Analysis Determinants of Riau Province's Export Value: *Gravity* Model Approach

Rahma Diana[1], Syapsan[2], Cut Endang Kurniasih[3]

[123]Riau University, Faculty of Economics and Business, Bina Widya Campus. Simpang Baru, District Tampan, Pekanbaru City, Riau 28293

rahma.diana3900@student.unri.ac.id

ARTICLE INFO

ABSTRACT

Exports are an important part of international trade because they can make a very significant contribution to the economy of Riau Province. There are differences in the export value obtained by Riau Province based on the export destination country. The aim of this research is to analyze the influence of economic distance, population, GDP, REER and FDI of the destination country on the export value of Riau Province. The data used is panel data starting from 2011-2021 with a cross section of the main export destination countries, namely Japan, China, India, South Korea, Malaysia, the United States, the Netherlands. The analytical method used is the gravity model approach with random effect model techniques using Eviews 12 software. Analysis results: the economic distance and REER variables have a negative and significant effect on the export value of Riau Province while the population, GDP and FDI variables have a positive and significant effect on the export value of Riau Province. The suggestion is that government policy should be able to encourage the growth of foreign direct investment, and BI should also pay attention to policies regarding the rupiah exchange rate and then for future researchers to also carry out research on various superior commodities and other variables .

Keywords: *Gravity Model, Exports, Economic Distance, Population, GDP, Real Effective Exchange Rate (REER), Foreign Direct Investment (FDI).*

1.Introduction

International trade is an important thing for every country, because because no country can fulfill it needs independently _ without exists economic relations with other countries, based on differences in resources owned by each region as well the ability of a country to produce a good or something services.

Foreign trade activities consist of imports and exports, which are buying and selling activities between domestic and foreign countries overseas. Imports and exports are carried out because there are profits to increase economy from trade (*gains from trade*) for each country. Based on the basic theory of Hecksher-Olin (HO) known as " *The Proportional Factor Theory* " put forward by a Swedish economic historian named Eli Heckscher and Bertil Olin stated that if the country has factor production high and cost production cheap will tend exporting rather than importing goods and services In Indonesia, activities boost the economy by increasing export value carried out thoroughly not only carried out by the central government but also carried out by each of the scattered provinces throughout Indo-

nesia for economic growth getting better and more even.

In recent years, Riau Province is one of the provinces in Indonesia that has considerable economic potential, moment _ Riau Province has this plantation palm widest in Indonesia, reach 2,537,375 H a on 2019. During 15 year final, growth wide land increase 2.55% per year, And development factory supporting processing (Syahza, 2022) By Because That, coconut palm become commodity superior Riau Province's economy is ready to be exported to international markets , as evidenced by the GRDP expenditure component, in Table 1.1 below show the value of exports of goods and services Riau Province provides the contribution figure is quite large compared to other components from year to year with an average of 5.83% per year, exceeding the average total GRDP in the same period , namely of 2.4% per year.

Percentage of Riau Province's export value even during the decade from 2011 to 2021 shows a positive trendline, however value development Riau Province's exports in general are

still very fluctuating . This can be seen in Figure 1.1 (BPS Riau Province, 2021).
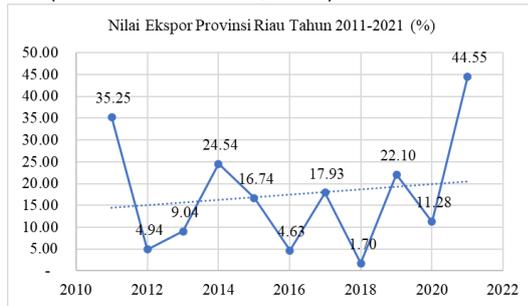

Figure1 Growth in Export Value of Riau Province in 2011-2021 (%)

Source: BPS Riau Province Publications, Various Years of Publication (processed).

Riau Province tends to export non-oil and gas commodities in the form of industrial products as derivatives with a total value of 143,714,593,000 US$, more specifically the commodities of animal/vegetable fats and oils, paper and cardboard, wood pulp and various other industrial products, followed by oil and gas. in the form of crude oil and its derivatives worth 29,637,367,000 US$.

Riau Province is ranked 2nd nationally which has a high export value to the destination countries of its trading partners . The main export destination countries for Riau Province include: Japan , China, India, South Korea, Malaysia, the United States and the Netherlands are processing Riau Province's export products for various types of food, cosmetics, hygiene products, and also as a source of biofuel or biodiesel , because for importing countries the price of palm oil tends to be cheaper . , easy to produce and very stable. (Heru, 2022) . Value _ Riau Province's exports to each of these countries are shown in Figure 1.2 below , where the market dominates the most is a Chinese country with a total export value over the last five years of 1 . 519 . 190 thousand US$.
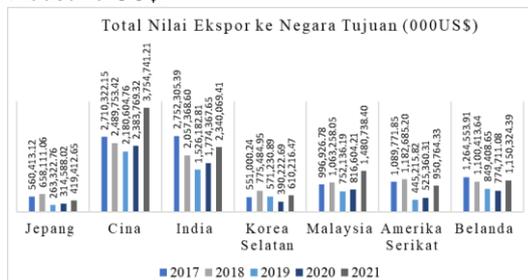

Figure2: Riau's export value to main destination countries in 2017-2021

Source: Wordbank Data , 2023

Existing empirical studies on international trade in Riau Province have so far only studied the import and export value of commodities based on the approach Revealed Comparative Advantage (RCA) to analyze competitiveness export value , Export Product Dynamic (EPD), Trade Specialization Index (ISP) and so on . However, in this research the author will use

approach gravity model against estimated variables _ influence export value of Riau Province. This model was chosen based on previous research with consideration that The gravity model is one of the models used to find out determinants of trade both on a global scale and domestic (Fejzic and Covrk , 2016; Gouveia and Rebelo, 2018; Karno, 2017; Leksono, 2019; Martha, 2011) .

The gravity model is an economic model that is often used to predict bilateral relations. This model is based on the gravitational theory of the attractive force between two objects discovered by Sir Isaac Newton in 1687 . Newton's law of gravitation states that the gravitational force between two objects is influenced proportionally by the mass of the two objects but inversely proportional to the distance between the two objects , furthermore developing in the field economy by Jan Tinbergen in 1962 for applied to international trade flows (Mankiw, 2019; Salvatore, 2013) . In Gravity theory, the mass model is assumed to be an economic measure such as: Population population of the destination country, Gross Domestic Product (GDP), Real Effective Exchange Rate (REER), Foreign Direct Investment (FDI), and others .

Linkages distance in international trade relations seen of the size of a country's economic capacity own negative relationship , where the further a country is from another country , the the more small possibility carry out bilateral trade, next GDP variable produced by a country own positive relationship with increasingly _ The greater a country's GDP , the greater the country's ability to conduct trade , and vice versa (cateris paribus) . For the destination country, the greater the GDP, the greater the country's commodity imports or what is often called absorptive capacity . Meanwhile, for countries with export value, GDP will determine the amount of production of export value commodities (product capacity). (Martha, 2011). Then confirmed by research results (Nurhayati and Mubarokah , 2020; Ridwannulloh and Sunaryati , 2018; Rizal and Wahyudin , 2022).

Apart from distance and GDP, previous research also uses other variables to measure The intensity of trade between two countries is such a variable population , real exchange rate and investment foreign (Leksono, 2019; Nurhayati and Mubarokah , 2020; Ridwannulloh and Sunaryati , 2018; Telaumbanua , 2013; Wahyudi and Anggita , 2015) . The export value is related closely related to population , where in theory the population of the destination country shows the large market potential for export value goods from the ex- porter country . The larger the population of the destination country, the greater the country's demand for imported goods (Salvatore, 2013), which is confirmed by research (Fejzic and Covrk , 2016; Gouveia and Rebelo, 2018).

In line with the previous *Gravity model* theory, then the development of GDP and population of the seven export destinations of Riau Province which are presented in Table 1.2 can be seen that during In the last three years, GDP and population in the seven destination countries have trended increases. This shows expected potential to increase _ The economy of Riau Province is studied use *gravity* model.

Mark *Real Effective Exchange Rate* (REER) which is an assumption replacement mass in the *Gravity theory* model also influence export value. REER is real effective exchange rate (measure of value currency against the weighted average of several foreign currencies) divided by the price deflator or index cost. Increased REER has implications that the value of exports becomes more expensive and imports become cheaper and increase show loss of trade competitiveness . supported by research results (Telaumbanua, 2013; Wahyudi and Saras Anggita, 2015) . The REER value for Indonesia in Table 1.3 shows fluctuating numbers _ for the past five years .

Table 1. Indonesian REER data based on CPI (2017-2021) .

Year	REER
2017	106.18
2018	99.72
2019	104.02
2020	101.96
2021	100.93

Source: Bruegel (IMF processed data 2023)

According to Mankiw (2019) Trade flows can also be influenced by investment growth , in particular direct investment in an effort to maintain the competitiveness of export values and reduce imports to reduce the current account deficit. According to the World Investment Report, in general , FDI can increase exports by increasing domestic capital for exports, transferring technology and new products for exports, providing access to new export markets and foreign markets , improving infrastructure for smooth distribution of results production of goods to be exported, etc. Direct investment in Riau Province from 2017 to 2021 tends to be increasing , can be seen in Figure 1.3 below, supported by research results (Telaumbanua , 2013) which state that influential FDI relations positive and significant .
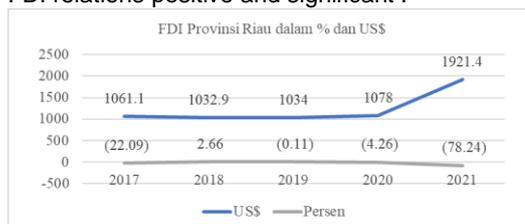

Figure3: Realization of FDI Value for Riau Province 2011-2021
Source: Wordbank Data , 2023

From the description above it can be concluded that to study The export value of the destination country can be seen from influencing factors , however _ from the results that have been obtained Previous research has shown mixed results . For this reason, it is also important to know the same problem for the condition of export values in Riau Province using *gravity model* as variety of trading models, so you can is known determinants and implications to Riau Province's export value. As for variables estimators such as economic distance, Gross Domestic Product (GDP) destination country, population of destination country, *Real Effective Exchange Rate* (REER) destination country and *Foreign Direct Investment* (FDI) of the destination country is used to see the determinants or factors that influence the export value of Riau Province during period 2011-2021. So it is hoped that the results of this research will be enriching literature about trade in Riau Province.

2. Literature Review

2.1 International Trade Theory

International trade is trade carried out by residents of one country with residents of another country based on a reciprocal agreement . According to (Nopirin , 2010) International trade in general often occurs because:
1. There are differences in the prices of goods in various countries.
2. There are differences taste .
3. There are differences income .
The following is the theory of international trade:
1. Pre Theory Classic Mercantilism
2. Classical Theory
    a. Absolute Advantage Theory
    b. Excellence Theory Comparative
    c. Modern Theory (Heckscher-Ohlin Theory)

2.2 Export Value

According to (Amir , 2004) the export value is the delivery of goods outside the Indonesian customs area. Export value activities start from the actors involved, namely the exporter and the destination of goods or services, both of which are different in different countries, and making a written agreement in a sales and purchase contract in which the rights and responsibilities of each are clearly stipulated so as to avoid possibility of misinterpretation.

Export value is one of the economic sectors that plays an important role through market expansion between several countries, where it can expand in one industry, thereby encouraging other industries, then encouraging other sectors of the economy (Baldwin, 2005)

According to Law Number 17 of 2006 concerning amendments to Law Number 10 of 1995 concerning Customs, export value is the activity of removing it from the Customs Area. Exiting the customs area means leaving Indonesia's jurisdiction .

2. 3 *Gravity* Models

Gravity models are one approach to prediction pattern of bilateral trade relations trading which is based on Sir Isaac Newton's theory of gravity in 1687 regarding the force of attraction between two objects (Telaumbanua , 2013). *The Gravity* Model was first used for international trade flows by Tinbergen in 1962 , then followed by many researchers who estimated it for many countries. (Yuniarti , 2007).

The advantage of the gravity model compared to other trading models is that the model presented is more empirical. In this model the country specializes in producing what it does best. Unlike other models, the framework of this model predicts that countries will become full specialists rather than producing a variety of commodity goods (Soraya, 2013).

Gravity model describe a simple form of market demand and supply forces. If country *i* is the country of origin, then M_i it is total amount of country bids *i* all customers. Meanwhile, M_j it is the total amount requested by the destination country *j* . Distance is considered as a kind border taxes or the imposition of trade fees, resulting in a lower balance of trade flows. (Head, 2003).

Basic *gravity* model formula:

$$F_{ij} = R_j \frac{M_i^{\alpha} M_j^{\beta}}{D_{ij}^{\theta}} \qquad (1)$$

or

$$ln\, F_{ij} = \alpha\, ln\, M_i + \beta\, ln\, M_j - \theta\, ln\, D_{ij} + \rho\, ln\, R_j$$

Where:

F_{ij} = Trading style between country *i* and country *j*

R_j = K constant gravity measure trade intensity between countries *i* and country *j*

M_i^{α} = Economic indicators of country *i* (for example, GDP)

M_j^{β} = Economic indicators of country *j* (for example, GDP)

* Variables based on economic factors . If you want to measure flows in units of money (such as import and export value) then the variable used is national income such as GDP. If you want to measure labor movement, the variable usually used is population.

D_{ij}^{θ} = Geographic distance between country *i* and country *j*

2.4 Economic Distance

Economic distance is a variable that represents or proxies for trade barriers such as transportation costs, delivery times or market access barriers. The further the distance from the main destination country for Riau Province's exports, the greater the volume of Riau Province's exports will be because the transportation costs and delivery time borne will be greater. This has an impact on decreasing export demand. Therefore, economic distance is thought to have a negative effect on export demand. (Sari and Widyastutik, 2015). The economic distance used

in this research is the geographical distance between Riau Province and the destination country which is multiplied by the results of dividing the total GDP of the destination country by the total nominal GDP for the year being observed. Economic distance is expressed in kilometers (km) (Gunawan, 2015). Economic distance is obtained based on the following formula:

$$JE_{ijt} = JG_{ij} \frac{\Sigma \text{Total PDB} j}{PDB jt} \qquad (2)$$

Information:

JEij = Economic distance of country i to country j in year t

JGij = Geographic distance of country i to country j

$\Sigma \text{Total PDB} j$ = Total GDP of country j in the observation period

GDPit = GDP of country j in year t

2.5 Population

Population is the entire number of people who occupy an area (such as a country or the world) and is constantly changing due to increases and decreases (Telaumbanua, 2013) .

Changes in a country's population affect the amount of trade from both the demand and supply sides. On the demand side, it influences changes in the quantity demanded of a particular commodity (Salvatore, 2013), while on the supply side, it influences changes in the number of workers.

$$(2.2)$$

2. 6 GDP Theory

Product Gross Domestic (GDP) is the value of goods and services in a country produced by factors production owned by inhabitant that country and foreign countries (Sukirno, 2016). The GDP referred to in this research is the 7 GDPs of the destination countries export value of Riau Province.

GDP theory explains income The people of a country (GDP of the destination country) determine the amount of value of that country's imports. The more tall income Makka the more the imports that the destination country will carry out are also high . According to (Mankiw, 2019) the goal of GDP is summarize economic activity in a certain money value during period certain . Therefore , the import function is closely related to income national . To show people's purchasing power of a country can be seen from mark income per capita or GDP per capita , which is the result of dividing a country's GDP by the country's population.

2 .7 *Real Effective Exchange Rate* (REER)

REER is tool measuring the level of competitiveness of a country's export value in international trade, *Real Effective Exchange Rate* (REER) shows the relative purchasing power of domestic output by a number of destination countries in a country. REER is the product of the nominal exchange rate and the ratio of foreign and domestic price indices. REER can be determined with the following formula:

$$REER_t = NEER_t \frac{CPI_t^{foreign}}{CPI_t^{domestic}} \qquad (3)$$

d faith :

REER $_t$ = N the real effective exchange rate of a country against a set of currency values money of destination countries;

$CPI_t^{foreign}$ = I consumer price index of destination countries

$CPI_t^{foreign}$ = I domestic consumer price index

NEER $_t$ = N nominal effective exchange rate of the domestic country

2. 8 *Foreign Direct Investment* (FDI)

FDI is the most important source of external resource flows to developing countries after the 1990s and has become a significant source of capital formation for these countries. They also argue that FDI will contribute to more than proportional economic growth for the host country. Furthermore, FDI is usually accompanied by the transfer of production methods and managerial capabilities from developed to developing countries . Direct Investment: Foreign *direct investment* (FDI) has more advantages. Apart from its permanent/long-term nature, foreign investment contributes to the transfer of technology, transfer of management skills and opening up new job opportunities. (Jufrida et al., 2016).

3. Framework Thinking
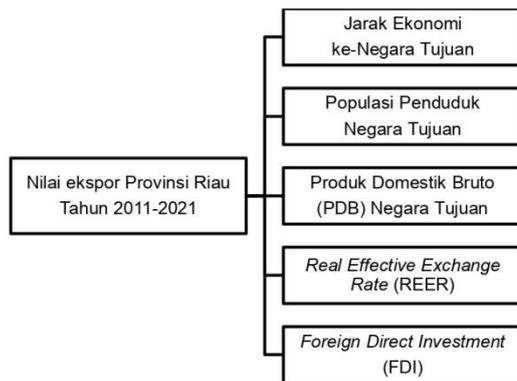
4. Hypothesis

1. Economic distance of the destination country main allegedly influential negative to export value of Riau Province.
2. Population of the main destination country allegedly influential positive to export value of Riau Province.
3. Product Gross Domestic (GDP) of the destination country main allegedly influential positive to export value of Riau Province.
4. *Real effective Exchange Rate* (REER) of the main destination country allegedly influential negative to export value of Riau Province.
5. *Foreign Direct Investment* (FDI) main destination country allegedly influential positive to export value of Riau Province.

6. Economic distance, destination country population , GDP, REER and FDI influence the export value of Riau Province .

5 . Research methods

5.1 Research Location and Time

Selected research location is Riau Province with predictions The research period is 6 months starting April 2023 until completion .

5.2 Population

Population from this research are Riau Province's export value from 2011 to 2021 was sourced from the Central Statistics Agency (BPS) which focused on seven The main destination countries of Riau Province, namely : Japan , China, India, South Korea, Malaysia, the United States and the Netherlands, using variable data distance economy to the destination country, population of the destination country, Product Gross Domestic (GDP) of the destination country, *Real Effective Exchange Rate* (REER) as well as *Foreign Direct Investment* data (FDI) Riau Province.

5.3 Data Types and Sources.

Data type used in this research is quantitative data . Using secondary data sources obtained from *the Worldbank* and BPS Riau Province. The independent variables in this research are distance economy to the destination country , population of the destination country, product Gross Domestic (GDP) of the destination country, *Real Effective Exchange Rate* (REER) and *For eign Direct Investment* (FDI) Riau Province with the dependent variable being the export value of Riau Province in 2011-2021.

5.4 Collection Techniques .

The data used in this research is secondary data. Secondary data is data obtained from records or documents of other parties in the form of historical evidence or reports from agencies, companies, entities. Secondary data comes from weekly, monthly, quarterly or annual reports by reviewing studies which is in accordance with this research.

There are two ways to collect data, namely:

1. *Library research*
2. *Internet research*

5.5 Data Analysis

In this research the author will discusses the export determinants of Riau Province using *gravity* model , which is used to measure trade flows between countries at a macro level using variable distance Economy to the destination country, population of the destination country, Products Gross Domestic (GDP) of the destination country, *Real Effective Exchange Rate* (REER) , *Foreign Direct Investment* (FDI), estimated using panel data techniques based on references from the journal(Mas *et al.*, 2017; Telaumbanua, 2013)

6 . Research Results and Discussion

6.1 Analysis Descriptive Statistics Research Variables

Descriptive statistics are statistics that describe the characteristics of each research variable. Contains the results of research on the determinants of exports in Riau Province with the variables used, namely Economic Distance, Population, GDP, REER and FDI. The following is a picture of a descriptive statistics table along with an explanation of each variable:

Table 2: Descriptive Statistics.

	EXPORT	DIS-TANCE_E	POPULA-TION	GDP	REER	FDI
Mean	150.1842	563.5421	467.1988	588.8834	105.8482	87032.02
Median	113.7904	431.0344	127.0760	229.4798	98.89823	2949.109
Maximum	463.7724	1683.870	1412.360	2331.508	145.7748	4389255.
Minimum	26.33228	24.09396	16.69307	29.79520	79.38644	3.100000
Std. Dev.	94.86484	427.2762	577.3310	670.1173	16.39756	500171.0
Skewness	1.123544	0.868143	0.869520	1.167084	0.619144	8.427789
Kurtosis	3.835607	2.890555	1.866297	2.962572	2.319419	72.97487
Jarque-Bera	18.44036	9.710554	13.82645	17.48458	6.405587	16621.07
Probability	0.000099	0.007787	0.000995	0.000160	0.040649	0.000000
Sum	11564.19	43392.74	35974.31	45344.02	8150.315	6701465.
Sum Sq. Dev.	683949.6	13874935	25331641	34128351	20434.87	1.90E+13
Observations	77	77	77	77	77	77

Source: Processed Data E-Views 12 (2023).

Based on Table 2, it states that during the research period observed, the average value of the research sample, namely Riau Province's exports, was 4.819006 , economic distance to the export destination country 5.883510 , population 5.038973 , GDP 5.611044 , REER 4.650862 , and FDI 8.271691 .

Variable The highest export value in Japan in 2012 amounted to 463.77 US $ and the lowest in Japan in 2019 amounted to 26.33 US $.

Variable highest economic distance there is in the United States in 2021 worth 1683.87 km and variables distance Lowest found in Malaysia in 2011 worth 24.09 km.

Variable population highest There are 1412.36 people in China in 2021 And variable population Lowest There were 16.69 people in the Netherlands in 2016 .

Variable Product Highest Gross Domestic Product (GDP). in the United States in 2021 amounting to 2331.51 US$ and the lowest GDP variable in Malaysia in 2015 amounted to 29.80 US$.

Variable Highest *Real Effective Exchange Rate* (REER). in China in 2015 amounted to 145.77 US$ and the REER variable was the smallest in South Korea in 2011 amounted to 79.39 US$.

The highest *Foreign Direct Investment* (FDI) variable in China in 2012 amounted to 4389255 US$ and the lowest FDI variable was in South Korea in 2016 amounting to 3.10 US$.

6.2 Panel Data Model Test Results

Common Effect Model, Fixed Effect Model and *Random Effect Model* are 3 approach methods used in panel data. To determine the most appropriate model from the three methods, 3 tests are required, namely the Chow Test, Hausman Test, and LM Test (*Lagrange Multiplier*).

The Common Effect Model (PLS) estimation results show that the independent variable Economic Distance is not significant, Population and REER are at a significant level of 5% while the variables GDP and FDI are significant at a significant level of 1%. The results of *the Fixed Effect Model* (FEM) estimation described in Appendix 8 show that the independent variables Economic Distance, Population, GDP are not significant while the REER and FDI variables are significant at the 5% significance level. Based on *the Random Effect Model* (REM) estimation results explained in Appendix 9, shows that the variables Economic Distance, GDP, REER, and FDI are significant at a significant level of 5%

After the CEM, FEM and REM results are known, the next step is to carry out the Chow Test, Hausman Test and LM (*Lagrange Mulplier*) Test to find out which model is most suitable for this research . The estimation results for the three tests are presented in Table 3.

Table 3: Research Model Testing

No	Model Selection	Model Selection Criteria	
		Chi-square Statistics	P-value
1	Chow Test (CEM/FEM)	7.121134	0.3098 **
2	Hausman Test (REM/FEM)	2.928510	0.7110 *
3	LM Test (CEM/REM)	12.73491	0.0004 ***

Information:

*	significant at α = 10%
**	significant at α = 5%
***	significant at α = 1%

Source: Results Processed by Researchers, Eviews 12 (2023)

Table 3 displays the test results in selecting the most suitable estimation method to use between CEM, FEM and REM. The Chow Test results comparing CEM and FEM show that FEM is a more suitable model because the probability value obtained is 0.3098 or greater than α = 0.05. Meanwhile, the results of the Hausman Test used to select a model between REM or FEM show that REM is a more suitable model with the probability value obtained being 0.7110 or greater than α = 0.05

Then, to be more sure that the most suitable model to use is REM, it is necessary to carry out the LM (*Lagrange Multiplier*) test, comparing CEM or REM as the appropriate model because it has a *Both probability value* of 0.0004 . or smaller than α = 0.05, which indicates that REM is the most appropriate model in this research. Following are the estimation results of the REM model (*Random Effect Model*).

Table 4: Estimation Results of Export Determinants for Riau Province Using *the Random Effect Model*.

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-3.751692	2.958523	- 1.268096	0.2089 *
DISTANCE_E?	- 0.104477	0.104485	- 0.999924	0. 0 207 **
POPULATION?	0.246693	0.094651	2.606333	0.0111 ***
GDP?	0.240803	0.125110	1.924726	0.0 4 83 **
REER?	- 1.630445	0.688746	- 2.367266	0.0206 **
FDI?	0.058163	0.026142	2.224851	0.0293 **
R-squared	0.324886	F-statistic		6.833481
Adjusted R-squared	0.277343	Prob(F-statistic)		0.000030
Durbin-Watson stat	0.638911 _			

Information:
***Significant at 1% level of significance
**Significant at 5% level of significance
*Significant at 10% level of significance
Source: Researcher Processed Data, 2023

logXi t = -3.751692 + -0.104477 logDistance_E ij + 0.246693 logPopulasij + 0.240803 log $PDBjt$ + -1.630445 REER t + 0.058163 logFDI t + εt

Based on Table 4 and equation 1 it is known that the constant value for the export value of Riau Province is - 3.751692. This value means that if the independent variables, namely economic distance, population, GDP, REER and FDI are zero then Riau Province's exports (Y) will decrease by 3.75 % . Furthermore from The equation also shows that Riau Province's export value is affected significant by the variables tested in this study in the direction varying signs . _ Population , GDP and FDI of the destination country have an influence positive and significant to export value of Riau Province. Meanwhile, economic distance , the real exchange rate has negative influence on the value of Riau Province.

6.3 T Test (Partial)

The T test was carried out to see how each independent variable influences the dependent variable in this research. The following are the T Test results obtained from the data processing results:

1. Economic Distance

The economic distance variable has a probability value of 0.0207 < α (0.05). This shows that the economic distance variable influences Riau Province's exports. The coefficient value of the economic distance variable is -0.104477, which means that if economic distance increases by 1%, Riau Province's exports will decrease by 0.10%

2. Population

The destination country population variable has a probability value of 0.0111 < α (0.05). This shows that the variable population of the destination country influences Riau Province's exports. The coefficient value of the destination country population variable is 0.246693 , which means that if the population of the destination country increases by 1%, Riau Province's exports will increase by 0.25%

3. GDP

The GDP variable has a probability value of 0.0483 < α (0.05). This shows that the GDP variable influences Riau Province's exports. The coefficient value of the GDP variable is 0.240803 , which means that if GDP increases by 1%, Riau Province's exports will increase by 0.24%

4. *Real Effective Exchange Rate* (REER)

The REER variable has a probability value of 0.0206 < α (0.05). This shows that the REER variable influences Riau Province's exports. The coefficient value of the REER variable is - 1.630445 , which means that if REER increases by 1%, Riau Province's exports will decrease by 1.63%.

5. *Foreign Direct Investment* (FDI)

The FDI variable has a probability value of 0.0293 < α (0.05). This shows that the FDI variable influences Riau Province's exports. The coefficient value of the FDI variable is 0.058163 , which means that if FDI increases by 1% then Riau Province's exports will increase by 0.06%

6.4 F Test (Simultaneous)
6.4.1 Coefficient Determination R ^{2} (5.1)

Based on the processing results on the previous page, it can be seen that *the adjusted r ^{2} value* is 0.277343. This means that the dependent variable, namely economic distance, population, GDP, REER and FDI, is 27.73% while the remaining 72.27% is explained by other variables outside the variables mentioned. used in this research.

6.5 Discussion
6.5.1 The Influence of Economic Distance on Exports of Riau Province

The economic distance value shows a coefficient value of -0.104477. From these results it is stated that the economic distance variable between Riau Province and destination countries has a negative influence on Riau Province's exports, where if the economic distance increases by 1% then Riau Province's exports decrease by 0.10%.

The probability value of the economic distance variable is 0.0207 < α = 0.05 (5%). So it is concluded that the economic distance variable influences the export value of Riau Province. So it is stated that H $_1$ is accepted and H $_0$ is rejected. These results are in accordance with the initial hypothesis which states that the economic distance variable has a negative effect on the export value of Riau Province.

According to (Inayah *et al.*, 2015), economic distance shows the transportation costs charged to the importer, which also shows the communication costs and delivery time to the importing country. Apart from economic distance, tariffs are also a factor that influences exports. Tariffs here are import duties, excise or taxes imposed by the export destination country on goods traded between countries.

This research is in line with several studies conducted (Kusuma dan Firdaus, 2015; Mubarokah dan Nurhayati, 2020)which state that economic distance has a negative effect on exports to destination countries because economic distance describes transportation costs so that the greater the economic distance will result in transportation costs which include shipping costs, loading and unloading costs at ports, and insurance premiums. more increasing. This increase in transportation costs will increase the production costs of an exported product, causing the selling price of the product to become expensive, which will ultimately reduce the exports demanded by the importing country.

6.5.2 Influence Population Against Exports of Riau Province

Based on the regression results, it is known that the coefficient value of the destination country population variable is 0.246693. From this it is stated that the population variable has a positive influence on the export value of Riau Province. Where if there is an increase in popula-

tion by 1%, the export value of Riau Province will increase by 0.24%, conversely, if there is a decrease in population by 1%, the export value of Riau Province will decrease by 0.24%.

The probability value of the population size variable is 0.0111 < α = 0.05 (5%). So it is concluded that the population of trading partner countries influences the export value of Riau Province. So it is stated that H_1 is accepted and H_0 is rejected. The results of this research are in accordance with the initial hypothesis which states that the population variable of trading partner countries has a positive effect on the export value of Riau Province.

The increase in population is directly proportional to the increase in consumption (Salvatore, 2013). With an increase in population that is balanced with high levels of income and can produce production, it will have an influence on increasing the economic growth of a country. The more prosperous the people of a country are, the greater the country's economic growth. Adam Smith (Mankiw, 2019)put forward his theory that economic growth is related to an increase in population which has an impact on increasing output and results.

This is in line with research conducted by (Telaumbanua, 2013; dan Yuniarti, 2007)those who stated that the population of the destination country shows a positive and significant relationship to the size of the market potential for export goods from the exporting country. The greater the population of the destination country, the greater the country's demand for goods .

6.5.3 Influence GDP to Exports of Riau Province

regression results , it is known that mark coefficient Variable The GDP of the destination country is 0. 240803 . From this it is stated that variable GDP own influence positive to export value of Riau Province. Where if there is an increase in GDP by 1% then Riau Province's export value will increase of 0.24%, on the other hand if a decline occurs it 's just m GDP by 1% then Riau Province's export value will decrease of 0.24%.

Probability value GDP amount variable equal to 0.0 483 < α = 0.05 (5%). So it's concluded that the total GDP of partner countries trade influential to export value of Riau Province. So that stated H_1 accepted and H_0 rejected . The results of this research are in accordance with the initial hypothesis stated that variable Partner country GDP trade influential positive to export value of Riau Province.

According to the theory contained in the book (Krugman, 2018 ; dan Salvatore, 2013) explains that the greater a country's GDP, the greater the country's ability to carry out export and import trade with other countries. because an increase in GDP is directly proportional to an increase in consumption, this explains that demand for exports to destination countries is determined by the income of the people of a country (destination country's GDP). The higher people's income, the higher the demand they will make. Therefore, the export function is closely related to

national income to show the purchasing power of the people of a country.

This research is also in line with research conducted by (Ridwannulloh dan Sunaryati, 2018; Rizal dan Wahyudin, 2022; Wahyudi dan Saras Anggita, 2015)which states that Gross Domestic Product (GDP) has a significant positive effect on the value of exports to each export destination country.

6.5.4 Influence REER on Riau Province Exports

The REER value shows a coefficient value of -1.630445. From these results it is stated that the REER variable between Riau Province and destination countries has a negative influence on Riau Province's exports, where if REER increases by 1% then Riau Province's exports decrease by 1.63%.

The probability value of the REER variable is 0.0206 < α = 0.05 (5%). So it is concluded that the REER variable influences the export value of Riau Province. So it is stated that H_1 is accepted and H_0 is rejected. These results are in accordance with the initial hypothesis which states that the REER variable has a negative effect on the export value of Riau Province.

According to the theory explained in the book, (Salvatore, 2013)*the Real Effective Exchange Rate (REER)* variable has a negative influence on the value of exports, which means that when a country's currency exchange rate strengthens (appreciates), exports tend to decrease and vice versa if the currency exchange rate If a country weakens (depreciates) against another country's currency, exports from that country tend to increase

This result is supported by research conducted by (Ekananda, 2014; Ridwannulloh dan Sunaryati, 2018; Telaumbanua, 2013)which also states that the relationship between the exchange rate and exports has a negative relationship to the export value of the exporting country.

6.5.5 Influence FDI on Exports of Riau Province

Based on the regression results, it is known that the coefficient value of the destination country FDI variable is 0.058163. From this it is stated that the FDI variable has a positive influence on the export value of Riau Province. Where if there is an increase in the amount of FDI by 1% then the export value of Riau Province will increase by 0.06%, conversely if there is a decrease in the amount of FDI by 1% then the export value of Riau Province will decrease by 0.06%.

The probability value of the variable amount of FDI is 0.0293 < α = 0.05 (5%). So it is concluded that the amount of FDI from trading partner countries influences the export value of Riau Province. So it is stated that H_1 is accepted and H_0 is rejected. The results of this research are in accordance with the initial hypothesis which states that the FDI variable from trading partner countries has a positive effect on the export value of Riau Province.

According to the theory put forward by (Krugman, 2018),the FDI (*Foreign Direct Investment*) variable, the destination country has a significant positive influence because foreign direct investment has become a driver of the growth of export-oriented industrialization where access to foreign markets through FDI can help export companies to gain access to foreign markets more effectively. It's easy, by investing directly in export destination countries companies can also build stronger relationships with local customers and distributors. Not only that, foreign investment often involves the transfer of technology, management and operational expertise which helps export companies increase their production capacity to produce more. many goods or services to export.

The results of this research are in accordance with research proposed by (Telaumbanua, 2013)Foreign *Direct Investment* and the value of exports which has a positive relationship seen from the significant increase in direct investment growth which has indirectly increased industrialization which in the end will increase the amount of output which allows for an increase on exports in North Sumatra Province.

6.5.6 Analysis of Individual Intercept Values
The Random Effect Model has different intercept values for each country. This situation can be explained by the fact that economic distance, population, GDP, REER and FDI have different levels of influence on the exports of Riau Province for each of the main destination countries for Riau Province's exports. The Intercept *Random Effect Model* shows that there are changes in economic distance, population, GDP, REER and FDI for each main export destination country in Riau Province.

Table 5: Intercept Value

COUNTRY OBJECTIVE	INTERCEPTION VALUE
_JAPAN--C	0.050128
_CHINA—C	0.087570
_INDIA--C	-0.048173
_SOUTH_KOREA--C	0.038739
_MALAYSIA--C	-0.050783
_UNITED STATES--C	-0.094290
_THE NETHERLANDS--C	0.016809

Source: Researcher Processed Results, Eviews 12 (2023).

Japanese Country Intercept Value (0.05-3.75)
If there is a change in the economic distance of Riau Province to Japan, the population, GDP, REER and FDI of Japan have an individual influence on Riau Province's exports of -3.70

Chinese Country Intercept Value (0.09-3.75)
If there is change from the economic distance of Riau Province to China, population , GDP, REER and FDI of China influence individual to Riau Province exports of -3.66

Indian Country Intercept Value (-0.05 - 3.75)
If there is a change in the economic distance of Riau Province to India, population, GDP, REER and FDI of India have an individual influence on Riau Province's exports of -3.80

South Korea Country Intercept Value (0.04- 3.75)
If there is a change in the economic distance of Riau Province to South Korea, the population, GDP, REER and FDI of South Korea have an individual influence on Riau Province's exports of -3.71

Malaysia Country Intercept Value (-0.05-3.75)
If there is a change in the economic distance of Riau Province to Malaysia, the population, GDP, REER and FDI of Malaysia have an individual influence on Riau Province's exports of -3.80

United States Country Intercept Value (-0.09-3.75)
If there is a change in the economic distance of Riau Province to the United States, the population, GDP, REER and FDI of the United States have an individual influence on Riau Province's exports of -3.80

Netherlands Intercept Value (0.02-3.75)
If there is a change in the economic distance of Riau Province to the Netherlands, the population, GDP, REER and FDI of the Netherlands have an individual influence on Riau Province's exports of -3.73

6.6 Conclusion
From the results of research estimates and discussions as described in the previous chapter, the *gravity* model approach is able to explain the determinants of Riau Province's exports in the 2011-2021 period. The conclusions from this research are as follows:
1. Economic distance to the main destination country influential negative and significant on Riau Province's exports.
2. Population of the main destination country influential positive significant to export value of Riau Province
3. Product Gross Domestic (GDP) of the main destination country influential positive significant to export value of Riau Province.
4. *Real Effective Exchange Rate* (REER) of the main destination country influential negative and significant to export value of Riau Province.
5. *Foreign Direct Investment* (FDI) main destination country influential positive significant to export value of Riau Province.
6. Economic distance, population , GDP, REER and FDI together have an influence on Riau Province's exports.

References

Aisyah, N. (2021), "Ini Penyebab Jepang Alami Penurunan Jumlah Penduduk, Siswa Sudah Tahu?", *Detik.Com*, 23 September.

Arifin, S. (2008), *Memperkuat Sinergi ASEAN di Tengah Kompetisi Global (MEA 2015)*, Elex Media Komputindo, Jakarta.

BPS Provinsi Riau. (2021a), *Statistik Perdagangan Luar Negeri Provinsi Riau 2021*.

BPS Provinsi Riau. (2021b), *Badan Pusat Statistik Provinsi*.

Darmawan, A.D. (2021), "Indonesia Paling Banyak Ekspor Lemak ke Belanda.", *Katadata.Co.Id*, September.

Ekananda, M. (2014), *Ekonomi Internasional*, Erlangga, Jakarta.

Fejzic, A. dan Covrk, E. (2016), "Infrastructure, Transport Cost, And Bosnia And Herzegovina's Trade : A Gravity Model Approach", *Ekonomski Vjesnik / Econviews*, pp. 77–90.

Frislidia. (2021), "Volume komoditas ekspor pertanian Riau 108 juta kg", *Antaranews.Com*, 14 August.

Gouveia, S. dan Rebelo, J. (2018), " *Port wine exports: a gravity model approach*", *International Journal of Wine Business Research*, pp. 218–242.

Gunawan, I.R. (2015), *Daya Saing Dan Determinan Ekspor Udang Beku Indonesia Di Negara Tujuan Ekspor*.

Hadyan, R. (2021), "Jepang Catat Penurunan PDB Tahunan Terbesar", *Ekonomi.Bisnis.Com*, 19 May.

Head, K. (2003), *Gravity for Beginners*, Vancouver: Faculty of Commerce University of British Columbia, Colombia.

Heru, R. (2022), "Tanah Riau Subur, 45 Jenis Komoditi Diekspor dan Jadi Cuan", *Media Center Riau*, Pekanbaru, 6 January.

Inayah, I., Oktaviani, R. dan Heny, K. (2015), "The Analysis of Export Determinant of Indonesian Pepper in the International Market.", *International Journal of Science and Research (IJSR)*.

Jufrida, F., Nur Syechalad, M. dan Nasir, M. (2016), "Analisis Pengaruh Investasi Asing Langsung (FDI) dan Investasi Dalam Negeri Terhadap Pertumbuhan Ekonomi Indonesia", Vol. 2 No. 1.

Karno, K. (2017), "Gravity Modeling Approach for Indonesia's Exports with ten Asian Countries", *International Journal of Economics and Business Administration*, pp. 3–20.

Krugman, P.R. (2018), *International Economics*.

Kusuma, R.L. dan Firdaus, M. (2015), "Daya Saing dan Faktor yang Memengaruhi Volume Ekspor Sayuran Indonesia Terhadap Negara Tujuan", *Jurnal Manajemen & Agribisnis IPB*, Vol. 12 No. 3, pp. 226–236.

Leksono, D.A. (2019), *Studi Ekspor Indonesia dengan Pendekatan Gravity Model Tahun 2001 – 2018*, Universitas Atma Jaya Yogyakarta., Yogyakarta, 11 August.

Mankiw, N.G. (2019), *N. Gregory Mankiw - Macroeconomics-Macmillan Higher Education (2019)*.

Martha, F.L. (2011), *Analisis Potensi Ekspor (CPO) Indonesia Ke Empat Negara Mitra Dagang Utama Dengan Pendekatan Graviti Model*, Institut Pertanian Bogor, Bogor.

Mas, Y., Ambarita, R., Sirait, T., Statistika, P. dan Stis, P.S. (2017), *Penerapan Model Gravitasi Data Panel: Kajian Perdagangan Internasional Indonesia ke Negara Anggota ASEAN (Application of Gravity Model Panel Data: International Trade Study of Indonesia to ASEAN Members)*.

Mubarokah, I. dan Nurhayati, E. (2020), *Analisis Pengembangan Ekspor Kayu Manis Indonesia*.

Nopirin. (2010), *Ekonomi Internassional*, 3rd ed., BPFE, Yogyakarta.

Nurhayati, E. dan Mubarokah, I. (2020), "Analisis Pengembangan Ekspor Kayu Manis Indonesia", Vol. 3, pp. 1–11.

Ridwannulloh, R. dan Sunaryati, S. (2018), "Determinants Of Indonesian Crude Palm Oil Export: Gravity Model Approach", *Jurnal Ekonomi & Studi Pembangunan*, JK School of Gov, Universitas Muhammadiyah Yogyakarta, Vol. 19 No. 2, doi: 10.18196/jesp.19.2.5004.

Riskiyanto, C.A. (2015), *Analisis Determinan Ekspor Surakarta ke Enam Negara Tujuan dengan Menggunakan Pendekatan Graviti Model*, Universitas Sebelas Maret Surakarta, Surakarta.

Rizal, L.M. dan Wahyudin. (2022), "Analisis Ekspor Jahe Indonesia ke Enam Negara Tujuan Utama Tahun 2010-2020", *Seminar Nasional Official Statistics 2022 /*, Vol. 2022.

Sahril. (2021), "Jepang Target Ekspor Cangkang Sawit dari Siak", *GATRA.Com*, 27 October.

Salomo and Ronny, M. (2007), "Peranan Perdagangan Internasional Sebagai Salah Satu Sumber Pertumbhan Ekonomi Indonesia", *Jurnal Perdagngan Inter-*

nasional, Parallel Session IIId: Trade III (Grow & Fdi).

Salvatore, D. (2013), *International Economics*.

Sari, K.R. and Widyastutik. (2015), "Faktor yang Mempengaruhi dan Estimasi Garis Ekuivalen NTB Ekspor Kayu Lapis Inonesia", *Buletin Ilmiah Litbang Perdagangan*, Vol. 9, pp. 95–108.

Soraya, B. (2013), *Analisis Determinan Ekspor Karet Indonesia*.

Sukirno, S. (2016), *Makroekonomi Teori Pengantar (Edisi Ke-3).*, 3rd ed., PT.Raja Grafindo Persada., Jakarta.

Syahza, A. (2022), "Metodologi Penelitian, Edisi Revisi", *UnriPress,Pekanbaru*.

Tambunan, T. (2000), *Perdagangan Internasional dan Neraca Pembayaran: Teori dan Temuan Empiris*, LP3ES., Jakarta.

Telaumbanua, E. (2013), "Analisis Determinan Ekspor Provinsi Sumatera Utara: Pendekatan Gravity Model", *QE Journal │Vol 2*, Vol. 2, pp. 2–52.

Todaro, M.P. (2000), *Ekonomi Untuk Negara Berkembang: Suatu Pengantar Tentang Prinsip-Prinsip Masalah dan KEbijakan Pembangunan*, Bumi Aksara, Jakarta.

Wahyudi, S.T. dan Anggita, R.S. (2015), "Model Gravitasi Perdagangan Bilateral Indonesia", *Jurnal Internasional Tata Kelola Ekonomi Sosial dan Lokal (IJLEG)*, Vol. 1, pp. 153–156.

Wahyudi, S.T. dan Saras Anggita, R. (2015), *The Gravity Model Of Indonesian Bilateral Trade*, *International Journal of Social and Local Economic Governance (IJLEG)*, Vol. 1.

Yuniarti, D. (2007), "Analisis Determinan Perdagangan Bilateral Indonesia Pendekatan Graviti Model", *Jurnal Ekonomi Pembangunan*, Vol. 12, pp. 99–109.