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Analysis the effect of globalization and uncertainty on trade openness in ASEAN: A panel quantile regression approach



Amber Khalil^{a,1,*}, Rifki Prasetya Abadi^{b,2}, Muhammad Safar Nasir^{b,3}

^a School of Economics and Finance, Xi'an Jiao Tong University, China

^b Department of Economic Development, Faculty of Economy and Business, Universitas Ahmad Dahlan, Indonesia

¹khalilamber@stu.xjtu.edu.cn*; ²rifkyabadi@gmail.com; ³safar.nasir@ep.uad.ac.id

* corresponding author

ARTICLE INFO

Received : 18-07-2025

Revised : 24-09-2025

Accepted : 29-09-2025

Published : 30-09-2025

Keywords:

Trade openness

Globalization

Uncertainty

JEL Classification:

F13; F15; F18

ABSTRACT

Trade openness is defined as a country's involvement in the global economy through international trade, foreign investment, and capital flows. High levels of trade openness enable countries to capitalize on the vast global market, access foreign technology and capital, and increase economic efficiency and competitiveness. This study focuses on the determinants of trade openness and the institutional environment. This is inseparable from the fact that ASEAN countries have more developing countries than developed countries, so that global shocks have an impact on the domestic economy. This study used a panel quantile regression. The findings show globalization has an effect at the quantile levels of 0.25, 0.50, and 0.75 and indicates that increasing globalization also increases trade openness. As globalization increases, socio-economic relations between countries also improve, such as expanding relations between countries for international cooperation and at the 0.90 quantile level, globalization has no effect on trade openness. This means that high levels of globalization do not affect trade openness. The panel quantile of 0.10, 0.25, 0.50, 0.75, and 0.90 indicates that economic uncertainty has no effect on trade openness means countries on economic recovery, the government still applies international trade restrictions to protect domestic entrepreneurs. The implication of the study for the policymakers that need to increase the globalization index to not only foreign trade occurs, but also technology transfer that can encourage high-quality and globally competitive domestic production, thereby supporting the trade-led growth hypothesis.

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1. Introduction

Trade openness is a key determinant of a country's achievement of higher economic growth (Tahir et al., 2018). Trade openness is defined as a country's involvement in the global economy through international trade, foreign investment, and capital flows. High levels of trade openness enable countries to capitalize on the vast global market, access foreign technology and capital, and increase economic efficiency and competitiveness. To achieve optimal economic growth, each country needs to increase its involvement in international trade through economic cooperation, both regionally and globally (Nguyen et al., 2021). Trade openness has become an increasingly relevant topic amidst the current global economic shift. In era interdependence between countries, trade openness is considered a key driver of economic growth, innovation, and improved public welfare (Ur Rehman et al., 2021). However, despite these benefits, trade openness also brings new challenges, such as instability in the face of global market shocks and pressure on domestic industries that are not yet sufficiently competitive (Saam, 2008). This situation makes trade openness not only about reducing cost barriers, but also related to a country's economic resilience and global competitiveness (Khan et al., 2023).

Trade openness has a strong relationship with economic growth (Tahir & Azid, 2015). Economic growth is defined as an increase in national income or per capita income over a specific period. Economic growth is an important indicator of a country's progress. Economic integration regions such as ASEAN play a crucial role by creating an environment that supports the free and mutually beneficial movement of goods, services, and resources between member countries (Tahir et al., 2019). Keho (2017) revealed that open international trade can encourage the flow of foreign investment into a country. Trade openness is a crucial element in global financial integration, allowing businesses to obtain capital to conduct trade internationally. Despite trade openness has significant effect on growth but study from Hausmann et al (2007) reveals trade openness may impact growth negatively for countries which specialize in production of low-quality products. The challenge is even greater for developing countries with low-specialization products and domestic economies that are vulnerable to global shocks.

Trade openness matter for developing countries as key drive for their economic transformation to access larger markets. Yu & Gu (2025) explained developing countries has a opportunity to scale up their production and specialize in industries where they have a comparative advantage. Tahir et al (2019) focusing on sectors that have advantages and a high level of product specialization, thereby ensuring global competitiveness. Despite access larger markets, trade openness encourage domestic firms to foreign competition and affecting more adequate technology transfer (Zhang & Mei, 2025). Langinier et al (2025) explains not only technology transfer but also promoting the use of green technology, but the challenges for developing countries are greater in terms of technology transfer and green technology itself. More expected from trade openness is that it will have a greater effect on employment, especially in countries with high unemployment rates, thereby boosting the economy through job creation. Alfalih (2024) found that diversification and strengthening of leading sectors are necessary to create employment through international trade.

This study focuses on the determinants of trade openness and the institutional environment. This is inseparable from the fact that ASEAN countries have more developing countries than developed countries, so that global shocks have an impact on the domestic economy. Yan & Piao (2025) found geopolitical risks significantly suppress trade openness, confirming the detrimental effects of geopolitical shocks on a country's degree of external economic liberalization. Liu & Fu (2024) found the geopolitical tensions may lead to rising tariff barriers. The findings indicate that global shocks play an important role in trade openness. The study focuses on the role of globalization and uncertainty in trade openness in ASEAN. To fill the gap, the study applies panel quantile regression to specifically analyze the role of globalization and uncertainty at the lowest to highest quantile levels, as the role of quantiles is important to avoid unilateral alignment at the ASEAN level and to focus on differences based on data rather than at the country level.

The study contributes to strengthening the literature on the link between globalization and trade openness, where globalization encompasses political, cultural, economic, and institutional roles that impact trade openness, which in turn affects domestic economic growth. Second, regarding the impact of uncertainty on trade openness in ASEAN, this is based on evidence from previous studies that uncertainty has an impact on the domestic economy. This study examines how the level of economic uncertainty affects trade openness, which can suppress the level of domestic trade relative to global trade, and third, by applying heterogeneous analysis to panel quantile regression, it explains that differences in globalization and uncertainty levels are based on data levels rather than country levels, thus showing detailed differences in results based on data levels compared to country levels. The findings bear important practical implications for ASEAN country to strengthen global trade through trade openness.

2. Literature Review

Research on trade openness has been extensively developed, and many studies have developed trade openness as an independent variable (Kurniawan et al., 2024; A'yun & Khasanah, 2022; Rathnayaka & Malsha, 2022; Kacaribu et al., 2021) which shows varying results and the important role of trade openness in the developed model. This study focuses on the determinants of trade openness and how globalization and uncertainty affect trade openness in ASEAN countries. According to Chen & Liu (2024) is a significant determinant that influences material consumption. The high degree of openness brought about by globalization has led to increased cross-border trade and consumption. The challenges of globalization today lead to the exploitation of natural resources,

excessive consumption, and a decline in the competitiveness of domestic products, which can cause a trade deficit.

Globalization is the process of growing interconnectedness across countries, involving flows of goods, services, capital, people, technology, and ideas. Moreover, globalization pressures countries to lower tariffs, reduce trade barriers, and harmonize regulations (Guo et al., 2023). A greater challenge for countries that produce goods that lack international competitiveness, which can lead to trade deficits through globalization. However, globalization drives new market diversification for exports and strengthen international trade policies to improve the competitiveness of domestic products internationally. Appiah et al (2022) reminding that globalization can hurt vital economic sectors like agriculture, farming, tourism, and fisheries and, in due course, altered trade openness. Weather changes also influence the trade structure through direct or indirect channels. The importance of applying globalization to trade openness models cannot be separated from Razin (2022) stated different income groups have varied attitudes towards globalization, depending on trade-related and macro-related fundamentals.

Kacou et al (2022) stated countries with a higher share of trade (higher openness) show gains in labor productivity. However, dependence on primary commodity exports limits such gains. However, in the past decade, high global uncertainty has impacted the domestic economy and, in particular, trade openness. A study on the impact of uncertainty has been extensively developed such on money demand (Kurniawan et al., 2022; Özdemir & Saygili, 2013); exchange rate (Salim & Soelistyo, 2024; Fracasso et al., 2022); green bond (Darsono et al., 2022; Nittayakamolphon et al., 2024), and not many apply it to trade openness models. Yan & Piao (2025) geopolitical risk at the national level undermines trade freedom through multiple transmission mechanisms. When global uncertainty rises, firms face higher risks and may delay exports, imports, and investment. Another transmission from policy uncertainty, uncertainty in domestic or international policy (trade wars, tariffs, sanctions) often triggers protectionist measures.

Baek et al (2024) stated uncertainty can directly affect the formulation of trade policies via heightened security expectations and strategic precaution mechanisms. Today's uncertainty is one part of global value chain. All countries faced uncertainty, there are some risks to trade openness such as delay on investment, slow technology transfer in exported products, which has an impact on the high trade deficit and the decline in domestic foreign exchange reserves. Uncertainty that adversely affects the domestic economy through trade openness must have strong institutions to withstand the negative impact. the importance of applying uncertainty to trade openness models to determine the impact of uncertainty variables in ASEAN countries, this is inseparable from the fact that ASEAN countries are vulnerable to global uncertainty, which can worsen domestic economic conditions.

3. Method

The data used in this study are secondary data regarding the trade openness index, globalization index, economic growth, economic uncertainty index, and percentage of foreign investment. The data comes from several sources, including: KOF Globalisation Index, World Bank, and World Uncertainty Index (WUI). This study uses panel data with the ASEAN region as the unit, cross section as many as seven countries in the ASEAN region, namely, Indonesia, Singapore, Cambodia, Philippines, Malaysia, Vietnam, and Thailand. While the unit time series from 2012 to 2023. The panel quantile regression method is a recent innovation in econometrics. The panel quantile regression method emerged from regression analysis, which has several advantages, such as the inability to clearly demonstrate individual impacts. To overcome this, panel quantile regression analysis can be used. This technique has several advantages, such as being more robust to outliers, depicting the entire conditional distribution of the dependent variable, and being invariant to monotonic transformations (Koenker & Hallock, 2001).

Estimation of the parameters in the quantile equation, the approach applied is different when using panel data compared to cross-sectional or time series data (Koenker & Hallock, 2001). This study used a fixed effect model for panel quantile regression analysis because the model is more flexible and we do not need to assume the absence of a relationship between the regression and individual effects (Bui et al., 2021). Moreover, the panel quantile regression has advantages in analysis based on the lowest to highest data levels without reducing the effect of cross-section (Guritno et al., 2025). In addition to globalization and uncertainty, the study also applied economic growth and FDI as control variables. The equation for panel data as follows:

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$$TO_{it} = \alpha_0 + \beta_1 GLB_{it} + \beta_2 UNC_{it} + \beta_3 EG_{it} + \beta_4 FDI_{it} + \varepsilon_{it} \quad (1)$$

Where TO is trade openness; GLB is the globalization index; UNC is world uncertainty index; EG is the economic growth; FDI is the foreign direct investment; α_0 is the constant; $\beta_1 - \beta_4$ is the coefficient of independent variables; ε is the error term; notation i is for cross-section and t is for time-series. The panel quantile regression written as follows:

$$Q_\tau(y_{it}|x_{it}, \alpha_{i0}(\tau)) = \alpha_{i0}(\tau) + x_{it}\beta_0(\tau) = X_{it}\theta_{i0}(\tau), \quad t = 1, \dots, T, i = 1, \dots, n \quad (2)$$

Where y_{it} is the dependent variable; x_{it} is a k dimensional vector of explanatory variable or independent variables; $\beta_0(\tau)$ is the common slope coefficient; $\alpha_{i0}(\tau)$ is the individual specific fixed effect parameter; $\theta_{i0}(\tau)$ as the epsilon for panel quantile regression. The parameters on the quantile index depend on $\tau \in (0, 1)$, and τ is fixed.

4. Results and Discussion

Table 1 shows trade openness has a minimum value of 33 and a maximum value of 369.2, adjusted according to the percentage of each country's GDP. This reflects that a higher trade openness score means easier, unhindered access to international trade, thereby increasing exports and imports. Furthermore, access to international markets can increase economic openness, attracting foreign investment, either through direct investment or technology transfer, which can strengthen the competitiveness of national industries. The average trade openness score in the study sample was 139.1, which is still far below the maximum score of 369.2. This indicates that the countries selected in this study have a relatively low level of trade openness. This is due to the protection of domestic industries, preventing exports and imports from interfering with domestic industries.

Table 1. Descriptive Statistics

Variable	Min	Max	Mean	Std. Dev	Obs
TO	33	369.2	139.1	89.4	84
GLB	55.8	83.7	69	9.1	84
UNC	0	0.7	0.2	0.1	84
EG	-9.5	9.7	4.4	3.3	84
FDI	-1	34.9	7.4	8.4	84

Source: data processed

Globalization has a average 69, which is not far from the maximum score of 83.7. This means that the countries selected in this study already have a fairly high level of globalization. This is due to each country's strong relationships with other countries, acceptance of cultural diversity, and adaptation to current developments. Therefore, with a high level of globalization, countries become increasingly integrated with the economic system, such as easier access to global markets, allowing investment and technology to flow easily into the country. This can create new innovations and increase production efficiency through specialization, which in turn accelerates economic growth. Table 1 shows economic uncertainty has a minimum value of 0 and a maximum value of 0.7, and a mean value of 0.2, which means the countries selected in this study have low economic uncertainty values, as seen from the mean value being smaller than the maximum value. This occurs when the country is stable, such as maintained inflation, a consistent exchange rate, and a well-directed fiscal policy. However, it is not completely free from disruptive risks such as dependence on certain commodities, geopolitical conflicts, and changes in government policy direction.

Table 2. Pairwise Correlation

	TO	GLB	UNC	EG	FDI
TO	1.000				
GLB	0.639	1.000			
UNC	-0.087	-0.123	1.000		
EG	-0.085	-0.221	-0.164	1.000	
FDI	0.841	0.360	0.059	-0.019	1.000

Source: data processed

Table 2 shows two variables have a strong and positive correlation with trade openness. These variables are globalization, with a correlation value of 0.63, and foreign investment, with a correlation

value of 0.84. Therefore, this pairwise correlation value can be used as a reference in forming a quantile regression panel, breaking down the values into quantile levels of 0.1, 0.25, 0.5, 0.75, and 0.9.

Table 3. Panel Quantile Regression

Variable	0.10	0.25	0.50	0.75	0.90
GLB	3.91 (1.51)	3.82 (2.19)*	3.75 (2.82)**	3.63 (2.00)*	3.54 (1.30)
UNC	6.38 (0.36)	3.95 (0.33)	1.84 (0.20)	-1.58 (-0.13)	-4.18 (-0.23)
EG	1.53 (1.47)	1.35 (1.94)*	1.19 (2.26)*	0.95 (1.31)	0.76 (0.70)
FDI	0.85 (0.35)	-0.25 (-0.16)	-1.20 (-0.98)	-2.75 (-1.67)*	-3.93 (-1.67)*
Obs	77	77	77	77	77

Source: data processed

Table 3 shows globalization has an effect at the quantile levels of 0.25, 0.50, and 0.75. This indicates that increasing globalization also increases trade openness. As globalization increases, socio-economic relations between countries also improve, such as expanding relations between countries for international cooperation. [Dix-Carneiro et al \(2023\)](#) stated that globalization can increase interconnectedness between countries worldwide in accessing global markets. Furthermore, increasing globalization accompanied by easy access to global markets will facilitate international trade through exports and imports, thus increasing trade openness through international trade. [Guo et al \(2023\)](#) stated that the economic benefit of globalization is that it can increase a country's economic openness, thereby increasing international trade. However, at the 0.90 quantile level, globalization has no effect on trade openness. This means that high levels of globalization do not affect trade openness. This is because broad access to global markets has led entrepreneurs to focus too much on international trade, while domestic markets are unable to meet their needs, leading the government to implement protectionist policies. [Rodrik \(1998\)](#) argues that international trade has a negative impact on domestic market development, requiring the implementation of protectionist policies to regulate tariffs and subsidize exports and imports to balance international and domestic trade. Furthermore, [Onyia \(2020\)](#) also explain in their research that the negative impact of increasing globalization can weaken domestic industries due to unequal competition with multinational companies.

The panel quantile of 0.10, 0.25, 0.50, 0.75, and 0.90 indicates that economic uncertainty has no effect on trade openness. This finding, contradict with the previous studies and means that low or high levels of economic uncertainty cannot affect trade openness. [Behera & Rath \(2024\)](#) stated in their study that WTO member countries are bound by international agreements that restrict them from raising tariffs or imposing trade barriers unilaterally. For example, countries that have committed to trade openness often maintain open policies despite facing economic pressures, so that trade openness remains stable despite economic shocks such as during the COVID-19 pandemic and geopolitical tensions. Although economic uncertainty is low, it is still not optimal for increasing trade openness. [Bown & Crowley \(2013\)](#) states countries undergoing economic recovery, despite having good economic stability, the government still applies international trade restrictions to protect domestic entrepreneurs.

Table 3 shows at quantile values of 0.90 and 0.75, economic growth has no effect on trade openness, meaning that higher levels of economic growth will have no effect on trade openness. This is because the government is strengthening protectionist policies to protect domestic industries, especially if that growth is not driven by global trade, but rather by domestic sectors such as increased consumption and infrastructure. This is in line with [Keho \(2017\)](#) states that countries experiencing rapid economic growth must continue to impose tariff barriers to protect domestic industries. The implementation of this policy will cause exports and imports to stagnate, thus preventing trade openness from increasing. [Gunnella & Quaglietti \(2019\)](#) argued that increasing economic growth cannot increase trade openness if the volume of exports and imports cannot increase, because exports, imports, and economic growth are a unit that is an indicator of trade openness. However, at quantile values of 0.25 and 0.50, economic growth can influence trade openness, indicating that moderate economic growth can increase trade openness. This is motivated by governments opening themselves to international trade to accelerate economic growth by seeking markets to increase exports and attract

foreign investment. Thus, international trade becomes an important instrument for a country with limited domestic markets. Pertiwi et al (2020) states that countries with less than high economic growth rates will implement open trade policies to maximize growth.

Table 3 shows the foreign investment variable had no effect on trade openness at any data structure level, including 0.10, 0.25, 0.50, 0.75, and 0.90. This means that foreign investment inflows do not affect trade openness. This is because some foreign investment, even at high levels, is market-seeking, meaning investors enter a country to access the domestic market rather than to produce export goods. Foreign investment is not entirely export- and import-oriented; many countries with high levels of foreign investment are more focused on domestic sectors such as services or the public sector. Alfaro et al (2004) argued foreign investment plays a greater role in increasing production capacity or infrastructure development. This means that foreign investment cannot encourage trade openness, but it can directly drive economic growth. Meanwhile, Dumo et al (2023) states that foreign investment funds are used to increase economic capacity and increase income through capital creation or other types of capital that increase production capacity. However, the decline in foreign investment over the past five years led to reduce capital for domestic production and complicate technology transfer. Consequently, export and import activities cannot increase, resulting in a decline in trade openness. The report from OECD (2024) shows that the post-pandemic decline in FDI has slowed the involvement of developing countries in global value chains, impacting exports and imports in the industrial sector

5. Conclusion

Trade openness is defined as a country's involvement in the global economy through international trade, foreign investment, and capital flows. High levels of trade openness enable countries to capitalize on the vast global market, access foreign technology and capital, and increase economic efficiency and competitiveness. The challenge is greater for developing countries with low-specialization products and domestic economies that are vulnerable to global shocks. This study focuses on the determinants of trade openness and the institutional environment. This is inseparable from the fact that ASEAN countries have more developing countries than developed countries, so that global shocks have an impact on the domestic economy. This study used a panel quantile regression and has several advantages such as more robust to outliers, depicting the entire conditional distribution of the dependent variable, and being invariant to monotonic transformations.

The findings show globalization has an effect at the quantile levels of 0.25, 0.50, and 0.75 and indicates that increasing globalization also increases trade openness. As globalization increases, socio-economic relations between countries also improve, such as expanding relations between countries for international cooperation and at the 0.90 quantile level, globalization has no effect on trade openness. This means that high levels of globalization do not affect trade openness. The panel quantile of 0.10, 0.25, 0.50, 0.75, and 0.90 indicates that economic uncertainty has no effect on trade openness means countries on economic recovery, the government still applies international trade restrictions to protect domestic entrepreneurs. The implication of the study for the policymakers that need to increase the globalization index to not only foreign trade occurs, but also technology transfer that can encourage high-quality and globally competitive domestic production, thereby supporting the trade-led growth hypothesis.

Acknowledgment

The authors would like to express their sincere appreciation to all individuals and institutions that contributed to the realization of this research. Special thanks are extended to the UAD and School of Economics and Finance, Xi'an Jiao Tong University for the collaboration.

Declarations

Author contribution	:	All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.
Funding statement	:	This research did not receive funding from any other party or funding agency
Conflict of interest	:	The authors declare no conflict of interest.
Additional information	:	No additional information is available for this paper.

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