BILATERAL TRADE ANALYSIS OF ASEAN AND CHINA COUNTRIES IN ACFTA COOPERATION (GRAVITY MODEL APPROACH)

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Abstract. At the end of 2001 ASEAN and China agreed on free trade in Bandar Sri Begawan, Brunei Darussalam, known as the ASEAN-China Free Trade Agreement (ACFTA). Periodically, ASEAN and China make agreements, one of the goals of which is to eliminate or cut barriers to trade in goods, both tariffs and non-tariffs. Under ACFTA, tariff reduction began in July 2005 and aims to cut import duties to zero by 2010 on about four thousand types of goods for the relatively developed ASEAN countries namely Thailand, Malaysia, Singapore, Indonesia, the Philippines and Brunei. The Gravity Model predicts trade based on distances and interactions between countries in terms of their economic size. The Gravity Model in economics imitates Newton's law of gravity which also takes into account the physical distance and size between two objects. The application of this model to explain economic phenomena regarding the interaction between the two countries has been widely carried out by economists. The study uses panel data from China and ASEAN6 in the 2010-2020 research period with ASEAN6 exports to China as the dependent variable, and the independent variables include the GDP of the destination country and the country of origin, economic distance proxied in the form of transportation tariffs, exchange rates and economic openness. Panel data regression analysis was used to see the effect of the independent variable on the dependent variable by determining the best model (common effect, fixed effect, random effect) and the classical assumption test performed was the multicollinearity test and the heteroscedasticity test. The results showed that the GDP of destination and origin countries, distance, and exchange rates significantly affected the export value of ASEAN6 to China. Meanwhile, economic openness has no significant effect on the value of ASEAN6 exports to China.

Keywords: gravity model; international trade; ASEAN; ACFTA; panel data regression.

INTRODUCTION

The economic growth of a country cannot be separated from the role of international trade which is one of the factors that can be used as a driving force for economic growth or an increase in the value of GDP. To improve trade relations with countries in ASEAN, at the end of 2001 ASEAN agreed on free trade with China within the framework of ACFTA (ASEAN-China Free Trade Agreement) in Bandar Sri Begawan, Brunei Darussalam and fully implemented in 2010. Exports of ASEAN countries China, based on data from ASEAN Statistics, from 2010 to 2019 was in the top rank compared to other countries. This can be seen in Figure 1, where China occupies the top chart and shows a positive trend since 2010. In addition to China's exports which have been ranked the highest in the last ten years, the value of China's imports to ASEAN also ranks at the top (Zhang, Yang, Wang, Zhan, & Bian, 2020). This can be seen in Figure 2 which shows a positive trend of Chinese imports into the ASEAN market.

Figure 1 shows that the exports of ASEAN countries had the highest number of exports to China during 2010 to 2019. Likewise with the number of imports to the ASEAN market (Webb, Strutt, Gibson, & Walmsley, 2020), China was in the top rank compared to other countries during 2010 to 2019. Of course the increase in export value and Chinese imports in the ASEAN market occur in line with the policy of implementing ACFTA cooperation (Chen & Lombaerde, 2019), one of which is that there is no tariff for imports. In addition, the ease of trade between China and ASEAN countries is also influenced by the distance between countries which is not far when compared to the distance between non-ASEAN countries. Since January 1, 2010, China and ASEAN-5 plus Brunei have removed tariffs on 7000 product categories covering 90% of traded goods (Li et al., 2016).
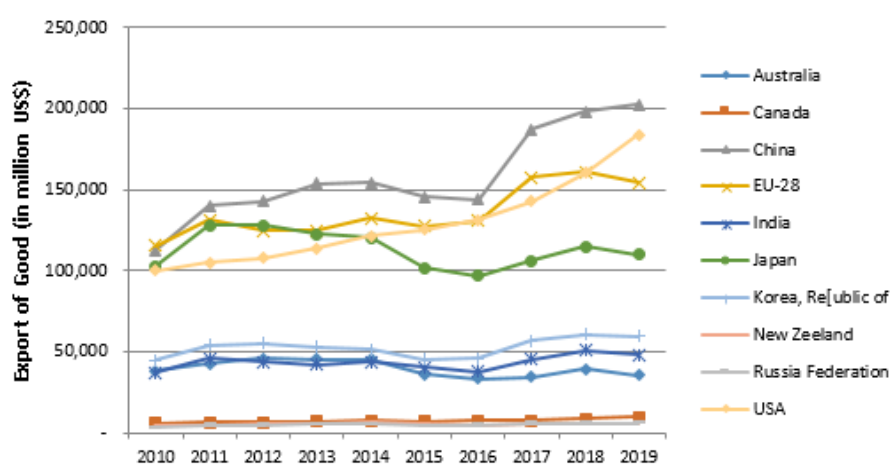

Figure 1. Exports of goods from ASEAN countries to countries in 2010-2019
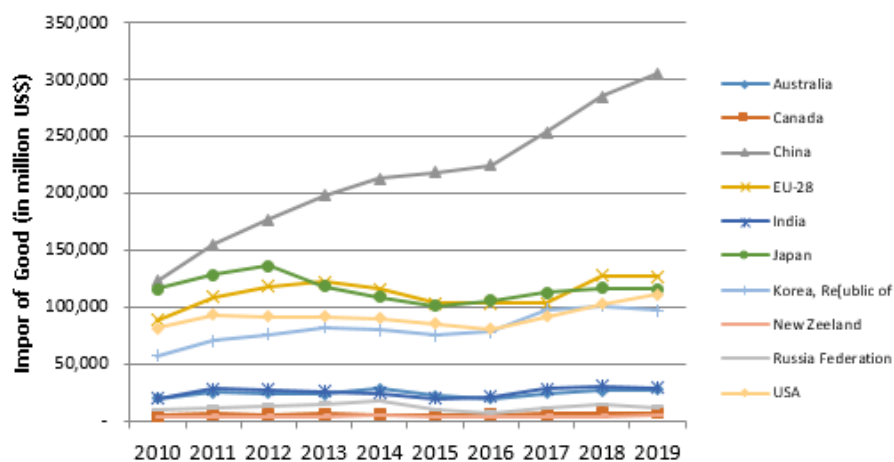(Source: ASEAN Statistical Yearbook 2020)

Figure 2. Imports of goods from countries to ASEAN markets in 2010-2019
(Source: ASEAN Statistical Yearbook 2020)

International trade is created because There are differences in production from one country to another. Smith argued that trade between two countries was based on absolute advantage. Smith in his theory believes that all countries will benefit from free trade which causes the world's resources to be used efficiently and maximize welfare. But in Smith's view there is a paradox that most countries impose many restrictions on the free flow of international trade. While in reality, trade restrictions are only recommended by some industries and trade unions who feel threatened by imported products (Howse & Langille, 2012) Classical international trade theory has received criticism from modern theory because classical theory cannot explain why there are differences in the production function between two countries. Modern trade theory from the Hecker-Ohlin (HO) model explains that countries export what they are most efficient and produce the most (Espinoza, 2020). Economic integration in general is the removal (removal of) economic barriers between two or more economies (countries). Operationally, discrimination is defined as deprivation and political unity (policy) such as norms, rules, procedures. These instruments include import duties, taxes, currencies, laws, institutions, standardization, and economic policies.

There are two approaches that are particularly useful as literature in international trade policy, namely the Gravity Model which predicts trade based on the distance between countries and the interaction between countries in terms of their economic size, and the Computable General Equilibrium Models (Babatunde, Begum, & Said, 2017). The Gravity Model in economics imitates Newton's law of gravity which also takes into account the physical distance and size between two objects. The application of this model to explain economic phenomena regarding the interaction between the two countries has been widely carried out by economists. In practice, export activities are economic

activities that are directly related to other countries. ([Mulyadi, Zhang, Dutzer, Liu, & Deng,](#) 2017) have conducted a similar study, which in his research found that the GDP of export destination countries had a significant effect and had a positive sign. In line with the theory described by the Gravity Model where the GDP of the destination country increases, exports to that country will increase. In addition, research also conducted by ([Abbas & Waheed,](#) 2015) in Pakistan found that distance has a negative relationship to Pakistan's exports. However, ([Naudé, Bosker, & Matthee](#), 2010) found that the economic distance variable had a positive and significant effect on new coal exports.

Referring to the exposure of empirical studies that have been carried out previously, this study wants to further examine the role of ACFTA cooperation, China's trade cooperation with ASEAN6 member countries (Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, and Thailand) with the Gravity Model.

METHODS

Objects and Types of Research Data The

Objects in this study are ASEAN6 member countries (Brunei Darussalam, Malaysia, Philippines, Singapore, Thailand, Indonesia) and China. The selection of research objects is based on the ACFTA agreement which is fully valid only with 6 ASEAN6 countries in 2010. The data used in this study is panel data which includes export data of each ASEAN6 country to China, China's GDP and GDP of ASEAN6 countries, distance economy, exchange rates and economic openness.

The type of data used in this research is annual data from 2010 to 2020. The selection of the research period is based on the full implementation of the ACFTA cooperation agreement. Data sources are taken from IMF, World Bank, ASEAN Statistics, comtrade.org and distanceworld.com. With the number of countries studied are 6 countries and a time period of 11 years using annual data, then the amount of data used in this study is 66 data.

Research Model Specifications This research

Model specification adopts research that has been done previously by ([Agung, Ishak, Asngari, & Bashir](#), 2019); ([Irshad, Xin, Shahriar, & Arshad](#), 2017). The variables used as indicators in this research are Export, GDP, Distance, Exchange Rate, and Economic Openness. The econometric model that will be used in this study is written in equation 6 as follows.

$$lnX_{ijt} = \alpha_0 + a_1 ln(GDP_{it}.GDP_{jt}) + a_2 lnDIST_{ijt} + a_3 lnEXC_{jt} + a_4 OPEN_{jt} + e_{i,t}$$

Where:

lnX : exports of each ASEAN6 country to China in t converted into natural logarithm (ln)

lnGDP : product of China's GDP with GDP of ASEAN6 countries in year t converted into natural logarithm (ln)

lnDIST : transportation costs from each ASEAN6 country to China in year t converted into natural logarithm (ln)

lnEXC : exchange rate of national currencies of ASEAN6 countries per US$, average per period converted into natural

logarithm (ln)

OPEN : economic openness of ASEAN6 countries

i   : Indonesia, Singapore, Brunei, Malaysia, Philippines, Thailand

j   : China

t   : 2010 – 2020

Data Analysis Method The

Method used in explaining the analysis of ASEAN 6 bilateral trade with China is the Least Square Panel (PLS). The Panel Least Square (PLS) method will provide an explanation related to the formulation of the problem in this study (Hair, Sarstedt, Ringle, & Mena, 2012). PLS is an estimation method that uses panel data, which is a combination of time series and cross section data so that more data will be observed than time series or cross section. In addition, the use of panel data will make the regression results tend to be better than regressions that only use time series or cross section. In using the Least Square Panel (PLS), there are several approaches used to estimate the model parameters, namely the Common Effect, Fixed Effect and Random Effect approaches.

The next test after getting the best model results in this study will be a classical assumption test which generally consists of autocorrelation, multicollinearity, and heteroscedasticity tests. However, in this study, the classical assumption test that was only used was the Multicollinearity and Heteroscedasticity test. This is because in panel data which is a combination of time series and cross section there will be no autocorrelation because autocorrelation only occurs in time series data. In addition,

if the best model chosen later is the Fixed Effect, then the autocorrelation test does not need to be carried out because the Fixed Effect does not require free equations from autocorrelation (Nachrowi, 2006; 334).

Operational Definition of Variables

Several variables used in this study have various units and their respective operational definitions. Some of the variables used also consist of various different sources. The operational definitions of the variables used in this study consist of the following:

a. Xij is the export of each ASEAN6 country to China with units of million US$. Net export data obtained from comtrade.org.

b. GDPij is the product of the GDP of China and each ASEAN country6 (Irshad et al, 2018). GDP is a proxy for the size of the economy in the gravity model. The GDP used is real GDP based on the base year 2015. The unit used is US$ and the data is taken from the World Bank.

c. DISTij is a proxy for transportation costs in conducting international trade. The value of the economic distance of the country of origin to the country of destination is obtained from the calculation of the geographical distance of the capital cities of the two countries multiplied by the nominal GDP of the destination country (China) in the last research period divided by the total nominal GDP of the destination country (China) in year t (Liu et al., 2021). Country distance data is taken from distanceworld.com and GDP data is taken from the World Bank.

d. EXCj is the average domestic currency exchange rate (domestic currency) per period in US$ units in ASEAN countries6. The exchange rate used is the real exchange rate. Exchange rate data is taken from the IFS website.

e. OPENj is the percentage of economic openness of each ASEAN country6 expressed in percent. Data obtained from the World Bank.

RESULTS AND DISCUSSION

China's trade growth rate has increased rapidly since 2001, when the country joined the WTO and held two initial meetings to discuss the establishment of the ASEAN–China Free Trade Area (ACFTA). More specifically, the average annual growth rate in bilateral trade from 2001 to 2008 was about 30%. In 2011, ASEAN became China's third largest trading partner behind the United States and the European Union. China and ASEAN consider the period between 2002 and 2009 to be a transition period before the completion of ACFTA. During this period, the tariffs imposed on goods traded between China and ASEAN will be lowered gradually. Under the goods trade agreement, the reduction in tariffs began in July 2005 and aims to cut import duties to zero by 2010 on about four thousand types of goods for six relatively developed ASEAN countries namely Thailand, Malaysia, Singapore, Indonesia, the Philippines and Brunei, and to 5 % in 2015 for other ASEAN members, namely Vietnam, Laos, Cambodia and Myanmar (Yang & Martinez-Zarzoso, 2014).

The development of bilateral trade between China and ASEAN6 since the implementation of the ACFTA policy which cut import duties to zero since 2010 can be seen in Figure 3 China's net exports in Figure 3 show a positive trend during the period of zero import duty. Although at the beginning of 2010 – 2011 China's net exports to ASEAN6 countries decreased, but in the following year (2011 to 2015) the development of China's trade with ASEAN6 countries showed an increase. The development of this positive trend does not seem to be going well because net exports declined again in 2015 to 2017 for Brunei, Thailand, Malaysia and Singapore, while Indonesia and the Philippines still showed a positive trend. In the final year of the study period (2019-2020), Indonesia, Singapore and Brunei trade with China showed a decline. Based on ASEAN Key Figures 2020, the Covid-19 pandemic and the movement restrictions it causes have a significant impact on trade and supply chains around the world, including ASEAN. This ultimately resulted in weakening international trade (ASEAN Secretariat, 2020). In its latest forecast, the World Trade Organization (WTO) projects a 9.2% decline in trade volumes by the end of 2020 (WTO, 2020).
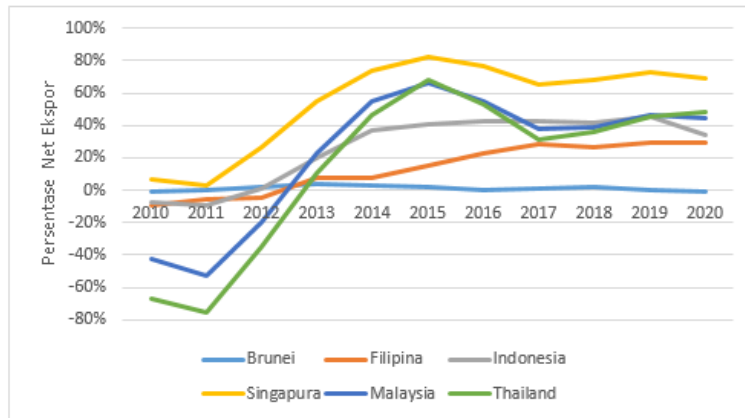
Figure. 3 Net Exports of China – ASEAN6 2010 – 2020
(Source: comtrade.org)

The positive trend of China's bilateral trade with ASEAN6 countries cannot be separated from the country's economic conditions. This can be seen from the development of the country's GDP which in this study can be seen in Figure 4. Based on data obtained from the World Bank, the GDP of ASEAN6 countries showed a positive trend from 2009 to 2019. Similar to trade, the Covid-19 pandemic 19 also affects the GDP of ASEAN countries6. Based on a report from ASEAN Key Figures 2021, the continuous increase in GDP per capita from 2000-2019 has decreased due to the COVID-19 outbreak in 2020 (Tailor, 2020).
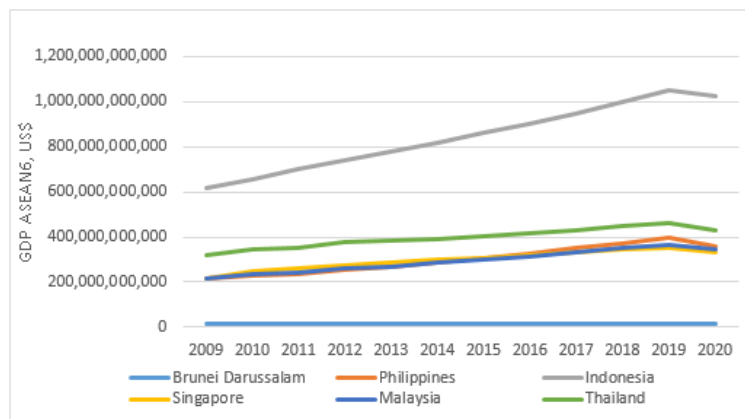

Figure. 4 GDP of ASEAN Countries6 2009 – 2020
(Source: World Bank)

Panel Regression Model Selection Test

Before entering the Panel Regression estimation, a series of panel regression model selection tests will be carried out based on the significance test of the model by comparing the Common Effect (CEM), Fixed Effect (FEM) and Random Effect (REM). The significance test of the model is carried out using the Chow test for the first,

where this test will see the best model from the comparison of the CEM model and FEM. Furthermore, Hausman test will be carried out to see the best model from the comparison of the FEM model and REM. The first model selection test was conducted, namely the Chow test. The results of the Chow test in Table 1 show a cross-section F 0.0232 which means less than 0.05, so it can be determined that the best model between CEM and FEM is FEM.

Furthermore, in testing the model selection between FEM and REM which was carried out with the Hausman test. The results of the Hausman test can be seen in Table 2 where the table shows that the probability value of a random cross section is 0.0435, which means less than 0.05. From the Hausman test, it can be determined that the best model between FEM and REM is FEM.

Table 1. Test Results Chow

Effects Test	Statistics	df	Prob.
Cross-section F	5.487768	(5.56)	0.0004
Cross-section Chi-square	26.318308	5	0.0001

Source: author's preparation

Table 2 Results of the Hausman

Test Summary	Chi-Sq.statistics	Chi-Sqdf	Prob.
Cross-section random	11.042514	4	0.0261

Source: author's preparation

From the model testing that has been carried out using the Chow test and Hausman test, the best model for research using panel data regression is Random Effect (REM) which will be discussed in the next subsection.

Panel Data Regression Test with Random Effect

After the researcher selects the best model, then estimation is done by panel data regression test using the Random Effect. The results of the panel data regression estimation using the Random Effects show the results where there are 3 independent variables having a probability value of less than 0.05, which means that these three variables significantly affect the exports of each ASEAN6 country to China with an alpha of 5%, while one independent variable is economic openness does not have a significant effect on exports of each ASEAN6 country6 to China. The results of the panel data regression estimation with the Random Effect can be seen in Table 3 as follows.

Table 3. Regression Panel Data *with Random Effect Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.23974	4.982195	-13.29529	0.0000
LOGGDP	1.663232	0.092921	17.89936	0.0000
LOGDIST	-0.327274	0.154613	-2.116729	0.0384
LOGEXC	-0.288815	0.048801	-5.918280	0.0000

| OPENESS | -0.002 | . | _ | _ |

(logx) with an alpha of 5%, namely loggdp, logdist and logexc which are indicated by probability values less than 0.05 alpha. The loggdp variable has a positive effect on imports of 1.663232 which means that when the GDP of China and ASEAN6 countries has increased by 1%, the exports of each ASEAN6 country to China have increased by 1.67%. The second variable that has an effect on logx is logdist, which in this study is the distance between two countries as a proxy for transportation costs. Logdist has a significant negative effect on exports of each ASEAN6 country to China. The effect of logdist is 0.327274, which means that if the cost of transportation from each ASEAN6 country to China increases by 1%, the export of each ASEAN6 country to China decreases by 0.33%. The next independent variable that affects logx is logexc. This variable has a significant negative effect on exports of

each ASEAN6 country to China by 0.288815, which means that if the nominal exchange rate of each ASEAN6 country increases by 1%, the export of each ASEAN6 country to China decreases by 0.29%. The next variable is openness which according to the estimation results has a negative effect on exports of each ASEAN6 country to China and but has no significant effect because the probability of this variable is greater than 0.05.

The classical assumption test used in this study is the multicollinearity and heteroscedasticity test. From the multicollinearity test, it can be concluded that the data does not experience multicollinearity, which means that there is no attachment between the independent variables used in the study. This can be seen from the values listed in Table 4, where the table shows that there are no values between variables smaller than 0.8.

Table 4. Test Results Multicollinearity

	LOGGDP	**LOGDIST**	**LOGEXC**	**openess**
LOGGDP	1	0.0500776636729	0.621123320778	0.0115028304456
LOGDIST	0.0500776636729	1	0.119401910807	0.0546518595241
LOGEXC	0.621123320778	0.119401910807	1	-0.599506469682
openess	0.0115028304456	0.0546518595241	-0.599506469682	1

CONCLUSIONS

Overall it can be concluded that the direction of the results of this study is in line with the Gravity Model and analysis can be formulated in several conclusions as follows:

a. GDP of origin and destination countries

has an effect on international trade, especially in ASEAN6 countries and China which have established trade cooperation in ACFTA.

b. The distance between countries that have trade cooperation, which in this study is proxied in the form of transportation costs between the two

c. countries, has an effect on determining whether the value of international trade is large or small.

d. The exchange rate of the domestic currency against the US$ is still one of the influential variables in determining international trade.

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