Applying ARDL to measure the effect of demand-side factors on Vietnam's exports in the context of Covid-19: A data mining approach

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Abstract

Purpose: The study aims to assess the impact of demand-side factors and trade openness policies of importing countries on Vietnam's goods exports in the context of the Covid-19 pandemic.

Design/methodology/approach: Applying the ARDL (Autoregressive Distributed Lag) model on monthly time series data from January 2011 to March 2023, the study examines the impact of GDP growth, tariff rates, market openness and market share of Vietnam's goods in 5 major partners (the United States, the EU, Japan, South Korea and China) on exports of key commodity groups such as phones, computers, textiles, wood and seafood.

Findings: The results show that Vietnam's exports are significantly affected by demand-side factors, especially GDP growth and market openness of importing countries. This impact varies across products and partners, and changes significantly during the Covid-19 period. The ARDL model also shows the existence of a long-term relationship between the variables.

Research limitations/implications: The study only focuses on demand-side factors; supply-side factors such as production capacity and logistics costs have not been included in the analysis.

Practical implications: The results help policy makers and exporting enterprises better understand the impact from foreign markets, thereby building more effective adaptation strategies in the context of global risks.

Originality/value: The study is one of the few that apply the ARDL model to assess the impact of demand-side factors on Vietnam's exports during the pandemic.

Keywords: *export, VietNam, Covid – 19, ARDL, openness, GDP*

1. Introduction

Vietnam has experienced a remarkable transformation in trade openness, with the trade-to-GDP ratio increasing from 19% in 1988 to 186% in 2021, significantly contributing to the country's economic growth (World Bank, 2022). This expansion in external trade was accompanied by robust economic performance, with GDP growth rates reaching 7.08% in 2018 and 7.4% in 2019—the highest among ASEAN countries at the time (Asian Development Bank [ADB], 2023).

However, the outbreak of the COVID-19 pandemic in 2020 brought severe disruptions to global economic activities and trade. Global GDP contracted by 4.4%, while international merchandise trade plummeted by 20% (United Nations Conference on Trade and Development [UNCTAD], 2021). Vietnam's key export markets—including the United States and the Eurozone—suffered sharp economic downturns, with GDP shrinking by 8.9% and over 12.4%, respectively, in the second quarter of 2020 (Bureau of Economic Analysis [BEA], 2021; Eurostat, 2022). As a result, external demand for Vietnamese exports declined, leading to a slowdown in export growth to 6.5%—the lowest level since the 2008 global financial crisis (General Statistics Office [GSO], 2021).

Notably, sectors such as agriculture, seafood, garments, and footwear experienced significant declines during 2020–2021, coinciding with the peak of the pandemic. Specifically, garment export revenue fell by 10% compared to 2019, while exports of seafood, coffee, and footwear declined by 9%, 2%, and 8%, respectively (Authors' calculations based on TradeMap data, 2023). Conversely, steel exports surged due to rising domestic demand in China, which temporarily eased global competition (Global Times, 2021).

The recovery of major economies—including the United States, the European Union, and China—since late 2021 (with Japan being an exception), along with the implementation of new-generation free trade agreements (FTAs) offering lower tariffs on Vietnamese exports, have provided a strong impetus for Vietnam's export resurgence (Organisation for Economic Co-operation and Development [OECD], 2023). This study aims to evaluate whether this recovery is sustainable in the post-pandemic context by examining the influence of demand-side factors.

The selection of five major export markets (the United States, the EU, China, Japan and South Korea) and five key product sectors (telephones, computers, textiles, wood and seafood) in the study was based on both the proportion of actual export turnover and the strategic role in Vietnam's trade structure.

According to data from TradeMap (2023), in the period 2011–2023, the United States has consistently been Vietnam's largest export market, accounting for about 25–30% of total merchandise exports; followed by the EU (15–17%), China (13–15%), Japan and South Korea (6–9%). These markets not only account for a large proportion but also represent many different economic models, from developed to developing economies, and are all clearly affected by policies responding to the Covid-19 pandemic. In addition, all five partners are members of important free trade agreements such as EVFTA, CPTPP, and RCEP, which help increase market openness and reduce trade barriers for Vietnamese goods.

The selection of five export products including steel (HS72), coffee (HS09), textiles (HS61–HS63), footwear (HS64), and seafood (HS03) in the study was based on the criteria that these

are traditional strengths of Vietnam, have large export value, and account for a high proportion of total export turnover for many consecutive years.

According to data from TradeMap (2023), in the period 2011–2023, these are five groups of products in the key export industry group, contributing significantly to the trade balance. Steel (HS72) is a sector with strong growth, especially in the 2020–2022 period due to increased regional demand and improved domestic production capacity. Coffee (HS09) is one of the key agricultural products, helping Vietnam maintain its position as the world's top 2 coffee exporter, mainly to the EU and Japan. Textiles (HS61–63) and footwear (HS64) are labor-intensive industries, highly competitive in major markets such as the US and EU, and often account for 10–15% of total export turnover. Aquaculture (HS03) is a group of processed agricultural products with stable turnover, with strengths in the markets of Japan, the US, South Korea and the EU.

The selection of these product groups helps reflect the diverse characteristics in Vietnam's export structure - from industrial products (steel, textiles, footwear) to agricultural and processed products (coffee, seafood). At the same time, these are also product groups that are clearly affected by fluctuations in global demand in the context of the Covid-19 pandemic, especially due to changes in consumption, logistics and supply chains.

2. Theoretical framework and Hypothesis

The Covid-19 pandemic has significantly influenced international trade, with varying degrees of impact across countries. Empirical studies using the ARDL model highlight this heterogeneity. Ugurlu & Jindřichovská (2022) Jindřichovská I & Uğurlu E (2021) pointed out that China flexibly adjusted its trade policy during the pandemic by shifting toward healthcare product exports. However, Chinese agricultural exports suffered a sharp decline due to the health protection policies of its trading partners (Ben-xi & Zhang, 2020; Zhao et al, 2021). Likewise, Orhan and Manga (2022) found that strict medical control measures in the EU and Turkey negatively affected exports: a 1% increase in lockdown stringency reduced exports by 0.102%, and a 1% rise in infection cases caused a 1.620% decline in export turnover. Countries with higher trade openness—measured by the trade-to-GDP ratio—are more vulnerable to pandemic-related disruptions (Bontempi & Coccia, 2021). Export, import, and GDP are the most vulnerable components during global crises (UNDP, 2011). According to Krugman et al. (2012), export performance is influenced by both demand- and supply-side factors. On the demand side, the economic growth rate of importing countries plays a key role. Labibah et al. (2021) demonstrated that lagged GDP growth in the U.S. and Japan significantly affected Indonesian exports. Feenstra & Kee (2008) and Santos-Paulino & Thirlwall (2004) highlighted that GDP growth in importing countries enhances demand for foreign goods, particularly in middle-income economies. On the contrary, the current study observes a statistically insignificant relationship between GDP growth and Vietnam’s export performance during Covid-19. This suggests the influence of temporary shifts in consumer behavior and policy responses during global health crises. Goldberg & Pavcnik (2007) and Subramanian & Wei (2007) provided strong evidence that lowering tariff rates boosts export volumes. Yet, this study found that average tariff changes had no significant effect on Vietnam’s exports during

Covid-19, aligning with findings from Hoekman & Nicita (2011) that emphasize the rising dominance of non-tariff measures. Dollar & Kraay (2004) and Helpman et al. (2008) argued that greater openness facilitates trade expansion and integration into global markets, especially in developing economies. Our results affirm this perspective, showing a robust and statistically significant link between market openness and Vietnam's export value. Taj & Wani (2019) and Fagerberg (1988) emphasized its importance in capturing export competitiveness. Chen et al. (2009) observed that countries maintaining higher market shares during crises recover more rapidly. The present study supports these findings, with market share emerging as the most influential variable in both short and long-term dynamics.

Finally, on the impact of Covid-19, Barbieri et al. (2020), Bonadio et al. (2020), and Beirne et al. (2021) noted the negative effects of lockdowns and logistics disruptions on global exports. Our results confirm that Covid-19 had a significant long-term negative effect on Vietnam's exports, especially in non-essential goods sectors.

Based on this theoretical foundation, the following hypotheses are proposed:

H1: The economic growth rate of importing countries positively affects Vietnam's exports. While prior studies (e.g., Labibah et al., 2021; Feenstra & Kee, 2008) affirm this relationship, our findings show insignificance during the pandemic, possibly due to shifts in demand priorities and consumption patterns.

H2: A higher level of market openness in importing countries leads to increased exports from Vietnam. Consistent with Dollar & Kraay (2004) and Helpman et al. (2008), the current study confirms that openness plays a robust role in promoting exports, even under external shocks like Covid-19.

H3: Tariff reductions in importing countries positively affect Vietnam's export performance. While conventional theory (e.g., Goldberg & Pavcnik, 2007) supports this, our results suggest tariff changes had limited influence, echoing Hoekman & Nicita's (2011) emphasis on non-tariff barriers during crises.

H4: Vietnam's export market share in importing countries is positively associated with its export value. Aligned with findings by Taj & Wani (2019) and Fagerberg (1988), this hypothesis is strongly supported, underscoring the strategic role of market share in trade resilience.

H5: The effects of demand-side factors on exports vary significantly across major trading partners and export commodities, especially during the Covid-19 pandemic. In line with Orhan & Manga (2022) and Barbieri et al. (2020), our study reflects differentiated impacts across sectors and markets, supporting the notion of heterogeneous trade responses to global disruptions.

3. Methodology and data

3.1. Methodology

This study applies the Autoregressive Distributed Lag (ARDL) model to investigate the impact of demand-side factors on Vietnam's export performance during the COVID-19 period. ARDL is a powerful tool for time series analysis that integrates both

autoregressive (AR) and distributed lag (DL) components, allowing researchers to explore dynamic relationships between variables over time. It is particularly effective in evaluating how past values influence current and future behavior, making it suitable for forecasting and structural analysis. The ARDL model is selected for this study due to its flexibility and suitability for analyzing macroeconomic time series data. One of its key advantages is its ability to incorporate variables with different levels of integration, specifically I(0) and I(1), provided that none are integrated of order two [I(2)], which is a common characteristic of macroeconomic datasets. In addition, the ARDL approach performs well with small to moderate sample sizes, making it particularly appropriate for this study, which utilizes data spanning from 2011 to 2023. Another strength of the ARDL framework is its capacity to estimate both short-run dynamics and long-run equilibrium relationships through the inclusion of an Error Correction Mechanism (ECM). Furthermore, the model helps mitigate concerns related to weak endogeneity that may arise when explanatory variables are not strictly exogenous.

Prior to estimating the model, the data undergo a comprehensive preprocessing phase using a data mining approach. This step is essential for ensuring the consistency and reliability of the dataset, particularly given the diversity of sources involved. Data are collected from multiple international institutions, which often differ in terms of format, units, and reporting frequency (e.g., monthly versus quarterly). To address these inconsistencies, several techniques are applied. GDP values originally reported in national currencies are converted to U.S. dollars using spot exchange rates to ensure comparability. Quarterly GDP data are smoothed and interpolated using a moving average method to produce consistent monthly series. Finally, all time series variables are transformed using the natural logarithm, which reduces heteroskedasticity and helps satisfy the assumptions required for valid ARDL estimation.The application of data mining allows for the effective integration of macroeconomic variables (e.g., GDP, tariffs, openness, Covid-19 data) and sector-specific trade data (e.g., exports by product and country), enabling a more granular analysis of Vietnam's export dynamics across different markets and timeframes. A detailed description of the data sources used in this study is provided in Section 3.2.

The general form of the ARDL model is presented as follows:

$$\Delta \ln(EX\_it) = \alpha_0 + \Sigma\, \beta\_j\, \Delta \ln(EX\_it{-}j) + \Sigma\, \gamma\_k\, \Delta \ln(Z\_it{-}k) + \varphi_1\, \ln(EX\_it{-}1) + \varphi_2\, \ln(Z\_it{-}1) + \varepsilon\_t$$

Where:

EX_it: Export value of product i to country t

Z_it: A set of independent variables, including GDP, tariff, openness, and market share

Δ: First difference operator

φ_1, φ_2: Long-run coefficients

For this study, the model is specified to include five demand-side variables and one pandemic-related variable, resulting in the following equation:

$$\ln(EX) = \beta_0 + \beta_1 * Growth\_t + \beta_2 * Tariff\_t + \beta_3 * MS\_t + \beta_4 * OP\_t + \beta_5 * CV\_t + u\_t$$

Where:

$\ln(EX)\backslash\ln(EX)\ln(EX)$: Natural log of total export value of five key commodities to five major trading partners

$Growth\_t$: Average quarterly GDP growth rate of the five partner countries

Tariff_t: Average applied tariff rates on Vietnam's selected products
MS_t: Vietnam's average market share in the five selected markets
OP_t: Trade openness of the importing countries ((Exports + Imports) / GDP)
CV_t: Monthly number of COVID-19 infection cases
u_t: Error term

3.2. Data

This study utilizes monthly secondary data from various international sources, covering the period from January 2011 to March 2023. The data encompass Vietnam's exports, macroeconomic indicators of its major trading partners, and pandemic-related variables, all of which are processed to align with the structure of the ARDL model. Export data for five key commodity groups—steel (HS72), coffee (HS09), textiles (HS61–HS63), footwear (HS64), and seafood (HS03)—to five major trading partners (the United States, European Union, China, Japan, and South Korea) are extracted from TradeMap, with disaggregation by HS codes and monthly frequency. Economic growth data are sourced from OECD iLibrary, using quarterly real GDP growth rates of the five partner countries. These are smoothed using the moving average method to obtain monthly estimates, ensuring consistency with the frequency of export data. Tariff data are collected from TAO/WTO, specifically the lowest applied rates on the five selected commodity groups exported from Vietnam. These rates are assumed to remain constant over the study period due to the lack of significant tariff adjustments during the Covid-19 crisis. Market share is computed based on Vietnam's share of each product group in the total imports of each partner country. The monthly market share reflects the competitiveness of Vietnamese goods in each destination market. Trade openness of partner countries is calculated as the ratio of (Exports + Imports) to GDP, with trade values extracted from TradeMap and GDP values (in national currency) from OECD. GDP values are converted into USD using spot exchange rates from the Federal Reserve Economic Data (FRED), followed by moving average smoothing for monthly compatibility.

The Covid-19 variable represents the monthly number of confirmed Covid-19 cases in each partner country, covering the period from January 2020 to March 2023. This dataset is obtained from Our World in Data.

4. Research Results and Hypothesis Testing

4.1. Research Results

Unit Root Test (ADF Test): The Augmented Dickey-Fuller (ADF) test was conducted to assess the stationarity of the time series variables. The results indicate that the Growth variable is stationary at level, I(0), at the 1% significance level. Other variables—including LnEx, Tariff, MS, and OP—are stationary at first difference, I(1). This confirms the suitability of the ARDL model, which allows for a combination of I(0) and I(1) variables.

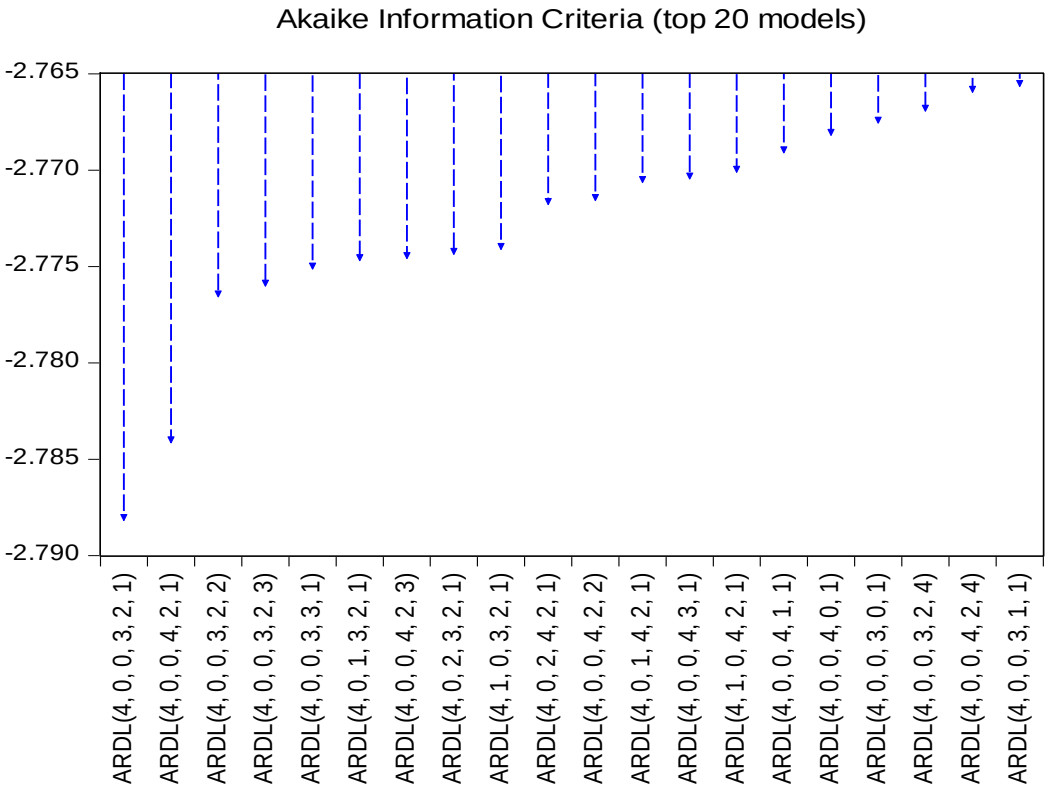
Table 1. Augmented Dickey – Fuller test

Variables	ADF value	P - value	t- value		
			1%	5%	10%
1. Variable value (constant)					
LnEx	-2.023608	0.2765	-3.475819	-2.881400	-2.577439
Growth	-6.346914	0.0000	-3.476805	-2.881830	-2.577668
Tariff	-1.345763	0.6072	-3.475500	-2.881260	-2.577365
MS	-1.800092	0.3793	-3.476805	-2.881830	-2.577668
OP	-1.916548	0.3240	-3.477144	-2.881978	-2.577747
CV	-5.511014	0.0000	-3.475500	-2.881260	-2.577365
2. First order difference (Constant)					
ΔLnEx	-19.09274	0.0000	-3.475819	-2.881400	-2.577439
ΔTariff	-11.96697	0.0000	-3.475819	-2.881400	-2.577439
ΔMS	-9.658139	0.0000	-3.476805	-2.881830	-2.577668
ΔOP	-4.222888	0.0009	-3.477487	-2.882127	-2.577827

Source: Authors' result from Eviews

Lag Length Selection: Using the Akaike Information Criterion (AIC), the optimal lags for the ARDL model were selected. The chosen model is ARDL(4,0,0,3,2,1), corresponding to lag lengths of 4 for LnEx, 0 for Growth and Tariff, 3 for MS, 2 for OP, and 1 for CV.

Figure 1. Lag selections



Source: Authors' result from Eviews

Bound Test for Cointegration: The Bound Test yielded an F-statistic of 15.25089, exceeding the upper critical bound at the 1% level. This confirms the presence of a long-run cointegration relationship among the variables, validating the estimation of both long-term and short-term dynamics.

Table 2. Bound test

F-Bounds Test		Null Hypothesis: No levels relations		
Test Statistic	Value	Sig	I	I
			Asymptotic: n=1000	
F-statistic	15.2508	10	2	
k	5	5	2	3
		2.5		3
		1	3	4

Source: Authors' result from Eviews

Long-Run Estimates

Table 3. Results of estimating ARDL (4,0,0,3,2,1) in the long run

Dependent variable: DLnEx

Case 2: Restricted Constant and No Trend

Variable	Coeffici	Std. Er	t-Stati	Prol
GROWTH	0.004	0.008	0.570	0.5
DTARIFF	0.019	0.013	1.447	0.1
DMS	11.44473	2.036	5.620	0.0
DOP	2.234415	0.446	4.999	0.0
CV	-7.48E-10	2.56E	-2.922	0.0
C	0.006	0.003	1.594	0.1

Notes: *** means 1% of significance level

Source: Authors' result from Eviews

The long-run coefficients indicate that market share (MS) has the most significant and positive impact on Vietnam's exports. A 1% increase in MS leads to an estimated 11.44% increase in export value, highlighting Vietnam's reliance on sustained market presence. Openness (OP) of importing countries also plays a significant role: a 1% increase in openness is associated with a 2.23% rise in exports. In contrast, Covid-19 infections (CV) have a significant negative impact, where a 1% increase in infection cases corresponds to a 7.48% decrease in export value. Both Growth and Tariff are statistically insignificant in the long run.

Short-Run Dynamics

Table 4. Estimation of short-term coefficients of ARDL model (4,0,0,3,2,1)

Dependent variable: DLnEx

Case 2: Restricted Constant and No Trend

Variable	Coeffici	Std. Er	t-Stati	Prol
D(DLNEX(-1))	0.29245	0.124	2.358	0.0
D(DLNEX(-2))	0.308282	0.095	3.214	0.0
D(DLNEX(-3))	0.212034	0.055	3.839	0.0
D(DMS)	8.926747	0.819	10.88	0.0
D(DMS(-1))	-5.354892	1.360	-3.937	0.0

D(DMS(-2))	-3.915490*	0.939	-4.168	0.0
D(DOP)	2.110584*	0.161	13.03	0.0
D(DOP(-1))	-0.639753*	0.207	-3.081	0.0
D(CV)	3.95E	4.11E	0.096	0.9
CointEq(-1)*	-1.552738*	0.146	-10.57	0.0

Note: ***; ** means the significance levels of 1%, 5%

Source: Authors' result from Eviews

Short-term estimates (see Table 4) suggest that past export values significantly influence current exports. Specifically, exports from the previous one, two, and three months positively affect current export levels, with coefficients of 0.29%, 0.31%, and 0.21%, respectively.

Market share has a positive contemporaneous effect (8.93%), but exhibits a rebound effect, as the lagged values for one and two months have significant negative impacts (–5.35% and –3.91%, respectively). This reflects possible short-term saturation or inventory accumulation in importing markets.

Openness shows a positive short-term impact (2.11%) in the current month but turns negative (–0.64%) after one month, suggesting short-term volatility or policy reversals. The Covid-19 variable is not statistically significant in the short term, indicating possible lag effects or adaptive responses.

The error correction term (CointEq(–1)) is –1.55 and significant at the 1% level, confirming a strong adjustment toward long-run equilibrium, with 155% of disequilibrium corrected within one period.

Model Diagnostics and Stability Tests

Table 5. Test results

Test	P-va	significant at
Jarque-Bera	0,840	The remainder is normally distributed
BreuschGodfreyLM Test	0.1	The model has no autocorrelation
White	0.1	The model has no variable variance
Ramsay RESET	0.8	The specified model is correct

Source: *Source: Authors' result from Eviews*

The model passed all diagnostic checks:

Jarque-Bera Test (p = 0.84): residuals are normally distributed.

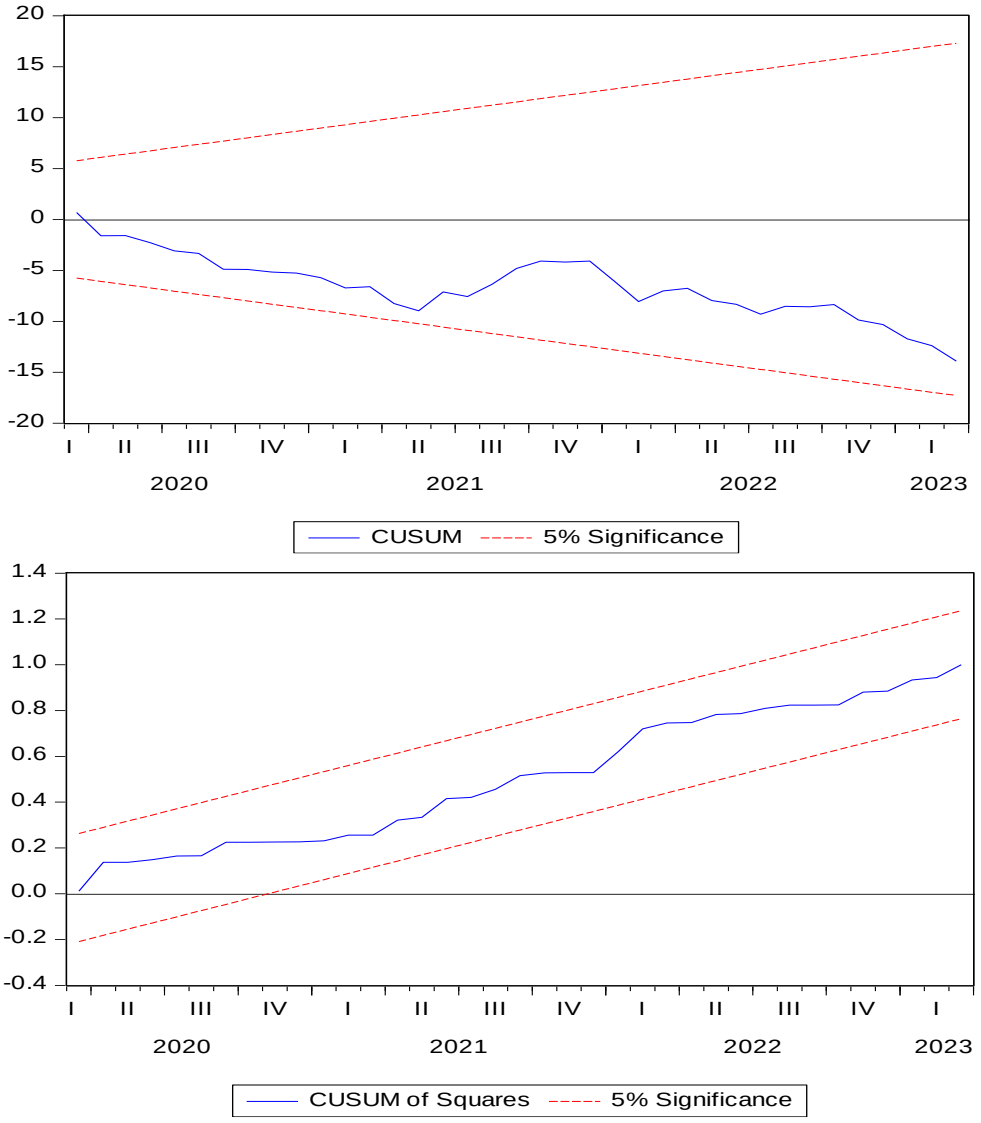
Breusch-Godfrey LM Test (p = 0.18): no autocorrelation.

White Test (p = 0.10): no heteroskedasticity.

Ramsey RESET (p = 0.81): model specification is appropriate.

CUSUM and CUSUMQ plots show parameter stability over time

Figure 2. The Cumulative Sum (CUSUM) of the remainder and the adjusted cumulative sum (CUSUMQ) of the remainder



Source: Authors' result from Eviews

The blue line is always within the red limit, showing that the model is stable at 5% significance level.

Detailed Interpretation of Key Variables

Market Share (MS): The most influential variable, with strong effects in both short and long term. Short-run fluctuations imply the need for businesses to monitor market saturation and adjust strategies accordingly. The results show that market share is the variable with the strongest impact on exports, with a coefficient of 11.44% in the long term. This demonstrates that the ability to maintain and expand the position of Vietnamese goods in major markets is decisive for export value, especially in the context of increasingly fierce international competition.

The short-term impact clearly shows fluctuations over time. Although current market share increases exports (8.93%), market share in the previous 1-2 months has a negative impact (decreased by 5.35% and 3.91%, respectively). This reflects the temporary

fluctuation or inventory effect when the market has consumed a large amount of goods in the previous period, leading to a decrease in imports in the following period.

The above analysis results show that businesses need to closely monitor market share fluctuations and import trends to flexibly adjust distribution, promotion and supply strategies according to each market and each period.

Openness (OP): Positive influence overall, but short-term reversals caution against over-reliance on immediate liberalization trends. In the long run, the coefficient of 2.23% shows that when partner economies become more open (increase in trade/GDP ratio), exports from Vietnam increase significantly. This reflects the role of globalization and trade liberalization in promoting international goods flows.

In the current month, market openness has a strong positive impact (2.11%), but tends to reverse after one month (-0.64%). This suggests that sudden opening may be accompanied by risks of adjusting consumer behavior or subsequent control policies, such as re-imposing quarantine, import restriction policies, etc.

The government should maintain stability in trade policy and support businesses to quickly take advantage of opportunities from periods of strong market opening.

Covid-19 Impact (CV): Strong long-run negative effect underscores the vulnerability of exports to global health crises. In the long run, a 1% increase in the number of infections leads to a 7.48% decrease in export value, reflecting the sensitivity of export activities to global health shocks. This result confirms that the pandemic is not only a public health issue but also a serious economic risk.

The impact is not statistically significant in the short run, possibly due to the lag effect in the response of enterprises and supply chains to unexpected shocks.

Therefore, early warning mechanisms, supply chain stabilization funds, and contingency policies are needed to respond to similar shocks in the future.

Tariffs: Statistically insignificant, suggesting the rising influence of non-tariff barriers. The results show that tariffs have no significant impact in both the short and long term, which is contrary to conventional expectations. In the context of the pandemic, non-tariff barriers (such as transportation, inspection, market sentiment) may have overshadowed the role of tariffs. This also suggests that when exports are no longer strongly influenced by tariffs, support policies should shift to improving logistics capacity, simplifying customs procedures and increasing market transparency.

GDP Growth (Growth): Insignificant effect suggests a decoupling between general economic recovery and demand for Vietnamese exports, likely due to shifts in consumption patterns. Statistically insignificant in both periods, indicating that economic growth does not directly translate into increased imports from Vietnam during this special period. The reason may come from changes in consumption structure (prioritizing essential goods, healthcare, etc.) or the impact of social distancing measures. Exporting enterprises need to grasp post-pandemic consumption trends, not only relying on GDP growth but also needing to deeply analyze consumer demand and changes in customer behavior.

The overall impacts of the explanatory variables are summarized in Table 6.

Table 6 – Summary of Variable Impacts

Variable	Long-Run Impac	Short-Run Impac	Significance	Implication
Market Share (MS)	+11.44% ↑	+8.93% (current), – 5.35%, –3.91% (lag	***	Strategic focus on k markets
Openness (OP)	+2.23% ↑	+2.11% (current), – 0.64% (lagged)	***	Leverage FTAs, anticipate policy sh
Covid-19 Cases (CV	–7.48% ↓	Not significant	*** (long run)	Develop resilience policies
Tariff	Insignificant	Insignificant	n.s.	Focus on non-tariff tr barriers
GDP Growth	Insignificant	Insignificant	n.s.	Monitor consumptio trends

Source: Authors

4.2. Hypothesis esting

H1: The economic growth rate of importing countries positively affects Vietnam's exports.

The empirical results show that the GDP growth rate of the five major trading partners (the US, EU, Japan, South Korea, and China) does not have a statistically significant effect on Vietnam's export value in both the short and long term. This result is not consistent with studies such as Labibah et al. (2021), which found that GDP growth in the US and Japan had a significant influence on Indonesian exports. A possible explanation for the divergence may lie in the Covid-19 context, where domestic consumption in these countries was redirected toward essential goods and healthcare, reducing demand for imported products.

H2: A higher level of market openness in importing countries leads to increased exports from Vietnam.

The coefficient of market openness is positive and significant at the 1% level in both short- and long-term models. A 1% increase in openness leads to a 2.23% increase in Vietnam's exports in the long run. This is in line with Bontempi & Coccia (2021), who argued that openness influences trade exposure during global shocks. The finding highlights that trade liberalization remains a critical factor, especially for an export-led economy like Vietnam.

H3: Tariff reductions in importing countries positively affect Vietnam's export performance.

In both short- and long-term estimations, the tariff variable is statistically insignificant. That is, changes in the average tariff rates imposed on Vietnam's exports do not appear to affect export value during the Covid-19 period. This result diverges from the International Monetary Fund [IMF] (2019) conclusion that tariff reductions typically lead

to higher trade volumes. A plausible explanation could be that during the pandemic, non-tariff barriers and logistics disruptions played a more decisive role than traditional tariff rates.

H4: Vietnam's export market share in importing countries is positively associated with its export value.

The market share variable is highly significant and positive in both the short and long run. Specifically, a 1% increase in market share leads to an 11.44% rise in exports in the long run and an 8.93% rise in the short run. These results strongly support the theoretical reasoning of Taj & Wani (2019), who emphasized market focus and competitiveness as key drivers of export performance. Moreover, the study by Gaware et al (2020) pointed out that India's egg exports were positively influenced by both export prices and its market share in the global market. The finding underlines the importance of maintaining and expanding Vietnam's foothold in target markets.

H5: The effects of demand-side factors on exports vary significantly across major trading partners and export commodities, especially during the Covid-19 pandemic.

While openness and market share have strong positive impacts, GDP growth and tariff effects appear muted or statistically insignificant. Additionally, the Covid-19 variable has a negative and significant long-term effect, implying that pandemic intensity in partner countries reduces Vietnam's export performance. This result echoes findings by Ugurlu & Jindřichovská (2022) and Tang et al. (2022), who noted that Covid-related restrictions, even in countries with strong demand potential, undermined trade flows. It also reinforces the conclusion that Vietnam's export sensitivity varies with product categories and external shocks.

5. Conclusion and implication

This study uses ARDL model to study the impact of several demand factors from Vietnam's main export markets such as the US, EU, Japan, Korea, and China on the total exports of 5 commodity sectors from Vietnam, such as footwear, textiles, seafood, coffee, and steel. The research results show that in both short term and long term, Vietnam's exports depend slightly on Vietnam's market share in these markets, as well as on the openness of the economies of other countries, with a confidence level of 1%. In long term, the Covid - 19 factor has an impact on demand and thus reduces the value of Vietnam's exports. However, economic growth and import taxes have no impact on Vietnam's exports.

Based on the analysis and empirical results, some crucial implications should be proposed for the government and enterprises as follow:

+ For the government: It is necessary to diversify promotion policies on each key export product for specific markets, which enables businesses to expand their market share. The government should disseminate the FTA's commitments to enterprises to aware them the opportunities and challenges such as of tariff incentives, non-tariff measures and rules of origin etc., thus, they can exploit the advantages efficiently.

+ For enterprises: the empirical result indicates that the role of market share in key export markets has the strongest effect on enterprise performance in the five industries such as

steel, textiles, footwear, seafood, and coffee. Therefore, to increase market share, Vietnam enterprises need to pay more attention to the improvement of product quality, increase in product innovation. Moreover, it is very important for Vietnam enterprises to invest in product design to enhance both tangible and intangible value and guarantee Vietnam's brand in the world market, especially for products that mainly rely on processing such as garments and footwear. These solutions are to persuade the global client to consume more Vietnam's product For main farming export products such as seafood and coffee, the result plays as evidence for enterprises that they should have intensive innovation in production processes, improve traceability to improve consumer confidence and overcome non-tariff barriers such as quarantine, technical inspection and other non-tariff measures. Enterprises should also take advantage of incentives from free trade agreements, especially new generation agreements such as EVFTA, CPTPP. The degree of comprehension in these agreements will pay the way for Vietnam enterprises to take advantage of market expansion, consolidate their position in the foreign markets. Besides, the research has some limitations that are the opportunities for further related study in the future. First, the research focuses only on demand-side factors, which does not cover supply-side factors such as commodity prices, production costs, logistics costs, domestic production capacity, exchange rates. Moreover, some other social and regulatory factors may interfere in export of the five products when the economy encounters a shock such as Covid-19. Second, the data are collected from five industries and key markets, which do not present for the whole international market with diversified foreign partners possessing various distinctive features. Our following research will cover supply-side factors such as producer price index, logistics costs, exchange rates, etc. to have comprehensive assessment on Vietnam's export dynamics. In the future, applying this model to analyze detailed effects on each industry in each market will also be for further research direction, which is not only valuable in the context of the Covid-19 pandemic but also in supporting export recovery after Covid-19.

Declarations

Data availability: Data available from the author.
Conflict of interest: The authors declare no conflict of interest.

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