The Effect Of Road And Port Infrastructure On Regional Inequality In Indonesia

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Keywords:
Regional Economic Inequality, Infrastructure, Roads, Ports

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Abstract: Infrastructure development is a public service obligation, where infrastructure is public infrastructure that is primary in nature in supporting the economic activities of a region. This research wants to see how much influence this role has on income inequality in Indonesia. The analysis used is panel data regression of 6 island corridors in Indonesia with a fixed effect model. The data used in this study is 2014-2022 with the variables Gini Coefficient, Degree of Openness, road length and loading and unloading. The research results show that all variables have a positive and significant effect on the Gini Coefficient. With the greatest elasticity value are [1] labor in the manufacturing sector, [2] road length, [3] degree of openness, [4] harbor loading and unloading

INTRODUCTION

Indonesia's policy in providing infrastructure has yielded quite good results, as shown by an increase in infrastructure stocks. Infrastructure stock is the total value of investment that has been spent by the government and the private sector in building infrastructure, minus depreciation. Although Indonesia's infrastructure stock is still below the global standard target of 75% of GDP, in 2019 Indonesia's infrastructure stock managed to increase to 43% from the previous 35% in 2015. (kemenkeu, 2022)It is known that the competitiveness of Indonesia's infrastructure is 67.7% below the Thailland State and above the State of Vietnam, where the role of economic growth is one of the indicators in determining the success of development so that it can determine what the direction of development will be in the future. (IMD, 2021) (Firdaus, 2009)
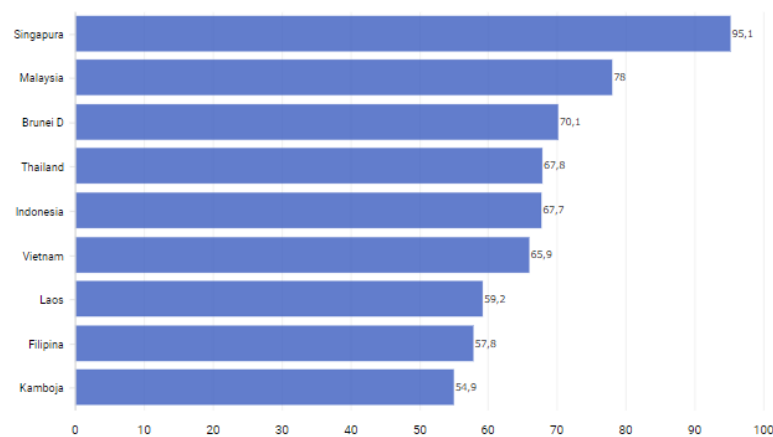
Sumber: *World Competitiveness Infrastructure, 2021*

Infrastructure development is public service obligation, Where infrastructure is a public infrastructure that is primary in supporting a country's economic activities. For this reason, it is necessary to have resources (Maqin, 2011)necessary to achieve community welfare, facilitate public access to obtain and enjoy various basic service facilities (education, health, clean water, electricity, security, and others), as well as ensure the availability of infrastructure and the continuity of these resources for the survival of the community. In addition, human resources are also needed (human resource) Where the level of population quality and technological advancement can also increase the development and growth of a region.

In the process of economic development in a region, the availability of adequate infrastructure plays an important role as a driving force for the economy as well as a prerequisite for other sectors to develop. Empirically, Nurdina (2021) and Makmuri (2017) concluded that the availability of infrastructure has a significant effect on the level of income inequality in Indonesia. In general, this study is to see how the condition of income inequality and economic development in Indonesia is described and identify economic development variables towards inequality in Indonesia, one of which is road and port infrastructure.

LITERATURE REVIEW

Road Infrastructure

Infrastructure is one part of physical capital. If a country has more equipment and infrastructure, then it has a greater production capacity. Infrastructure in economics is a form of public capital (public capital) formed from investments made by the government which includes roads. The benefits of road infrastructure include [1] improving

connectivity between regions or between countries; [2] increase the productivity of a region or country; [3] increase efficiency in resource allocation; [4] accelerate the equitable development of a region or country; [5] encourage new investment entering the region or country in accordance with Presidential Decree No. 38 of 2015

Port Infrastructure

Infrastructure development is an integral part of national development. Infrastructure is the driving force of economic growth. Transportation sector activities are the backbone of the distribution pattern of both goods and passengers. The region-based infrastructure development approach is increasingly important to pay attention to. Experience shows that transportation infrastructure plays a major role in opening up regional isolation, and the availability of irrigation is a prerequisite for the success of agricultural development and other sectors (Adris.A.Putra, 2016)

Income Inequality

The Gini coefficient (Gini index) is one of the measures used to describe the level of income inequality. The Gini Index is a measure that describes the level of inequality in aggregate where the measure is between the values of 0 (perfect equity) and 1 (perfect inequality). Todaro et al. (2006) stated that in general, countries with high levels of inequality have a Gini index in the range of 0.5 to 0.7. On the other hand, countries with income levels that tend to be evenly distributed generally have a Gini index of 0.2 to 0.35. The Central Statistics Agency (2021) states that the Gini index is based on the Lorenz Curve, which is a curve that compares the distribution of a variable, for example income with a uniform distribution that represents a cumulative percentage of the population. The calculation of the Gini index value can be defined as follows:

$$GR = 1 - \sum fpi \, n \, i{=}1 \, x \, (Fci + Fci{-}1) \quad\text{..} \quad (1)$$
where:

$GR = Koefisien \, Gini \, (Indeks \, Gini)$
fpi = Frequency of population in class of withdrawal to − i

Degree of Openness

Research on the effect of trade openness on inequality in Indonesia is still widely associated with income distribution inequality based on classical trade theories from Heckscher-Ohlin (HO) and Stolper-Samuelson (SS). The HO theory is based on David Ricardo's theory of comparative advantage which states that trade between countries can

occur due to differences in the number or proportion of endowment factors owned by each country, while the SS trade theory adds that the relative price of a good is influenced by the intensity of the use of abundant production factors in producing the good. In other words, if a country has a lot of labor, it is better to produce labor-intensive goods so that they can export, which ultimately increases profits and labor wages increase, and vice versa.

Krugman and Elizondo (1996) explain the relationship between trade openness and regional inequality through the creation of new economic agglomerations. Trade openness will have an impact on the emergence of new agglomeration locations so that industrial activities become more evenly distributed. This can have an impact on decreasing regional inequality. the choice of the location of the manufacturing sector workforce between two domestic regions with the amount of transportation costs for goods in the manufacturing sector from and abroad (external). The horizontal axis is the cost of external transportation (T0), while the vertical axis is the share of manufacturing labor in region 1. Paluzie explained that trade openness increases economies of scale which will reduce the cost of transporting manufactured goods. When the cost of external transportation is at 1.45, the manufacturing workforce will be evenly distributed across both domestic regions. This is shown by the position λ1 is at the 1/3 point, which means that the share of manufacturing labor in region 1 is worth 1/3, region 2 is worth 1/3, and area 0 is also worth 1/3. However, the more open the economy with a T0 value of 1.35, λ1 will be worth 2/3 or 0, which means that the share of manufacturing labor is concentrated in only one region

RESEARCH METHODS

The panel data method has two approaches, namely the Fixed Effect Model (FEM) and the Random Effect Model (REM). The two are differentiated based on whether or not there is a correlation between the error component and the free variable.

yit = AI + *Spray β* + εit …………………………………………………….……….. (2)

In *the one way error components model,* the error *components* are specified in the form of:

εit = λi + *it*……………………………………………………………………….(3)

While the *two way error components model, the error* components are specified in the form of:

IT = λi+ μi +uit…………………………………………………………………… (4)

Fixed Effect Model (FEM)

This assumption makes the *error* component of individual effects and time can be part of the intercept, namely:

For *one way* komponen *error*: $yit = αi + λi + Xit \beta + uit$…………………………….(5)

For *two way error component: yit = αi + λi + μt+ Xit \beta + uit*………………..………….(6)

Random effects Model (REM)

REM arises when there is no correlation between the effects of the individual and the regressor. This assumption makes the *error component* of individual effects and time incorporated into *the error,* where:

For *one way error component:*

$yit = AI + Xit \beta + uit + li$ ……………………………………………….……… (7)

For *two way error component:*

$yit = αi + Xit \beta + uit + λi + μt$…………………………………………….………(8)

Some of the assumptions commonly used in REM are:

$$E(u_{it}|\tau_i) = 0 \quad \text{……………………………………………………………… (9)}$$

$$E(u_{it}^2|\tau_i) = \sigma_u^2 \quad \text{……………………………………………………………(10)}$$

$$E(\tau_i|x_{it}) = 0 \quad \text{……………………………………………………………(11)}$$

$$E(\tau_i^2|x_{it}) = \sigma_\tau^2 \quad \text{……………………………………………………… (12)}$$

$$E(u_{it}\tau_j) = 0 \quad \text{……………………………………………………………(13)}$$

for i = j and t = 6s

$$E(u_{it}u_{js}) = 0 \quad \text{……………………………………………………………… (14)}$$

for i = j

$$E(\tau_i\tau_j) = 0 \quad \text{……………………………………………………………… (15)}$$

In order to facilitate data collection, the researcher calculated the total between islands in Indonesia so that it was divided based on the corridor of each island in Indonesia where [1] Sumatra Island (Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung, Riau Province); [2] Java Island (DKI Jakarta, West Java, Central Java, Jogja, East Java, Banten); [3] The islands of Bali, and

Nusa (Bali, NTB, NTT), [4] The islands of Kalimantan (West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, Kaltar; [5] Sulawesi Island (North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontala, West Sulawesi); [6] Maluku Island , Papua (Maluku, North Maluku, West Papua, Papua). The data used in this study is 2014-2022 where it can be seen whether infrastructure affects economic growth in Indonesia in accordance with the Vision of an advanced Indonesia where infrastructure development can reduce income inequality with a total of 6 islands multiplied by 4 variables so that there are 216 data.

$$KGAntar\ Pulau_{it} = a0 + a1PJ_{it} + a2DK_{it} + a3BM_{it} + e_{it} \dots\dots\dots\dots\dots\dots\dots\dots (16)$$

Where:

Coupistin Giniit = Gini Ratio
PJit = Length of island road i in year t (Km2)
Degree of Openness = Export-Import multiplied/PDRBx100 (Billion Rupiah
BMit = Dismantling of the estuary of island i in year t (ton)

RESULTS AND DISCUSSION

Data Results

In the research on the Influence of Infrastructure on Regional Economic Growth in Indonesia, there is a fixed individual heterogeneity. Thus, the fixed effects model is more appropriate. The selection of the fixed effect model is also theoretically more precise, so from the results of the reduced fixed effect model test or the classical assumption test test, it can be known that the propriety value $\alpha < 0.05$, which is 0.000

Table 1. Model Classic Assumption Test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1673.46870 2	(5,44)	0.0000
Cross-section Chi-square	283.669930	5	0.0000

Source: Eviews Output Results, 2022

Based on the results of the equation estimation fixed effect model It can be known that [1] workers in the manufacturing sector have the highest elasticity it is known that if the workforce in the manufacturing sector is increased by 10%, it will reduce income inequality by 34.1% [2] the variable that has a level of elasticity to reduce income inequality In Indonesia is a variable of road length, it can be known that the level of

elasticity of road length is 0.37, meaning that if the road length increases by 10%, it will increase the level of The GDP of islands in Indonesia is 3.8%, [3] then the variable that has the second highest level of elasticity is the variable degree of openness where the elasticity value is 0.36, meaning that if the performance of the degree of openness is good, it will reduce income inequality between islands in Indonesia by 3.6%, [4] Port loading and unloading, if increased by 10% in the performance of ports between regions, will reduce income inequality by 1.1%. In the testing of this model the value adjusted R Square is 0.78%, so the confidence of the model built is 78%, the remaining 22% is not explained in the estimation model

Table 2. Equation Model Results

Cross-section fixed effects test equation:
Dependent Variable: KG
Method: Panel Least Squares
Date: 01/04/23   Time: 14:36
Sample: 2014 2022
Periods included: 9
Cross-sections included: 6
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DK	0.365066	0.058975	6.190125	0.0000
PJ	0.376182	0.111116	3.385494	0.0014
BM	0.117092	0.059100	1.981264	0.0032
PKJM	3.410376	1.759459	1.938310	0.0000
C	-5.888700	1.911802	-3.080182	0.0034

R-squared	0.835299	Mean dependent var	0.766376
Adjusted R-squared	0.797364	S.D. dependent var	0.831111
S.E. of regression	0.689231	Akaike info criterion	1.868026
Sum squared resid	17.01248	Black criterion	2.052191
Log likelihood	-45.43669	Hannan-Quinn criter.	1.939051
F-statistic	14.11104	Durbin-Watson stat	0.266886
Prob(F-statistic)	0.000000		

Source: Eviews Output Results, 2022

Discussion

The Influence of Manufacturing Sector Workers on Regional Regional Inequality in Indonesia

The manufacturing industry continues to absorb domestic labor in line with increased investment or expansion. This is one of the chain effects of industrialization activities that at the same time encourage national economic growth. . explained that industrial development will stimulate the growth of other sectors so that it will expand jobs. With the increase in the number of jobs, it will be able to absorb more labor so that

people can improve their standard of living and can even distribute income in each Regency/City. According to Williamson's view, the development process tends to be concentrated in the central area but then it will decrease, that way. In Indonesia until now, structurally the Indonesian economy is supported by industry, it is known that the industrial sector is still a mainstay sector so that it is able to reduce the inequality of fiscal income (Syam, 2021)(Annisa Ilmi Faried, 2019)(Wahyu Indah Sari, 2020)

The Influence of Manufacturing Sector Workers on Regional Regional Inequality in Indonesia

Daumal (2010) examined the impact of trade openness on regional inequality in India for the period 1980–2003 and Brazil for the period 1985–2003. The research was conducted using time series analysis. The result of his research is that trade openness has a negative impact on regional inequality in Brazil. Meanwhile, in India, trade openness has a positive impact on regional inequality. His research explains that the effect of trade openness on regional inequality depends on the country being studied in terms of trade openness policies carried out by the country and also the composition of the goods traded

The Effect of Roads on Regional Regional Inequality in Indonesia

The research was conducted where he found that infrastructure has a positive influence on economic growth in the Indonesian region. This is because there is a community's dependence on road infrastructure compared to other transportation infrastructure capital. If referring to research conducted by those who state that roads in good condition will accelerate in encouraging economic growth compared to roads in damaged condition. The existence of road infrastructure will make it easier to distribute production factors, both services and goods. It can also cut the intermediate costs that the company has to incur. In addition, roads can also open access to other regions so that it is easier to mobilize production factors, thereby increasing regional GDP and reducing regional inequality. This also proves that the performance of the local government in providing the needs of the public in the last 10 years has been quite good in improving the regional economy(Prasetyo, 2009)(Ramadhian, p. 2018)

The Influence of Ports on Regional Regional Inequality in Indonesia

The results of the research on the relationship between ports and GDP per capita are in accordance with the theory put forward by those who state that trade theory is a

branch of economics that focuses its study on the spatial dimension. This is because the mobility of the flow of goods in a region results in changes in production factors that result in an influence on industrial locations, creating a geography of demand that eventually creates a pattern in trade. , (Masahisa Fujita, 2004) (Dewi Maharani Rangkuti, 2024) (Lia Nazliana, 2020) (Rusiadi, 2020)

From this statement, it can be concluded that spatial advantages in an area can improve The volume of economic activity is influenced by agglomeration forces and can increase the economic growth of the region itself. Based on the regression results carried out in this study, the result was obtained that the coefficient of the Freight Traffic Flow variable had a positive value of 0.058856 and a significance value of 0.0031 (less than α 5% or 0.05). These results mean that the Freight Traffic Flow variable has a positive and significant influence on GDP per capita in 15 districts/cities of Lampung Province. In other words, when the flow of goods traffic increases, the GDP per capita in 15 districts/cities in Lampung Province will also increase (Utama, 2018)

CONCLUSION

Some of the conclusions in this study are as follows:

1. All variables studied have a level of elasticity towards reducing regional income inequality in Indonesia, with the largest elasticity values being labor in the manufacturing sector, road length, degree of openness, port loading and unloading

POLICY RECOMMENDATIONS

1. Both the Central Government and the Regional Government synergize various programs regarding the need for labor in the manufacturing industry sector and for the future it is necessary to strengthen the quality of human resources in the manufacturing sector, it needs to be done through redesign that is adjusted to the needs of the manufacturing industry in the industrial era 4.0

2. Building multimodal transportation through optimizing the national logistics system, accelerating the development of multimodal transportation systems, synchronizing local, territorial and national transportation, developing an integrated sea transportation system network, improving sea transportation security, and utilizing green sea transportation

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