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The role of logistics performance and decreasing of trade competitiveness in ASEAN+3's manufacturing products

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A B S T R A C T

ASEAN Countries members plus Japan, South Korea, and China (ASEAN+3'S) logistics performance play a significant role in maintaining and improving their export and import values, depending on the various commodities trade. Meanwhile, during uncertain situations today, the stakeholders need to enhance the capability of import and export activities to improve logistics performance. The study focused on the competitiveness of the manufacturing products traded by these countries. The study used panel data analysis based on the panel data of 11 years (2008-2018) from the 10 ASEAN+3 countries. Export value and Net Comparative Advantage (NCA) index (including net export and trade openness) were used as dependent variables in the two model studies, and logistics performance was the primary variable. The result shows that logistics performance positively affects the export and trade competitiveness models of ASEAN+3's manufacturing products. The Logistics Performance Index (LPI) provides estimates that suggest that logistics performance has a significant impact on ASEAN + 3 export value (ExpM) and manufacturing trade competitiveness (NCAM). Meanwhile, there are different results of the effects of macroeconomic variables between the model of export value (ExpM) and the NCAM in the manufacturing in ASEAN+3's. The ExpM model follows the theory that Gross Domestic Product (GDP) and Foreign Direct Investment (FDI) increase the competitive value in ASEAN+3 countries. Meanwhile, in the NCAM model, GDP and FDI reduce trade competitiveness because of the high value of ASEAN+3 manufacturing imports.

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1. Introduction

International trade has made it possible for countries to offer more economic advantages. Export and import activities are important indicators measuring a country's trade competitiveness. A country's success in increasing exports reflects more substantial competitiveness, but it also indicates the growth of positive dynamics in the country's business climate. In addition, export is also an essential key to opening the door to a much bigger global market. The levels of satisfaction and sustainability depend on exporting high value-added products and increasing the diversity of products and markets (Erkan, 2014; Bashiri, Tjahjono, Lazell, Ferreira, & Perdana, 2021). Another key factor to economic growth acceleration is economic integration, which, in today's international trade, is the main element in connecting economic links among countries (Krapohl, 2017). Economic integration is a concept that can give considerable economic benefits to member countries in performing their international trade practices. Such an advantage has motivated many countries to pursue economic integration. AFTA (ASEAN Free Trade Area) is an example of such an economic integration. AFTA is an organization conducting cooperation to improve its economic welfare, including what is done by ASEAN countries. According to the data, ASEAN countries' total export values between 2013 and 2018 boasted of USD 205 billion, from USD 1.259 billion to USD 1.464 billion

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(UNCTAD, 2020). China, Japan, and South Korea, ASEAN's key trade partners, signed a trade and industrial agreement known as ASEAN+3. In 2018, the proportion of ASEAN+3 countries' trade was dominated by manufacturing products. The good-old-day trade of basic materials for agricultural products has been significantly abandoned, as marked by a shift to trade in processed food and manufacturing products that promise better-added values and can improve the countries' national economic growth and competitiveness (UNCTAD, 2020). Although it has quite a high potential, however, the export and import processes face various disruptions, such as logistics performance on international trade, global competitiveness, distribution, transportations, and global logistics networks, infrastructure, international trade policy, foreign investment climate, and global institutional challenges (Gani, 2017; Di Cosco, 2018; Puertas, Martí, & García, 2014; Erkan, 2014; D'Aleo & Sergi, 2017; D'Aleo & Sergi, 2017; Korinek & Sourdin, 2011). Moreover, climate change, the outbreak, and geopolitical situations (war and conflict) bring unexpected situations that lead to economic, social, and environmental crises (Achmad, Chaerani, & Perdana, 2021; Bashiri, Tjahjono, Lazell, Ferreira, & Perdana, 2021). Today's challenges have substantially impacted the individual industry and entire economic sectors, raising whether a paradigm shift is necessary to develop a new strategy to strengthen environmental, social, and economic sustainability (Bashiri, Tjahjono, Lazell, Ferreira, & Perdana, 2021). The challenges bring a profound uncertainty that forces the international trade sectors to consider their activities more carefully and consider a new strategy as mitigation or preventive action (Settembre-Blundo, González-Sánchez, Medina-Salgado, & García-Muiña, 2021; Laguir, Bose, Stekelorum, & Laguir, 2022). The increasing complexity of international trade has eventually increased the importance of logistics in market intervention and goods distribution, which require the involvement of both government and private institutions. Logistics as a part of the supply chain process that plans, implements, and controls the efficient, adequate flow and storage of goods, services, and information from the point of origin to the point of consumption (De Souza, Goh, Gupta, & Lei, 2007). Logistics is a complex sequence of coordinated activities whose entire performance relies heavily on the government interventions such as building infrastructure, developing regulations for transport services, and designing and implementing efficient customs clearance procedures (Ekici, Kabak, & Ülengin, 2016; Achmad, Chaerani, & Perdana, 2021; Sanjaya & Perdana, 2015).

As the backbone of international trade, logistics encompasses the movement of goods, warehousing, border clearance, payment system, and other functions that private service providers and goods owners perform. The international trade practices must comply with the prevailing government regulations and policies and are subject to regional and international trade agreements (Arvis, Mustra, Ojala, Shepherd, & Saslavsky, 2012). Thus, countries must develop and integrate logistics system into their trade policy. This is understood and shown more clearly by countries capable of taking the lead in the competition by making some adjustments to their comprehensive logistics system (Erkan, 2014). Until the early 2000s, the limited data available made research on logistics more difficult (Martí. 2014). The initiative introduced by the World Bank in the past decade to collect the LPI (Logistics Performance Index) score and rank data from most of the world's countries has enabled us to gain a substantial understanding of a country's logistics sector achievements. ASEAN+3's logistics performance improvement contributes to the increase in their foreign trade volumes. According to Arvis et al. (2016), the average logistics performance of Asian countries from 2007 to 2016 was more significant than that of the world. Several empirical studies on the correlation between logistics performance improvement and increased international trade volumes found that logistics performance correlates positively with export competitiveness. In other words, better logistics performance ensures higher export values, more total market shares, and better competitiveness (Di Cosco, 2018; Korinek & Sourdin, 2011; Luttermann, Kotzab, & Halaszovich, 2017). Conversely, as has been the case in several developing countries, poor logistics quality and performance pose an obstacle to international trade. The finding was supported by (Barbero & Lucio, 2013) and (Puertas, Martí, & García, 2014), who assert that logistics infrastructure is a crucial factor determining export competitiveness among developing countries. The above empirical studies analyzed the role of logistics in improving export competitiveness among countries, including European and South American countries.

In previous studies, a country's trade competitiveness was generally viewed based on its export value, which focused on a particular commodity or the total export. Such an approach has a limitation in that it fails to consider the dynamics of imports or trade flows. Export values are a proxy of a country's export competitiveness. To measure trade competitiveness, we used the export value and Net Comparative Advantage (NCA) index, which combines the measurement of relative net export and a country's relative trade openness for manufacturing products, which have characteristics. Some macroeconomic variables and variables contributing to the productivity of manufacturing products were used as control variables in the trade competitiveness model used in our study. The general aimed to analyze and compare the impacts of logistics performance on exports and Net Comparative Advantage (NCA) concerning ASEAN+3's manufacturing commodities. No similar study has been conducted in the context of ASEAN+3. The study offers an original contribution to the scope of trade competitiveness and its relation to logistics performance. This article consists of five parts: introduction, literature review, research methodology, findings, and conclusion.

2. Literature Review

2.1. Trade Competitiveness

Currently, there is no single and uniform approach to construe national competitiveness as a concept in economics (Colo, 1995; Porter, Sachs, & Warner, 2000). The concept of competitiveness may refer to different levels of aggregation:

international, national, regional, local, sectoral, industry, and individual businesses, which all can be described as objects of competitiveness. A macro-level approach to competitiveness usually refers to international trade and a nation's comparative competitiveness concerning the production of certain commodities as subjects of foreign trade. A countries or an industry's export competitiveness can be analyzed and measured using various methods and indicators. For example, revealed Comparative Advantage (RCA) is an index developed by Balassa in 1989. RCA compares the share of a good in a country's total exports with the same share in the world exports. The proportion of goods in the total export with the proportion of the same in the whole world's export (Gnidchenko & Salnikov, 2015). Balassa index is one of the most common comparative advantage indices based on trade flow data. Other indices use different indicators that also exploit the notion of comparative advantages.

The trade competitiveness was measured using a comparative index that simultaneously considers export and import data or Net Comparative Advantage (NCA) and imports data, which outperforms the Ballasa index and Kunimoto. NCA index is an aggregate measurement of a country's net relative export and trade openness for a particularcommodity group (Gnidchenko & Salnikov, 2015). A country's trade competitiveness is determined by exchange rates, relative prices, labor costs, GDP deflators, inflation, consumers' price index, and market structure (Durand & Giorno, 1987), which are conventional variables affecting trade competitiveness. Country trade competitiveness also included capital flow, population, and infrastructure as additional variables of trade competitiveness (Engman, 2005; Ho, 2013). As reported in several empirical studies, exchange rates affect trade (Gani, 2017; Durand & Giorno, 1987; Masmoudi & Charfi, 2013; Ofei, 2016; Hchaichi & Ghodbane, 2014; Bostan, Toderașcu, & Firtescu, 2018), in other words, the more a currency is appreciated against that of another, the lower trade values decrease. However, a stable and robust correlation between exchange rates and trade correlates with a currency (Hye, Iram, & Hye, 2009). Instead of supporting previous findings on the negative effect of currency volatility on trade volumes in developing countries, they found a positive correlation between exchange rates and trade (Lotfi & Karim, 2016). Furthermore, an important factor affecting trade competitiveness is relative prices (Durand & Giorno, 1987; Ho, 2013; Mwakanemela, 2014). An increase in the inflation rate can cause export goods production costs to increase and export volume to decrease. Another factor that affects a country's trade competitiveness and macro-economic stability is Gross Domestic Product (GDP). GDP's effect on trade competitiveness has been confirmed that the higher a country's GDP, the bigger the chance to increase its trade competitiveness (Durand & Giorno, 1987; Ho, 2013; Gani, 2017). GDP was used as a control variable to analyze the effects of logistics and trade facilities on export competitiveness (Puertas, Martí, & García, 2014; D'Aleo & Sergi, 2017; Gani, 2017).

Besides being affected by factors that are part of macro-economic stability variables, trade competitiveness is also affected by labor productivity and Foreign Direct Investment (FDI) and correlates positively to trade competitiveness (Masmoudi & Charfi, 2013; Olczyk & Kordalska, 2017; Kharlamova & Vertelieva, 2013; Hchaichi & Ghodbane, 2014; Luttermann, Kotzab, & Halaszovich, 2017). Interestingly, FDI in developed countries has yet to contribute positively to export competitiveness (Muratoğlu & Muratoğlu, 2016). Another factor contributing to trade competitiveness is innovation through research and development (R&D). When directed toward innovations and new products, research and development can boost export market acquisition and strengthen R&D (Bogliacino & Pianta, 2013; Guarascio, Pianta, Lucchese, & Bogliacino, 2015; Zhang, Li, Hitt, & Cui, 2007).

2.2. Logistics Performance Index

The role of logistics performance in improving trade competitiveness is the central theme of this study. Logistics Performance Index (LPI) is an indicator that consists of six work dimensions, each of which is determined using Principal Component Analysis (PCA), a standard statistical technique used to reduce the dimension of a dataset. The six dimensions of LPI are a) trade and transport infrastructure; b) customs and border management process efficiency; c) logistics services competence and quality; d) ease in regulating shipment at competitive prices; e) shipment traceability and trackability; f) delivery frequency and timeliness. All the sub-dimensions are measured using a 1-5 scale (Arvis, Alina Mustra, Ojala, Shepherd, & Saslavsky, 2010).

Based on literature review and previous studies, logistics performance correlates positively with export competitiveness. In other words, improvement in logistics performance will increase export values, augment market share, and improve competitiveness (Di Cosco, 2018; Korinek & Sourdin, 2009; Luttermann, Kotzab, & Halaszovich, 2017). Conversely, poor logistics quality and performance can be a stumbling block for international trade, as proven in some developing countries. Furthermore, logistics is critical to export competitiveness among developing countries (Barbero & Lucio, 2013). Improving LPI (Logistics Performance Index) can trigger more enormous trade volumes and strengthen competitiveness. The logistic performance in developing countries must intensify to the infrastructure and logistics services quality. Traceability and trackability are also essential to implement (Martí & Puertas, 2017). The study on the effects of logistics on international trade volumes and values showed that poor logistics quality, they conclude, is a hindrance to trade (Korinek & Sourdin, 2011). The importance of logistics performance in the export performance of EU countries in the period 2005 to 2010 (Puertas, Martí, & García, 2014). They found that logistics played a more important role in exporting countries than importing countries. Using LPI as a trade facilitation proxy, that logistics has more considerable effects on transport in the case of more complex commodities (Martí, Puertas, & García, 2014). For example, Argentina's logistics infrastructure is a critical factor

in its export competitiveness (Barbero & Lucio, 2013). Furthermore, the overall or partial logistics performance strongly affects export and import performance (Gani, 2017). Sustainable investment in infrastructure and logistics services contributes positively to international trade. The effect of logistics performance on export and how poor logistics performance could affect trade (Di Cosco, 2018). The improvement of logistics infrastructure, services, and customs and excise services can improve trade flow and facilitate export flows better in a significantly better way.

3. Methodology and Model Specification

3.1. Source of Data

This article analyzes how the change in logistics performance affected manufacturing products' trade competitiveness in the 10 ASEAN+3 countries (Cambodia, China, Indonesia, Japan, Republic of Korea, The Philippines, Singapore, Thailand, and Vietnam). The data samples used in the analysis were specifically balanced, which enabled us to adopt a panel data approach to estimate the research model. The data were obtained from UNCTAD and the World Bank. Panel data covering the period between 2008-2018 were used in the study. In other words, the sample's composition was restricted due to the unavailability of data and the necessity for a balanced panel.

3.2. Model Specifications

An econometric panel analysis of determinants of the Manufactured Export was conducted. The formula used to measure trade competitiveness was the NCA (Comparative Advantage Index) equation, which outperforms the Ballasa index and Kunimoto. NCA value was obtained using the following equation:

$$NCA_{m,c,t} = \underbrace{\frac{X_{m,c,t} - M_{m,c,t}}{X_{m,c,t} + M_{m,c,t}}}_{RNX_{m,c,t}} \times \underbrace{\frac{X_{m,c,t} + M_{m,c,t}}{GDP_{c,t}} \Big/ \frac{\sum_c X_{m,c,t} + \sum_c M_{m,c,t}}{\sum_c GDP_{c,t}}}_{RTO_{m,c,t}} \quad (1)$$

where *m, c,* and *t* are manufacturing products, country, and year; NCA is agrifood products competitiveness index; X and M are export and import values; Σ_c X and Σ_cM are ASEAN+3's manufacturing export and import value aggregates; Σ_c GDP is ASEAN+3 GDP.

$RNX_{m,c,t}$ refers to the net relative export value of country c for manufacturing products in year *t*
$RTO_{m,c,t}$ refers to the relative trade openness of country c for manufacturing products in year *t*.

These indicators allow us to quantify economic openness and the importance of trade flow for certain commodities to the economy.

After obtaining the manufacturing NCA index for each of the ASEAN+3 countries, we designed the econometric models. An econometric panel analysis of the export value determinants and NCA was conducted. The independent variables that presumably affected competitiveness were logistics performance and control variables, which consisted of GDP growth, exchange rates, foreign investment, research, and development, and value-added of manufacture. The estimated models can be represented as the following equations:

$$log(ExpM)_{pct} = \alpha_0 + \alpha_1 LPI_{ct} + \alpha_2 GD_{ct} + \alpha_3 log(FDI)_{c(t-1)} - \alpha_4 ER_{ct} + \alpha_5 VAM_{ct} + \alpha_6 RD1_{c(t-1)} + \mu_{2ct} \quad (2)$$

$$NCAM_{pct} = \beta_0 + \beta_1 LPI_{ct} + \beta_2 GD_{ct} + \beta_3 log(FDI)_{c(t-1)} - \beta_4 ER_{ct} + \beta_5 VAM_{ct} + \beta_6 RD_{c(t-1)} + \mu_{2ct} \quad (3)$$

where NCAM is the annualized competitiveness of each country, obtained from equation 1; LPI is logistics performance annualized data; other variables are control variables and μ_i error term. Table 1 shows the characteristic signs of coefficients estimated in Equations (2 and 3).

Table 1
Assumptions on panel analysis results.

Dependent Variables	Logistics Performance (LPI)	Macroeconomic Factors		Productivity Factors		
		GD	***ER***	***LogFDI***	***RD***	***VAM***
Expected signs	+	+	-	+	+	+

Note: This table shows the expected signs of the coefficients in panel analysis on *NCA* by Equations (2 and 3).

This study investigated a panel of ten (10) selected ASEAN+3 countries using data from (i) Trade and Development (UNCTAD) and (ii) World Bank for the period 2008 to 2018. All variables are well defined in Table 2.

Table 2
Panel analysis variable descriptions

Variable	Descriptions	Source
logExpM	Logarithmic return of Manufactured export (unit: percentage)	UNCTAD
NCAM	Trade Manufacture Competitiveness Index (unit: index)	Authors' calculation
LPI	Logistic Performance Index (unit: index)	World Bank
GD	Annualized growth rate of gross domestic product (unit: percentage)	UNCTAD
ER	Exchange rate of local currency against the US dollar (unit: percentage)	UNCTAD
logFDI	Logarithmic return of Foreign Direct Investment (unit: percentage)	UNCTAD; authors' calculation
RD	Index of company expenditures against research and development (unit: index)	World Bank
VAM	Value added of Manufactured (unit: percentage)	UNCTAD

4. Result and Discussion

4.1. Descriptive Statistics

This study is important to examine the descriptive statistics prior to performing panel data model analysis to observe variability and distribution of variables. The total value of exports from ASEAN+3 for 2008-2018 was USD 40,728,287.7516 million. China contributed over 50% of the 6.5% average growth per year (UNCTAD). ASEAN+3's average growth of manufacturing products exports during the research period was 6.6% per year, of which Vietnam booked the highest export growth record (19.7%). Japan was the country with the lowest manufacturing export growth (0.3%) after experiencing a growth of -26.7% following the 2008 crisis.

Table 3
Descriptive statistics

EXPORT GROWTH (%)	MEAN	STANDARD DEVIATION	MIN	MAX
VNM	19.7%	0.12	-1.6%	37.7%
KHM	13.0%	0.15	-13.6%	34.9%
CHN	6.5%	0.13	-15.5%	31.3%
MYS	5.0%	0.09	-7.7%	21.7%
PHL	4.6%	0.20	-19.1%	52.9%
THA	4.6%	0.12	-13.9%	29.4%
IDN	4.4%	0.11	-11.3%	24.9%
KOR	4.4%	0.12	-11.6%	27.6%
SGP	3.1%	0.12	-14.8%	28.1%
JPN	0.3%	0.16	-26.7%	33.9%

The results of the calculation of manufacturing products NCA using Eq. (1) are shown in Table 4. A proxy of ASEAN+3's trade competitiveness index, the NCA value can be obtained from the RNX index against RTO. Singapore, Korea, and China were countries with manufacturing NCA of over 0.2. Unlike the three countries, Cambodia, The Philippines, Indonesia, and Vietnam showed negative NCA values, which indicated low competitiveness due to high imports. NCA is a better measurement to indicate a country's trade competitiveness because it gives a complete view of trade flows. For example, Vietnam and Cambodia had the highest growth rate of manufacturing products exports (Table 4), but they also had higher imports, as indicated by their negative RNX values.

Table 4
The Net Comparative Advantage (NCA) index in ASEAN+3

NET COMPARATIVE ADVANTAGE - NCA	MEAN	STANDARD DEVIATION	MIN	MAX
SGP	0.498	0.070	0.324	0.593
KOR	0.418	0.042	0.319	0.464
CHN	0.280	0.022	0.250	0.327
JPN	0.137	0.018	0.119	0.176
THA	0.120	0.055	-0.007	0.209
MYS	0.104	0.064	0.026	0.256
KHM	-0.068	0.151	-0.280	0.212
PHL	-0.068	0.113	-0.279	0.047
IDN	-0.119	0.026	-0.167	-0.086
VNM	-0.136	0.236	-0.525	0.111

Net relative export, which reflects the product's relative trade intensity, is the most volatile element of the index due to its unstable average value and overall distribution. Therefore, trade intensity needs to be normalized by Symmetric Net Comparative Advantage (Symmetric NCA). According to Table 5, an SNCA index value ranges between -1 and +1. An SNCA value of -1 means that a country is a net importer or therefore lacks competitiveness, and vice versa.

Table 5
Symmetric NCA index in ASEAN+3

SNCA	MEAN	STANDARD DEVIATION	MIN	MAX
SGP	0.246	0.032	0.164	0.289
KOR	0.198	0.022	0.163	0.230
CHN	0.122	0.008	0.109	0.136
JPN	0.071	0.008	0.061	0.089
THA	0.061	0.027	-0.004	0.101
MYS	0.049	0.029	0.013	0.114
KHM	-0.022	0.070	-0.109	0.115
PHL	-0.026	0.046	-0.101	0.024
VNM	-0.065	0.112	-0.248	0.053
IDN	-0.071	0.014	-0.098	-0.051

The table below presents the descriptive statistics of LPI and control variables: average value, standard deviation, and maximum and minimum values. The average LPI was 3.36, the minimum value was 3.36 (Cambodia), the LPI value was 4.12 (Singapore), and the standard deviation was 0.45.

Table 6
cross-country summary descriptive statistics

VARIABEL	obs	MEANS	STDEV	MIN	MAX
LPI	110	3.36	0.45	2.51	4.12
Log FDI	110	5.11	0.55	3.49	6.17
GDP GROWTH	110	4.68	2.69	(5.42)	10.39
ER	110	0.12511	0.22740	0.00004	0.80021
RD	110	4.18	0.89	2.81	5.95
VAM	110	22.10	5.13	12.95	32.12

4. Result

As a primary estimation-providing variable, the Logistics Performance Index (LPI) significantly affects ASEAN+3's competitiveness in exports and manufacturing products trade. The effect of logistics performance on manufacturing products trade was reflected in the regression coefficient value, 0.43, which means that a one-point increase in the logistics performance index would increase manufacturing products trade competitiveness by 0.434. Meanwhile, the effect of logistics performance on the competitiveness of manufacturing products is indicated by the regression coefficient value obtained, which was 1.893. The value implies that a one-point increase in the Logistics Performance index would result in a 189.3% increase in manufacturing products' exports. Improvement of manufacturing products export competitiveness can be significant, for it may take more than ten years to increase the logistics performance index by one point.

Table 7
Results of ASEAN+3's Trade Competitiveness Regression Model and Export Value

Variable	**NCAM** ***Koef - Prob***	**Log ExpM** ***Koef - Prob***
C	-0.598	-2.179
LPI	0.434 (0.0354)**	1.893 (0.0000)***
GDP Growth	-0.011 (0.0001)***	0.031 (0.0000)***
Log FDI	-0.070 (0.0059)***	0.065 (0.0905)*
ER	-0.622 (0.0173)**	-0.636 (0.0316)**
VAM	0.002 (0.6537)	0.009 (0.1229)
RD1	0.026 (0.2056)	0.042 (0.1807)
R-squared	0.976	0.996
Prob(F-stat)	0.000	0.000
Method *Fixed Effect Model*	*Panel EGLS (Cross-section weights)* *Linear Estimation coefficient covariance*	*Panel EGLS (Cross-section weights)* *White cross-section standard errors & covariance*

Source: Eviews 9 output

The result is in line with the empirical study conducted by Gani (2017) with the aim of research analyzing the influence of logistics performance (LPI) as the main variable on international trade. The result shows that logistics performance strongly influences increasing exports and imports or the positive role of logistics performance that can increase trade. As concluded in other empirical studies, logistics performance correlates positively with export competitiveness in that improved logistics performance can increase export value, augment market share, and, eventually, boost competitiveness (Di Cosco, 2018; Luttermann, Kotzab, & Halaszovich, 2017). Furthermore, poor logistics quality poses an obstacle to trade (Korinek & Sourdin, 2011). The developing countries should significantly improve their logistics performance, particularly regarding the components of infrastructure, logistics services, and trace trackability, to increase trade volume and international competitiveness (Martí & Puertas, 2017).

Logistics performance has a more significant effect on export value than competitiveness. The explanation is as follows.

a) Export competitiveness is measured only in terms of export value and does not reflect trade activities.
b) On trade competitiveness using the NCA index value obtained from the Relative Net Export Index (RNX; comparison between net exports (X-M) to trade value (X+M)) in manufactured products with Relative Trade Openness (RTO), i.e., Trade Openness (TO) a country's manufacturing products against TO ASEAN+3 region.

Import value, which also reflects trade activities, affects a country's trade competitiveness. Combined with a relative openness value approach, the use of NCA in calculating trade competitiveness can reflect trade activities.

5. Discussion

Value-added Manufacturing Variables (VAM) and research and development (R&D) have no significant effect on export and trade competitiveness models. The view does not agree with empirical studies by Olczyk (2017), Kharmalova (2013), Hchaichi (2014), and Muratoğlu (2016), who claim that investments in research and development positively affect export

competitiveness. In the manufacturing export value model, Exchange Rate (ER) Variable yielded an estimated negative coefficient of -0.636 with a probability value of 0.0316, smaller than the 5 percent alpha level. In other words, ER has a significant effect but correlates negatively with Manufacturing Export value. A similar case was found in the manufacturing trade competitiveness model, where the ER variable yielded an estimated negative coefficient of -0.622 with a smaller probability value than the 5 percent alpha level (0.0173). The ER has a significant effect and negatively correlates with export value and trade competitiveness. That exchange rate affects trade is consistent with the finding of studies by Gani (2017), Durand (1987), Masmoudi (2013), Ofei (2016), Hchaichi (2014), and Bostan (2018). The previous studies mention that the more a currency depreciates against another, the lower a country's trade value and competitiveness. Thus, the exchange rate variable has a significant effect and negative correlation with ASEAN+3's export competitiveness and manufacturing products competitiveness.

Logistics performance, which is the main variable in export value and trade competitiveness models for ASEAN+3's manufacturing products, has a positive effect in that it can improve competitiveness. The effect, however, was not found with other variables, i.e., control variables. In this case, GDP growth and foreign investment variables positively affect the export value model (ExpM) but adversely affect the trade competitiveness model.

In the manufacturing export value model with an alpha level of 1 percent, GDP growth positively affects. A one-point rise in GDP can cause manufacturing exports to increase by 3.1 percent. That GDP growth positively affects export value is in line with the finding of studies by Gani (2017), Puertas (2014), and D'Aleo (2017), who used GDP as a control variable to see the effect of logistics and trade facilities on export competitiveness. Based on some other empirical studies (Durand & Giorno, 1987; Ho, 2013), the higher a country's GDP, the bigger the chance to improve trade competitiveness.

A different result was identified in the manufacturing trade competitiveness model (NCAM), which was found to have a negative effect. A further point that can be raised regarding the degree of GDP effect on manufacturing products trade competitiveness is that a one-point increase in GDP can lead to a 0.011 decrease in manufacturing products trade competitiveness (NCAM), with an assumption that the other variables remain unchanged in values.

A country's economic growth can negatively impact or reduce trade competitiveness if trade grows faster than the overall economy of a country or region. For example, during the COVID-19 pandemic, countries that only rely on the trade sector experienced a decline in trade and the country's competitiveness. The period studied (2018-2018), ASEAN+3's manufacturing products trade increased by 4.8% per year, explained as follows. Manufacturing exports increased by 4.6 % per year and manufacturing imports by 5% per year. In comparison, economic growth in the ASEAN+3 region in the period studied grew by 4.68% per year, smaller than manufacturing trade growth. This finding is in line with the trade and value-added industry, which grew faster than the GDP growth trend in the CEE (Central and Eastern European) region, negatively affecting trade competitiveness (Pilinkiene, 2016). In addition, in developing countries, where their continuously growing trade, mainly their high import flows, had terrible effects on economic growth (Kim, 2011).

The NCA relates to manufacturing export and import flows (net export relative index) and relative trade openness value in the ASEAN+3 region. The NCA would reveal that the high growth of manufacturing products import flow can lead to a trade balance deficit, which negatively impacts economic growth. The NCA is an existing correlation between trade balance deficit and economic growth (Blavasciunaite, Garsviene, & Matuzeviciute, 2020; Kheyfets & Chernova, 2020). Economic growth deceleration is affected by trade balance deficit and vice versa. Thus, the deceleration of economic growth will affect trade growth negatively.

Foreign Direct Investment (FDI) variable positively affects manufacturing export value at a 10% alpha level. A one-percent increase in FDI will cause manufacturing export value to rise by 0.065 percent, based on whom FDI in developed countries has yet to contribute positively to export competitiveness (Masmoudi & Charfi, 2013; Olczyk & Kordalska, 2017; Hchaichi & Ghodbane, 2014; Luttermann, Kotzab, & Halaszovich, 2017; Kharlamova & Vertelieva, 2013). In this case, the correlation between international trade as a trade competitiveness proxy and FDI is complimentary (Blomström, Lipsey, & Kulchycky, 1988; Liu, Wang, & Wei, 2001; Antoni, 2008).

Different results, however, were identified in the NCAM, where FDI yielded an estimated negative coefficient. In other words, FDI affected manufacturing products' competitiveness at alpha 1 percent. How FDI causes a decrease in competitiveness can be explained as follows. FDI coming to a country tends to be followed by demands for capital goods, raw materials, or intermediate materials that are unavailable nationally, resulting in increased import volumes and values and affecting the competitiveness index despite the value added to industries (Hailu, 2010). The situation is relevant in the ASEAN region, where incoming foreign direct investments fluctuate, particularly in manufacturing industries.

Furthermore, weakening competitiveness is caused by foreign direct investment that occurs within a short period (Pramadhani, Bissoondeeal, & Driffield, 2007; Pacheco-López, 2005; Skipton, 2007). The situation is generally found in industries requiring raw and intermediate materials with imported contents, where technological transfer and resources are

limited. In the long run, however, the foreign direct investment will increase trade volume and competitiveness due to import substitution in raw and intermediate materials and exports.

This scenario is also in line with one of the advantages of FDI is that it increases the productivity of materials in a country, eventually increasing exports (Appleyard & Cobb, 2008). However, it takes some time for the process to contribute significantly to export performance due to FDIs' principally long-term nature. The above-mentioned empirical studies can explain why investments negatively impacted trade competitiveness during the period studied. The underlying reason was that imported products still dominated raw and intermediate production during the period studied.

Overall, the findings of our study indicate that logistics performance plays an essential role in determining ASEAN+3's manufacturing trade and export competitiveness. The application of NCAM in measuring trade competitiveness proved to yield better results. It reflected trade activities while integrating a relative openness approach to a region. Another interesting finding of this study concerns the different effects of GDP and FDI on ExpM and NCAM. Our study concludes that whereas GDP growth could reduce trade competitiveness due to high manufacturing import growth and higher trade growth, FDI can reduce trade competitiveness in the short run.

5. Conclusion

The study aimed to test the effect of logistics performance on ASEAN+3's manufacturing products trade competitiveness from 2008 to 2018 using two models differentiated by their dependent variables, namely manufacturing export value (ExpM) and manufacturing trade competitiveness (NCAM). As the primary variable, Logistics Performance Index (LPI) yielded an estimation implying logistics performance has a significant effect on ASEAN+3's export value (ExpM) and manufacturing products trade competitiveness (NCAM).

As control variables, GDP and FDI growth positively affected the export value model. That is, they could improve export competitiveness. Our findings are consistent with several previous studies, which refer to GDP and FDI growths as Pro Trade Variables. However, our empirical analysis resulted in three crucial findings contrary to previous findings. *First*, in the trade competitiveness model (NCAM), GDP growth was found to reduce trade competitiveness, possibly due to manufacturing trade growth being accompanied by import growth that was higher than economic growth in ASEAN+3 countries.

Second, FDI in the trade competitiveness model (NCAM) could reduce trade competitiveness. The coming of foreign direct investments (FDI) into a country tends to be followed by an increase in the imports of capital goods, raw materials, and intermediate materials unavailable in the country. Therefore, the situation affects the country's competitiveness index. A decrease in trade competitiveness caused by FDI usually happens in the short term. In the long run, FDI can increase trade volumes and competitiveness due to import substitution of raw and intermediate materials and export growth. *Third,* by comparing the results yielded by the two competitiveness models, we can generally say high import values can cause a decrease in trade competitiveness. The application of NCAM in the trade competitiveness model yielded better outputs because it can reflect flow trade.

The limitation of this research is that it only uses ten years of data due to data availability and access. If using more than ten years of data, the analysis results will be more complex and dynamic, and the spectrum of research can be expanded. It can cover Asian countries, and the authors can classify poor, developing, and developed countries. The variables used are only basic variables. Accordingly, it is still possible to be detailed (especially for the LPI variable). Then, the current model does not consider the variable distance between countries that affect competitiveness.

Further studies are therefore required to improve our findings. The period observed must be extended, and a cross-sectional approach applied to obtain more accurate results. In addition, there is also a need to conduct further studies that separate the role of logistics performance on the export and import values of different groups of commodities to obtain better and more complete analysis results.

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References

Achmad, A. L., Chaerani, D., & Perdana, T. (2021). Designing a food supply chain strategy during COVID-19 pandemic using an integrated Agent-Based Modelling and Robust Optimization. *Heliyon*, *7*(11), e08448.

Antoni. (2008). Investasi Langsung Asing (FDI) Dan Perdagangan: Bukti Empiris Di Indonesia. *Jurnal Ekonomi Bisnis dan Koperasi*, *10*(2).

Appleyard, F., & Cobb. (2008). *International Economics.* New York: McGraw-Hill.

Arvis, J. F., Alina Mustra, M., Ojala, L., Shepherd, B., & Saslavsky, D. (2010). *Connecting to Compete 2010: Trade Logistics in the Global Economy-The Logistics Performance Index and Its Indicators.* World Bank.

Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2012). *Connecting to Compete: Trade Logistics in the Global Economy. The Logistics Performance Index and its Indicators.* Washington: The World Bank.

Barbero, J., & Lucio, C. (2013). *Logistic Infrastructure Towards a Matrix Of Burdens For Competitiveness And Sustainable Development.* Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento.

Bashiri, M., Tjahjono, B., Lazell, J., Ferreira, J., & Perdana, T. (2021). The dynamics of sustainability risks in the global coffee supply chain: a case of Indonesia–UK. *Sustainability*, *13*(2), 589.

Blavasciunaite, D., Garsviene, L., & Matuzeviciute, K. (2020). Trade balance effects on economic growth: Evidence from European Union Countries. *Economies*, *8*(3), 54.

Blomström, M., Lipsey, R. E., & Kulchycky, K. (1988). US and Swedish direct investment and exports. *Trade policy issues and empirical analysis*, 259-297.

Bogliacino, F., & Pianta, M. (2013). Innovation and demand in industry dynamics: R&D, new products and profits. *In Long term economic development, Springer, Berlin, Heidelberg*, 95-112.

Bostan, I., Toderaşcu, C., & Firtescu, B. N. (2018). Exchange rate effects on international commercial trade competitiveness. *Journal of Risk and Financial Management*, *11*(2), 19.

Colo, B. (1995). National competitiveness in a global economy (pp. 32-33). D. P. Rapkin, & W. P. Avery (Eds.) . *Boulder: Lynne Rienner Publishers*.

D'Aleo, V., & Sergi, B. S. (2017). Does logistics influence economic growth? The European experience. *Management Decision*, *55*(8), 1613-1628.

D'Aleo, V., & Sergi, B. S. (2017). Human factor: the competitive advantage driver of the EU's logistics sector. *International journal of production research*, *55*(3), 642-655.

De Souza, R., Goh, M., Gupta, S., & Lei, L. (2007). An investigation into the measures affecting the integration of ASEAN's priority sectors (Phase 2): the case of logistics. *REPSF Project, 6*(1).

Di Cosco, C. (2018). The Impact of Logistics on Exports. *Academia, Accelerating the world's research*.

Durand, M., & Giorno, C. (1987). Indicators of international competitiveness: conceptual aspects and evaluation. *OECD Journal : Economic Studies*, *9*, 147-182.

Ekici, Ş. Ö., Kabak, Ö., & Ülengin, F. (2016). Linking to compete: Logistics and global competitiveness interaction. *Transport Policy*, *48*, 117-128.

Engman, M. (2005). The economic impact of trade facilitation. *OECD Trade Policy Papers*.

Erkan, B. (2014). The importance and determinants of logistics performance of selected countries. *Journal of Emerging Issues in Economics, Finance and Banking*, *3*(6), 1237-1254.

Gani, A. (2017). The logistics performance effect in international trade. *The Asian Journal of Shipping and Logistics*, *33*(4), 279-288.

Gnidchenko, A., & Salnikov, V. (2015). Net comparative advantage index: Overcoming the drawbacks of the existing indices. *Higher School of Economics Research Paper*, 119.

Guarascio, D., Pianta, M., Lucchese, M., & Bogliacino, F. (2015). Business cycles, technology and exports. *Economia Politica*, *32*(2), 167-200.

Hailu, Z. A. (2010). Impact of foreign direct investment on trade of African countries. *International Journal of economics and Finance*, *2*(3), 122-133.

Hchaichi, R., & Ghodbane, S. B. (2014). Empirical analysis of determinants of international competitiveness . *International Journal of Business and Social Science*, *5*(5).

Ho, C. S. (2013). Evaluating the Determinants of International Trade Competitiveness of Emerging ASEAN5 4 Countries. *SSRN*, 2202716.

Hye, Q. M., Iram, U., & Hye, A. (2009). Exchange Rate and Trade: A Causality Analysis for Pakistan Economy. *IUP Journal of Applied Economics*, *8*.

Kharlamova, G., & Vertelieva, O. (2013). The international competitiveness of countries: economic-mathematical approach. *Economics & Sociology*, *6*(2), 39.

Kheyfets, B., & Chernova, V. (2020). Globalization dynamics in times of crisis. *Uncertain Supply Chain Management*, *8*(4), 887-896.

Kim, D. H. (2011). Trade, growth and income. *The Journal of International Trade & Economic Development*, 20(5), 677-709.

Korinek, J., & Sourdin, P. (2009). Clarifying trade costs: Maritime transport and its effect on agricultural trade. *OECD Trade Policy Working Paper*.

Korinek, J., & Sourdin, P. (2011). To what extent are high-quality logistics services trade facilitating? *OECD Trade Policy Working Papers*.

Laguir, I. G., Bose, I., Stekelorum, R., & Laguir, L. (2022). Analytics capabilities and organizational competitiveness: Unveiling the impact of management control systems and environmental uncertainty. *Decision Support Systems*, *156,* 113744.

Liu, X., Wang, C., & Wei, Y. (2001). Causal links between foreign direct investment and trade in China. *China economic review*, *12*(2-3), 190-202.

Lotfi, B., & Karim, M. (2016). Competitiveness determinants of Moroccan exports: quantity-based analysis. *International Journal of Economics and Finance*, *8*(7), 140-148.

Luttermann, S., Kotzab, H., & Halaszovich, T. (2017). The impact of logistics on international trade and investment flows. *In The 29th NOFOMA conference taking on grand challenges.* Lund University, Lund, Sweden: NOFOMA.

Martí, L., & Puertas, R. (2017). The importance of export logistics and trade costs in emerging economies. *Maritime Economics & Logistics*, *19*(2), 315-333.

Martí, L., Puertas, R., & García, L. (2014). The importance of the Logistics Performance Index in international trade. *Applied economics*, *46*(24), 2982-2992.

Masmoudi, M., & Charfi, F. (2013). The macro-economic determinants of export competitiveness of the Tunisian economy in a context of liberalization and crisis. *International Journal of Business and Management Invention*, *2*(7), 36-49.

Muratoğlu, G., & Muratoğlu, Y. (2016). Determinants of export competitiveness: evidence from OECD manufacturing. *Journal of Economics and Political Economy*, *3*(1), 111-118.

Mwakanemela, K. (2014). Impact of FDI inflows, trade openness and inflation on the manufacturing export performance of Tanzania: An econometric study. *International Journal of Academic Research in Economics and Management Sciences*, *3*(5), 151.

Ofei, E. O. (2016). Trade Liberalization and Export Competitiveness: Evidence from the EU-ECOWAS Trade. *Université Paris 1 Pantheon-Sorbonne*.

Olczyk, M., & Kordalska, A. (2017). International competitiveness of Czech manufacturing-a sectoral approach with error correction model. *Prague Economic Papers*, *2*, 213-226.

Pacheco-López, P. (2005). Foreign direct investment, exports and imports in Mexico. *World Economy*, *28*(8), 1157-1172.

Pilinkiene, V. (2016). Trade openness, economic growth and competitiveness. The case of the central and eastern European countries. *Inžinerinė ekonomika*, *27*(2), 185-194.

Porter, M. E., Sachs, J. D., & Warner, A. M. (2000). Executive summary: Current competitiveness and growth competitiveness. *The global competitiveness report*, 14.

Pramadhani, M., Bissoondeeal, R. K., & Driffield, N. L. (2007). *FDI, Trade and Growth, A causal link?* Aston Business School.

Puertas, R., Martí, L., & García, L. (2014). Logistics performance and export competitiveness: European experience. *Empirica*, *41*(3), 467-480.

Sanjaya, S., & Perdana, T. (2015). Logistics system model development on supply chain management of tomato commodities for structured markets. *Procedia Manufacturing, 4*, 513-520.

Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021). Flexibility and resilience in corporate decision making: A new sustainability-based risk management system in uncertain times. *Global Journal of Flexible Systems Management, 22*(2), 107-132.

Skipton, C. (2007). Trade openness, investment, and long-run economic growth. *In Southern Economic Association (SEA) Meetings*, 18-21.

UNCTAD. (2020). *United Natioms Conferernce On Trade And Development*. Retrieved from UNCTADSTAT Data Base: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders

Zhang, Y., Li, H., Hitt, M. A., & Cui, G. (2007). R&D intensity and international joint venture performance in an emerging market: Moderating effects of market focus and ownership structure. *Journal of International Business Studies*, *38*(6), 944-960.