

# DETERMINANT OF INTRA ASEAN TRADE: A GRAVITATION APPROACH

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## DETERMINANT OF INTRA ASEAN TRADE: A GRAVITATION APPROACH

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### ABSTRACT

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The main objective of this paper is to analyze the factors that determine the Intra ASEAN trade. The Gravity model has been employed as a model in this research. The research used a quantitative method. To see the effect of gravitation on the intra ASEAN exports, multiple regression models using panel data and gravity model have been employed. The estimation model used is the Random Effect Model. The findings show that distance, GDP, exchange rates, and population affect Intra-ASEAN exports. The distance factor negatively affects intra-ASEAN trade, which means that the farther the distance between countries, the less priority is to export. Therefore, ASEAN must seriously encourage trade activities in the ASEAN region. With mutually beneficial trade, the economy in this region is expected to grow rapidly.

Keywords: Trade, Intra ASEAN, Panel Data, Gravity Model, and Distance.

## 1 INTRODUCTION

### 1.1. Background

Trade liberalization has become a very popular word for the past 3 (three) decades. Although it is still often debated, a number of researchers prove that trade liberalization is able to boost a country's economic growth. Therefore it is not surprising when the open economy through trade liberalization has been adopted by almost all countries (Haryadi, 2009, 2012, 2015, Udvari and Voszka, 2018).

Indications of world openness can be seen from the development of a country's export and import ratios. The World Bank shows that of the 160 countries surveyed, 102 countries had a ratio of exports to GDP above 35 percent. Furthermore 35 countries have an export to GDP ratio of between 25 and 34 percent, 21 countries have an export to GDP ratio of between 10-24 percent, and only 2 countries have an export ratio below 10 (Table 1).

Table 1.1 Ratio of Export on GDP of All Countries in the World

Number	Ratio of Export on GDP	Number of Country
1	>35 percent	114
2	25 s/d 34 percent	34
3	10 s/d 24 percent	10
4	<10 perscent	2

Source: International Trade Statistics, WTO (2018). Data Processed.

Based on the facts, trade liberalization is not only triggered by the ability of exports to encourage economic growth, but also caused by economic growth that has been proven to drive exports. Conclusions like this are often found by researchers. Research on the relationship between exports and economic growth has also been carried out by Barro (1991, 1997); Abbas (2012), Abbas (2014) and Haryadi (2015).

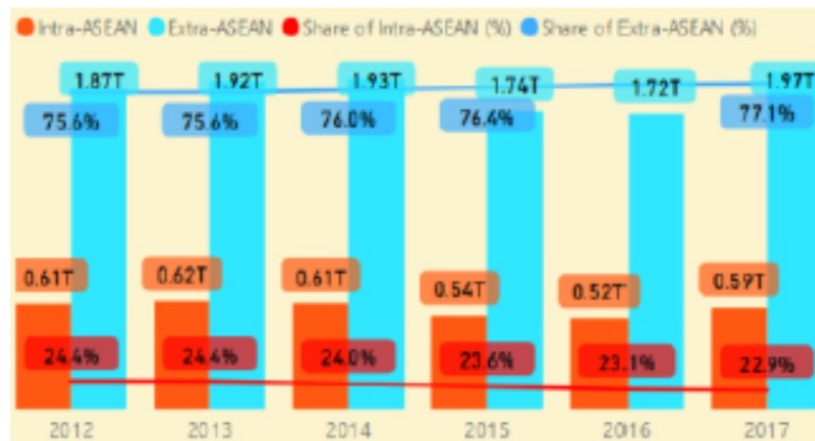
Khaled (2010) also supports the ELG hypothesis. The study conducted in Libya examines the relationship between exports and economic growth in Libya. Khaled said that there is a causal relationship between exports and economic growth in Libya. Khaled (2010) also mentions that export expansion could promote specialization in the production of export products. According to him, this condition in turn can increase the productivity of the export sector accompanied by the reallocation of resources from sectors outside the relatively unproductive business to the more productive tradable sector. In essence, increased productivity can lead to output growth.

Along with the development of time, in the last few decades, there have been quite fundamental changes in the world of commerce. Some countries began to form economic cooperation among their countries in other regions. In the 1990s, there were quite a number of trade agreements including the North American Free Trade Agreement (NAFTA), the Latin American Free Trade Association (LAFTA), the European Economic Community (EUC) and the ASEAN Free Trade Area (AFTA) in the ASEAN region (Haryadi, 2012).

ASEAN is one of the area that has the potential to grow rapidly. With a population of 642,078.8 million (Anonymous, 2018), teoretically the potential of ASEAN as a free market area is very promising. This huge market potential is also expected to be one of the strong reasons for ASEAN establishing the Asean Free Trade Area (AFTA) in 2002. In addition to considering the population, another consideration is a distance proximity. Distance is expected to be one of the triggers of an increase in intra-ASEAN trade. Not only satisfied with liberalization in the trade sector, ASEAN countries then formed the ASEAN Economic Community (MEA) which effectively implemented in January 2016. Through MEA, ASEAN expanded the scope of its integration into economic associatio that freed the flow of investment and labor.

However, the hopes of ASEAN countries to make this region truly integrated have not been in accordance with the conditions that occur at this time. The fact shows that until now the ASEAN intra-trade is still relatively small and even tends to decline. Intra-ASEAN trade transactions have not shown real progress. As shown in Figure 1.1, intra-ASEAN trade even declined after the MEA was implemented. In 2012, intra-ASEAN trade was 24.4 percent. But the transaction in percentage terms even decreased. In 2016 (when the MEA began to be implemented), ASEAN intra-trade transactions fell to 23.1 percent. This decline continued until 2017, ASEAN intra-trade transactions actually only amounted to 22.9 percent. Uniquely, extra ASEAN trade transactions are actually increasing. Figure 1.1. Intra and Extra ASEAN Trade 2012-2017.

Figure 1.1. ASEAN trade transactions are actually increasing. Figure 1.1. Intra and Extra ASEAN Trade 2012-2017.



Source: ASEAN Statistics, Asean Secretariat, 2018

Figure 1.2. presents ASEAN Extra Trade based on the destination country. Based on the figure, there are no ASEAN member countries which are the four major trading partners of ASEAN member countries.

Figure 1.2. ASEAN Primary Trade Partner Country



Source: ASEAN Statistics, Asean Secretariat, 2018

China is ASEAN's biggest trading partner with trading volume of US \$ 368.7 billion (Figure 1.2). The other three biggest trading partners are the United States, Japan and South Korea. Another interesting fact is that the ASEAN trade balance with the four main trading partner countries is a deficit (exports are smaller than imports).

The question that arises is: "Is it true that the proximity of the region (distance) affects the increase in intra-ASEAN trade?". This question is important to answer, considering that one of the reasons for the establishment of the AEC is the proximity of the region. The purpose of this paper is to analyze the factors that influence Intra ASEAN trade, using the Gravity model.

## 2. LITERATURE REVIEW

### 2.1 Concept of Gravity Model

The Gravity Model is a model that is very commonly used in international economics. The model introduced by Tinbergen in 1962 (Zarzoso and Lehmann, 2002), is widely used to analyze the effects of economic integration on trade. The Gravity Model naming is based on the use of a formulation similar to the Gravity Model proposed by Newton (Kusuma and Firdaus, 2015, Alemayehu and Atnafu, 2008).

Even though he had been criticized for not giving a clear theoretical foundation, this intuition that was originally considered simple could be recognized as being correct. Gravity models have been widely used in empirical studies of international trade.

The first important consideration in improving the Gravity Model is the addition of relevant variables that can explain trade in a country or region. Explanatory variables such as population size, GDP per capita and real exchange rates have been used for the Gravity Model by different researchers at different times (for example, Frankel et al, 1995; Matyas et al, 2000; and Elliott & Ikemoto, 2004). In addition, several dummy variables have been included to capture geographical, cultural, institutional and related factors that can influence the flow of bilateral trade (for example, Aitken, 1973 and Endoh, 1999).

### 2.2. Theoretical Framework

Newton suggested that the interaction between two objects is proportional to their mass and inversely proportional to the distance between the two objects. In the context of trade, this model states that the intensity of trade between countries will be inversely proportional to the distance between the two. With this analogue, the Gravity Model can explain international trade flows well. (Abbas, 2014).

In addition, the distance between the two countries is also important in measuring the interaction between the two countries. Newton's gravitational law can be used to see economic interactions between regions with the following equations (Anderson, 2016). The standard forms that can be used in gravity models are as follows:

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_3 \ln Y_j + \beta_4 \ln N_j + \beta_5 \ln D_{ij} + D_{pij} + u_{ij}$$

Where:

$X_{ij}$ : Commodity of bilateral trade flows from country i to country j.

$Y_i, Y_j$ : GDP of countries i and j.

$N_i, N_j$ : The population of countries i and j.

$D_{pij}$ : Dummy policy

$D_{ij}$ : Distance between countries i and j.

$Pop_{ij}$ : Number of population between countries i and j

$u_{ij}$ : standard error.

$\beta$ : coefficient

The model above draws a normal or systematic pattern of world trade which is depicted by natural logarithms of trading volumes such as  $Y_i, Y_j, N_i, N_j$ , and  $D_{ij}$ . Bilateral distance variables are used for each bilateral trade flow (Sitorus, 2009). The factors in this study are the population of the destination country, the real exchange rate of export destination countries, distance, and gross domestic product. Distance variables are then tested in the gravity model equation to see the effect on Intra ASEAN export values.

According to Harris and Matyas (1998), the main weaknesses of previous studies came from the nature of the data used and the limitations of the model. Some researchers have used single time series data in the export approach between countries. However, in order to take into account heterogeneity in countries that conduct trade interactions, the Gravity Model has been modified to regulate panel data (Harris and Matyas, 1998).

### 2.3. Previous Study

The Gravity Model is widely used in empirical research because of its high explanatory power and strong theoretical basis. Baier and Bergstrand (2001, 2009) examined the macroeconomic impact of relative income growth, reduced transportation costs, tariff liberalization, and income convergence on trade flows among OECD countries using Gravity. His findings show that 67 percent of trade between OECD countries is influenced by the rate of economic growth, a 25 percent reduction in tariffs, and an 8 percent decrease in transportation costs. Furthermore, the findings show that income convergence has no effect on bilateral trade flows. This study does not include a distance factor so that this variable seems to have no effect.

Research using the Gravity Model was also carried out by Leita (2010). Leita sought to investigate the determinants of trade flows from the United States to the European Union, NAFTA, and ASEAN countries. Leita (2010) shows that bilateral trade flows are determined significantly and positively by last year's exports, domestic GDP, population, FDI, per capita income, while distance has a negative effect. This means that the farther the distance between countries, the lower the trading activity. Furthermore, the dummy variable for bordering countries also shows a significant positive impact. The positive impact of per capita differential shows that US trade flows are consistent with the Linder hypothesis which argues that international trade occurs because both countries have the same tastes, according to him this is not relevant at this time.

Research using the Gravity Model was also carried out by Nsiah et al. (2012). They examined the performance of manufacturing exports from 50 US states in 20 Asian markets using the Gravity Model using panel data for the period 1999 to 2005. The estimation results showed that the value of a country's manufacturing intensity, infrastructure, legal system, tax rates, labor intensity, abatement costs pollution, and significant regional locations have an impact on exports.

Research using gravity models has also been carried out in Egypt. The study was conducted by Hatab et al. (2010). The findings show that the flow of Egyptian agricultural exports is positively determined by the real exchange rate and GDP of capita per trading partner, while the distance has a significant negative impact on the export flow. He confirmed the negative impact of Egypt's GDP per capita on export flows by urging an increase in per capita demand for all normal goods.

Research using the Gravity Model has also been carried out in the case of Vietnam. Nguyen (2010) examined the flow of Vietnamese exports to fifteen major trading partners using data panels plus a static and dynamic gravity approach for the period 1986 to 2006. Nguyen's findings show that Vietnam's positive export flow is determined by its own lag value, GDP, GDP of countries trading partners, and real exchange rates. Meanwhile, the distance variable shows a significant positive impact on the export flow. Batra (2004) sought to investigate Indian trade behavior with 146 trading partners using. He conducted a sensitivity analysis to examine the robustness and fragility of the estimated coefficients. The estimation results show that main determinant of Bangladesh's export flows are exchange rates, import demand by partner countries, and openness of the Bangladesh economy, while transportation costs have a non-significant negative impact. He, therefore, urged a reduction in trade barriers, currency devaluation, and increased product quality.

Other studies using Gravity Models have also been carried out in Pakistan by Gul and Yasin (2011). They try to estimate Pakistan's trade potential, using the gravity trade model. Panel data for the period 1981-2005 in 42 countries. His findings show that Pakistan's trade potential is highest with countries in the Asia-Pacific region (Association of South Asian Nations [ASEAN]), European Union (EU), Middle East, Latin America and North America. In particular, maximum potential exists with Japan, Sri Lanka, Bangladesh, Malaysia, the Philippines, New Zealand, Norway, Sweden, Italy and Denmark.

In the Indonesian context, research uses Gravity Model Nugraheni and Telisa (2012). They examined the factors that influenced the import of fruit in Indonesia using the gravity model. One of the independent variables in the research model is technological distance which is used to measure technology differences between Indonesia and partner countries. This study uses panel data from 8 partner countries in 1990 - 2011 and parameter estimation methods from the model using fixed effects.

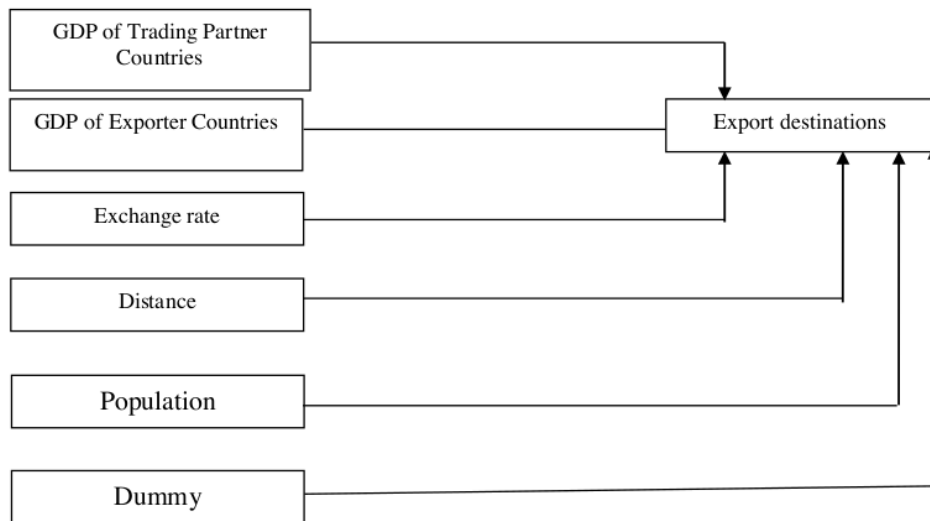
Their findings indicate that in addition to the general factors in the gravity model, namely GDP and Indonesia's population and GDP and population of partner countries, the flood of imported fruit in Indonesia is caused by a decrease in import tariffs and technological differences between Indonesia and partner countries. The recommendation from the results of this study is to reduce fruit imports, the government should take a policy to improve fruit cultivation and post-harvest technology so that local fruits of high quality and competitiveness can be produced.

Melece and Hazners (2014) construct the gravity model for Latvian agri-food trade to be used in evaluating of the determinants of trade flows as well as for the prediction of future trade flows of the country. The results of the study confirm that the key determinant of trade flows in this case is the GDP per capita in Latvia and in a partner country. The negative impact of long distance on trade development is also confirmed. Imports from the EU are highly significant for Latvia, while EU exports are moderately significant. Exports to CIS and Russia in particular are also moderately significant. Forecast with the application of the gravity model shows the positive development trend for Latvia's net exports of agri-food

Research using the Gravity Model was also carried out by Rifin et al. (2014). Measurements using the Gravity Model show that the variables that have a significant effect on the export of Indonesian cocoa are the real-per-capita GDP of the destination country, the exchange rate, and the export duty on cocoa beans. The results of the study did not show the effect of the proximity of the region to the trading partner countries.



In addition to the two studies, there are also studies conducted by Astari and Widyastutik (2013). This study aimed to analyze the effect of economic and non-economic variables on Indonesia's imports from ASEAN + 6 through sea transportation modes. During the period of 2007-2011 Indonesian imports from ASEAN + 6 countries were dominated by imports of raw materials and auxiliary materials. The variables analyzed using the gravity model include economic variables, namely GDP per capita ASEAN + 6, GDP per capita Indonesia, economic distance, real exchange rate, and non-economic variables, namely port quality, political stability and effectiveness of the Indonesian government. The estimation results using the gravity model approach shows that the variables that significantly positively influence Indonesia's imports are Indonesia's GDP per capita and Indonesia's port quality. Meanwhile, the variable economic distance, real exchange rate, political stability and the effectiveness of the Indonesian government were significantly negative.



Raihanisya (2017) explore the determinants and competitiveness of exports for Indonesian natural rubber in world markets. The finding showed that the GDP per capita of Indonesia and destination countries, population and IRCo membership had positive and significant influence on Indonesian natural rubber export. Meanwhile, distance, real exchange rate and world crude oil price didn't significantly influence Indonesian natural rubber export. The result of competitiveness analysis showed that Indonesian natural rubber export had comparative and competitive advantages in the world market.

This research is different from previous research conducted by the researchers who have already been mentioned. Throughout the literature survey conducted, there have been no studies in Indonesia that have analyzed export determinants specifically in Indonesia using the Gravity Model approach.

### 3. RESEARCH METHOD

#### 3.1. Types and Data Sources

The data used in this study is the monthly time-series data 2013-2017. Data is sourced from Economic Indicators published by the Central Statistics Bureau (BPS), Indonesian Economic and Financial Statistics published by Bank Indonesia, International Financial Statistics (IFS), and Asian Development Bank (ADB), and International Monetary Fund (IMF), and ASEAN Secretariat.

#### 3.2. Method and Tool of Analysis

This research used a quantitative method. To see the effect of gravitation on the intra ASEAN exports, multiple regression models and gravity model have been employed. The estimation model used is the Random Effect Model. This study aims to analyze the effect of several macro variables namely GDP per capita, total exports, total imports, real effective exchange rates, inflation rates, and distances. In economic terms, the gravity star model predicts trade based on distance between countries and interactions between countries. In this paper modified gravity models are used: The equation of the gravity model in this study is as follows:

$$X_{ijt} = \alpha_0 + \beta_1 ER_{ijt} + \beta_2 POP_{ijt} + \beta_3 GDP_{ijt} + \beta_4 Distance_{ijt} + \beta_5 Policy_{ijt}$$

where:

$X_{ijt}$  = Intra ASEAN Trade

$\alpha_0$  = intercept

$ER_{ijt}$  = real exchange rates of member countries against US \$

$POP_{ijt}$  = Population of Each Member Country

$GDP_{ijt}$  = real GDP per capita of Export Destination countries

$\beta_1 - \beta_7$  = coefficient of independent variables

$DISTANCE_{ijt}$  = the economic distance of the capital of an importer country with another country and the distance of the capital of an exporting country with the capital of the destination country

$POLICY_{ijt}$  = real exchange rates of member countries against US \$

$\epsilon_{ijt}$  = error terms

#### 4. RESULTS AND DISCUSSION

The simulation in this study was carried out in several stages. The first step was entering all variables into the equation. The result is shown in Figure 4.1. From the figure, it can be seen that all variables are not significant. This condition can be seen from the t statistics which are much smaller than t table and the probability values are still above alpha 10 percent, even though overall (indicated by F significant statistics). In this equation (Figure 1) it can be seen that the distance is at alpha 67 percent.

The simulation results as shown in Figure 4.1 show that the variables included in the equation have not succeeded in showing the effect of distance on exports of ASEAN. Because the distance variable is the focus of attention, this variable is maintained in each simulation. The next simulation is carried out by deleting a policy variable from the model. The policy referred to in this study is every policy carried out by the government in encouraging exports, both carried out by local governments, the central government, and international agreements. In this context the policy variable is set for ASEAN (due to the enactment of the ASEAN Economic Community or MEA), China because of the presence of ACFTA, and India due to the existence of AIFTA. Meanwhile, for the United States and Japan there are 0, which means there is no trade policy carried out by the government. Thus another simulation is needed to get the right results in describing the influence of the distance on exports of a country or region on intra ASEAN Trade.

Figure 4.1. Simulation Results 1 Multiple Regression Factors Determining the Intra ASEAN Trade Using the Gravity Model approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.827065	4.087020	0.447041	0.7324
ER	-0.212614	0.240303	-0.884774	0.5389
Distance	0.558766	0.993389	0.562484	0.6738
Policy	1.337366	0.918029	1.456779	0.3830
GDP	0.985886	0.621242	1.586960	0.3580
POP	-1.330201	0.715703	-1.858594	0.3142
R-squared	0.992378	Mean dependent var		5.277713
Adjusted R-squared	0.974266	S.D. dependent var		0.425309
S.E. of regression	0.270910	Akaike info criterion		-0.005681
Sum squared resid	0.073392	Schwarz criterion		-0.052044
Log likelihood	6.019885	Hannan-Quinn criter.		-0.578716
F-statistic	2.757601	Durbin-Watson stat		1.737045
Prob(F-statistic)	6.426689			

The result of stage 2 simulation has not succeeded in showing a significant effect from distance. From the results of this simulation it can be found that none of the estimated variables is significant. From the picture it can be seen that the GDP and Distance variables, GDP of each ASEAN Members are not significant because the probability is greater than alpha 10 percent. These results indicate that the variables that affect Intra ASEAN Trade are exchange rates and government policies, while the Distance and GDP variables have no effect.

Figure 4.2. Simulation Results 2 Multiple Regression Factors Determining the Intra ASEAN Trade Using the Gravity Model approach

7 Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.002550	4.319564	1.158115	0.3664
ER	-0.004621	0.241502	-0.019133	0.9865
Distance	-0.610056	0.731840	-0.833592	0.4922
Policy	0.424247	0.608651	0.697028	0.5579
POP	-0.348764	0.301825	-1.155521	0.3673
6 R-squared	0.978869	Mean dependent var		5.277713
Adjusted R-squared	0.966607	S.D. dependent var		0.425309
S.E. of regression	0.338487	Akaike info criterion		0.847144
Sum squared resid	0.229146	Schwarz criterion		0.808508
Log likelihood	2.034996	Hannan-Quinn criter.		0.369615
F-statistic	1.868199	Durbin-Watson stat		1.271711
Prob(F-statistic)	0.377686			

This result has not been able to explain that the distance factor influences exports to other countries. In theory, distance has a negative effect on export volume and export value, meaning that the farther the distance between a region or country to the export destination country, the smaller the export to that country. The next action is to do a simulation by removing one of the variables. Several simulations have been carried out, and finally arrived at the equation as seen in Figure 3. This simulation proves that distance affects the volume of exports between countries. Thus, this equation can be used to estimate the effect of distance on Intra-ASEAN exports.

Figure 4.3. Simulation Results 3 Multiple Regression Factors Determining the Intra ASEAN Trade Using the Gravity Model approach

7 Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.734424	5.230555	1.096332	0.3873
ER	0.092450	0.261930	0.352955	0.0079
Distance	-0.874869	0.934177	-0.936513	0.0479
POP	0.268749	0.462424	-0.581174	0.0199
GDP	0.197364	0.677261	0.291415	0.7982
2 R-squared	0.988785	Mean dependent var		5.277713
Adjusted R-squared	0.096355	S.D. dependent var		0.425309
S.E. of regression	0.404300	Akaike info criterion		1.202490
Sum squared resid	0.326917	Schwarz criterion		1.163854
Log likelihood	0.791285	Hannan-Quinn criter.		0.724961
F-statistic	1.159944	Durbin-Watson stat		1.417143
Prob(F-statistic)	6.511700			



The simulation results can be seen in Figure 4.3. Based on the figure, it can be seen that distance has a negative effect on the Intra ASEAN Trade. The farther the distance from a member country, the smaller the export to that country. This result is in accordance with previous studies conducted in various countries and various types of commodities. Thus this model can be used to show that distance is proven to have an effect on intra-ASEAN exports.

## 5. CONCLUSSION AND SUGGESTION

### 5.1. Conclusion

1. The gravity model can be used to estimate the factors that influence intra-ASEAN trade.
2. Distance factors, GDP, dollar exchange rates, and population numbers affect Intra-ASEAN Trade.
3. The distance factor negatively affects intra-ASEAN trade, which means that the farther the distance between countries, the less priority is to export.
4. Distance Factor is the most influential variable among all the variables included in the simulation.
5. The results of this simulation are consistent with the intention of establishing AEC to encourage economic activity, including the economy among ASEAN member countries.

### 5.2. Suggestion

The results of the study have proven that the theory of gravity stating that regional proximity is one of the factor affecting trade among countries. Therefore, ASEAN must seriously encourage trade activities in the ASEAN region. With mutually beneficial trade, the economy in this region is expected to grow rapidly

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