP_{j,t}$	0.496**	0.940**
	(0.025)	(0.022)
$\ln POP_{i,t}$	-14.258**	4.431*
	(2.356)	(2.034)
$\ln POP_{j,t}$	0.423**	0.012
	(0.033)	(0.028)
MR_DIST_{ij}	-0.647**	-0.745**
	(0.038)	(0.031)
$Colony_{ij}$	-0.211	0.175
	(0.219)	(0.200)
Constant	204.785**	-110.883**
	(37.498)	(32.456)
Export inefficiency		
$INS_{j,t}$	-0.631**	-0.586**
	(0.145)	(0.208)
$INS_{i,t}$	-0.242**	-0.092
	(0.090)	(0.113)
$EF_{j,t}$	-0.070	-0.639**
	(0.100)	(0.140)
$FTA_{ij,t-1}$	-0.679**	-2.268**
	(0.222)	(0.586)
$FTA_{ij,t-1} \times INS\_SIMI_{i,j,t}$	-0.516*	-1.442*
	(0.233)	(0.630)
Constant	0.407	3.122**
	(0.727)	(0.970)
Vsigma		
Constant	-0.353**	-0.314**
	(0.097)	(0.051)
Number of Obs	1713	1722

Source: Authors' calculations

Note: Standard errors in parentheses. * significant at the 0.05 level; ** significant at the 0.01 level.

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Importantly, FTAs consistently lower export inefficiency in both sectors, but the magnitude is far greater for non-agricultural products ($\beta = -2.268$, $p < 0.01$) than for agricultural goods ($\beta = -0.679$, $p < 0.01$). This indicates that non-agricultural sectors benefit more strongly and more immediately from preferential market access, possibly due to higher baseline trade volumes, participation in regional value chains, and greater responsiveness to tariff and non-tariff reductions. In addition, the interaction term (FTAij,t-1 X INS_SIMIij,t) is statistically significant in both groups. Specifically, the effect is much stronger for non-agricultural products ($\beta = -1.442$, $p < 0.05$) compared to agricultural products ($\beta = -0.516$, $p < 0.05$). This reinforces the argument that institutional compatibility amplifies the effectiveness of FTAs, particularly in complex, capital- and knowledge-intensive sectors where regulatory alignment is crucial for seamless market access, technical recognition, and administrative efficiency.

These differences highlight the need for product-specific export strategies. In agriculture, emphasis should be placed on institutional reform, food safety, and compliance systems, while for non-agricultural goods, the focus should be on leveraging FTAs, aligning regulatory frameworks, and targeting liberal economies with compatible institutions.

G. Policy implications

The empirical findings of this study yield several critical policy implications for enhancing Vietnam's export efficiency and optimizing the gains from international trade integration.

First, the consistently strong and positive impact of FTAs on export efficiency, particularly in non-agricultural sectors, underscores the importance of proactive and strategic FTA utilization. Policymakers should prioritize deepening engagement with high-standard FTAs by improving domestic enforcement mechanisms, simplifying rules of origin procedures, and supporting enterprises in navigating FTA-related compliance requirements. Special attention should be paid to technical training and institutional coordination to translate preferential market access into tangible export outcomes.

Second, the significant role of institutional similarity in amplifying the benefits of FTAs suggests that Vietnam should seek to strengthen institutional alignment with key trading partners. This may involve harmonizing regulatory standards, enhancing transparency in customs and border procedures, and participating in mutual recognition frameworks. For future trade negotiations, institutional convergence should be considered a strategic objective to ensure the practical enforceability of FTA provisions.

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Third, the results highlight the critical influence of the institutional quality of both Vietnam and its trade partners, particularly in agricultural trade. To narrow the export efficiency gap in this sector, Vietnam must invest in modernizing domestic institutions related to food safety, sanitary and phytosanitary (SPS) measures, and certification systems. This includes upgrading inspection infrastructure, digitalizing export documentation, and fostering inter-agency coordination to streamline processes.

Fourth, the uneven effect of economic freedom across sectors implies that export promotion policies should be tailored accordingly. While non-agricultural exports benefit from liberal, market-driven environments, agricultural exports require more targeted state support to overcome structural weaknesses. Accordingly, Vietnam should develop sector-specific export facilitation programs, combining regulatory reform with infrastructure development and SME capacity-building.

Finally, the long-term trend of improving but suboptimal export efficiency calls for a comprehensive national export strategy. This strategy should integrate trade policy, institutional development, and industrial upgrading. Efforts should be made to promote value-added production, diversify export markets, and enhance Vietnam's position within global value chains. By addressing inefficiency at both systemic and product-specific

levels, Vietnam can unlock its full export potential and foster resilient, sustainable trade growth.

V. Conclusion

This study investigates the determinants of Vietnam's export efficiency using a stochastic frontier gravity model augmented with institutional variables and multilateral resistance terms. By integrating both structural and institutional factors, the research provides a nuanced understanding of the drivers behind Vietnam's export performance over the period 2002 to 2022.

The empirical findings highlight the critical role of institutional factors. The institutional quality of Vietnam's trading partners and their degree of economic freedom are found to significantly reduce export inefficiency. FTAs also contribute positively, and their effectiveness is further enhanced when institutional similarity exists between Vietnam and its partners. Notably, the impact of these factors varies across product groups, indicating that non-agricultural exports benefit more strongly from institutional compatibility and policy liberalization.

These findings suggest that in order to unlock its full export potential, Vietnam must go beyond tariff-focused trade liberalization. Strategic emphasis should be placed on improving domestic institutional quality, harmonizing regulatory frameworks with key partners, and tailoring export promotion policies to the

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specific needs of different sectors. Additionally, the interaction between institutional compatibility and FTA implementation should be recognized as a key lever for enhancing trade efficiency.

Future research may expand on these results by employing firm-level data, considering digital trade readiness, or analyzing the dynamic evolution of institutional quality. Such directions would provide deeper insights into the pathways through which Vietnam can strengthen its position in the global trading system.

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