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The infrastructure investment effect and transportation sector toward economic growth in Indonesia

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Abstract

The success of a country's economic development is identified by its economic growth, one of which is infrastructure investment and physical transportation sector. This research aims to analyze the effect of infrastructure investment and transportation sector toward economic growth in Indonesia. This research employed a quantitative approach based on time series analysis and Vector Autoregression analysis. Infrastructure investment significantly affected economic growth in Indonesia. In addition, it has a reciprocal correlation with economic growth. Meanwhile, land and sea transportation positively affected economic growth in Indonesia.

Keywords: Economic growth, Investment, Infrastructure, transportation, Vector autoregression.

El efecto del sector de inversión en infraestructura y transporte hacia el crecimiento económico en Indonesia

Resumen

El éxito del desarrollo económico de un país se identifica por su crecimiento económico, uno de los cuales es la inversión en infraestructura y el sector del transporte físico. Esta investigación tiene como objetivo analizar el efecto de la inversión en infraestructura y el sector del transporte hacia el crecimiento económico en Indonesia. Esta investigación empleó un enfoque cuantitativo basado en análisis de series de tiempo y análisis de autorregresión vectorial. La inversión en infraestructura afectó significativamente el crecimiento económico en Indonesia. Además, tiene una correlación recíproca con el

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crecimiento económico. Mientras tanto, el transporte terrestre y marítimo afectó positivamente el crecimiento económico en Indonesia.

Palabras clave: Crecimiento económico, Inversión, Infraestructura, Transporte, Vector autorregresión.

1. INTRODUCTION

The 2014 Logistic Performance Index has Indonesia in the 53rd rank for its infrastructure, below Singapore, (5), Malaysia (25), Thailand (35), and even Vietnam (48). This low infrastructure index affects the high cost of logistics, goods, and services (KOMPAS, 2016)

The realization of infrastructure development budget has increased for years, especially since infrastructure development was regarded as the main priority of national development through the Master Plan for the Acceleration and Expansion of Indonesia's Economic Development (MP3EI) in the era of President Susilo Bambang Yudhoyono. Infrastructure development is vital to improving since this sector functions as an economic stimulus and critical driver for other sectors, such as employment, manufacturing industry, construction industry support, and so on, which will raise economic growth in the future (KOMPAS, 2016)

The increase in economic growth can be regarded from the increase in goods and services production. It is, nonetheless, difficult to record the number of product and service produced for a specified period. This problem occurs due to not only the variety of products and services manufactured but also the different measurement unit of the products. For instance, rice is measured in the unit of weight (kilograms or tons), while

clean water is measured in the unit of volume, oil in barrels, and so forth. In addition, some products cannot be measured with physical measurements, such as tourism services, consultation services, etc. Therefore, monetary value (money) is utilized to calculate output changes in the form of Gross Domestic Product (RAHARDJA, 2001).

Related to infrastructure, transportation sector plays a crucial role in supporting the country's economy. It occurs since transportation is closely related to production and distribution activities. Transportation functions to ship freights and passengers (MODY, 1997). Without sufficient infrastructure, production and distribution activities will face serious problems. Indonesia's conditions of having vast area and high population have caused transportation system unable to rely solely on one type of transportation mode. Instead, an intermodal transportation system (land, sea, and air) is what the country requires. The transportation system in Indonesia consists of several sub-sectors, namely land, sea, and air transportation sub-sectors, as well as transportation support services. Each transportation sub-sector has distinguished characteristics and functions in every region. Moreover, they highly depend on the economic structure, population distribution, and regional revenue (BAPEDA, 2015; DINAS PERHUBUNGAN, 2011).

In fact, sea transportation mode in Indonesia is hugely vital to stimulate economic growth in underdeveloped areas (the concept of transport follow the trade) and to function as the economic supporting means for developed areas (the concept of transport follow the trade). Sea mode transportation is widely used in Indonesian Eastern Islands. The utilization of sea mode transportation is oriented to serve inter-islands

passengers and is supported by relatively large transportation capacity compared to land and air modes. Meanwhile, freight is the main object transported by sea mode, in which 95% of cargo for export-import business utilizes this mode. Based on Inter-port data, freight transportation can be divided into three types of commodities, namely general cargo, container, and dry bulk cargo. The main transportation remains dominated by general cargo with the leading destinations of Surabaya and Jakarta. However, Surabaya-Balikpapan transportation rout remains the largest (BPS, 2012). The benefit and significance of transportation infrastructure, nevertheless, have been acknowledged for decades (PHANG, 2003). Transportation infrastructure can broaden the country's production capacity by intensifying both the mobility and productivity of available resources.

Transportation infrastructure can also affect economic growth by changing aggregate demand. For instance, the transportation infrastructure development may create and raise the input demand of other sectors, and stimulate the economic multiplier effect. Hence, transportation remains as the critical infrastructure to promote economic development (ESFAHANI, 2003; PHANG, 2003; Sanchez-ROBLES, 2003). Consequently, the transportation sector demand will rise along with the increase in economic growth, population growth, industrialization, urbanization, and so on (GRAMLICH, 1994). The reasons mentioned above underlie the objectives of this research which is to analyze the effect of infrastructure investment and transportation system toward the economic growth in Indonesia.

2. METHODOLOGY

The dependent employed in this study was the economic growth represented by Gross Domestic Product Meanwhile the independent variables included government infrastructure investment of Gross Fixed Capital Formation, land transportation measured through road length, and sea transportation measured by the number of loading and unloading of goods at the ports. This research was conducted by applying a quantitative approach based on time series analysis and Vector Autoregression analysis (LUTKEPOHL, 2011). The research observed the annual data between 1980 and 2014. In addition, the analysis model estimation in this research utilized Eviews 8 software.

3. RESULTS AND DISCUSSION

All variables were stationary at first difference and intercept level. It was identified by the t-statistic value which was higher than the Mackinnon value of (α) 1%, 5%, and 10%. If the stationary value of all variables were detected, the next step was to determine the optimal lag.

Table 1: Result of Optimal Lag Test

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.002684	5.430852	5.612247	5.491886
1	82.00780*	0.000382*	3.471700*	4.378674*	3.776869*
2	18.21091	0.000494	3.682609	5.315163	4.231914

Note:* illustrates the recommended lag

The information criteria of SC and HQ were applied in the optimal lag determination in this research. Nonetheless, the test result of Table 4.3 suggests that the optimal lag was on lag one. There was, however, lag number difference on VECM. If the optimal lag of VAR is p, the lag of VECM is p-1.

Table 2: The Correlation of Feedback/Bilateral Causality

Null Hypothesis (H_0)	**Probability**
GCF does not Granger Cause GDP	0.0090
GDP does not Granger Cause GCF	0.0037

Infrastructure investment and economic growth had a reciprocal correlation at 1% significance level. The null hypothesis, stating that infrastructure investment did not correlate with economic growth at 1% significance level. Therefore the null hypothesis was rejected at the 1% significance level since infrastructure investment affected the economic growth and vice versa.

Table 3: Independence Correlation

Null Hypothesis (H_0)	**Probability**
ROA does not Granger Cause GDP	0.9654
GDP does not Granger Cause ROA	0.9243
HAR does not Granger Cause GDP	0.6199
GDP does not Granger Cause HAR	0.1016
ROA does not Granger Cause GCF	0.5158
GCF does not Granger Cause ROA	0.8816
HAR does not Granger Cause GCF	0.5451
GCF does not Granger Cause HAR	0.1236

Source: Data Management Result

Therefore, there was no dependency correlation among each variable. The null hypothesis identified that sea transportation, indicated by the amount of loading and unloading of goods at the ports, was not related to land transportation and vice versa. The road length of land transportation was at the 10% significance level. Thus, there was no dependency correlation between the variables.

Table 4: Contribution Result of Shock toward GDP

Period	GCF	ROA	HAR
1	0.000000	0.000000	0.000000
2	23.54934	0.005425	0.046262
3	25.05421	0.071731	0.045847
4	28.24321	0.102661	0.046311
5	29.69966	0.128893	0.044626
6	30.90823	0.146854	0.043174
7	31.75182	0.160742	0.041835
8	32.41392	0.171410	0.040732
9	32.93129	0.179898	0.039816
10	33.34910	0.186747	0.039059

Source :Data processed

In this study, the variance decomposition result focused on the shock contribution to the infrastructure investment variable which statistically had a significant effect on the economic growth variable.

The calculation and analysis result described that infrastructure investment, land and sea transportation, influenced the Indonesian economic growth between 1980 and 2014. The research regression result identified that infrastructure investment significantly and positively affected the economic growth variable. The infrastructure

investment variable contributed to the economic growth variable. It was demonstrated from the shock variable of infrastructure investment toward relatively large economic growth variable on variance decomposition. On the other hand, Granger test result proved a reciprocal correlation between the variables of Gross Fixed Capital Formation and Gross Domestic Product. It identified that infrastructure investment was capable of promoting economic growth in Indonesia, and vice versa.

From 2006 to 2010, the average economic growth in Indonesia amounted to 5.7%, which was higher compared to the average of 4.8% in 2000-2005. The performance of national economic growth was highly influenced by internal and external factors. The external factors included the impact of global imbalances and foreign high-interest rates due to the implementation of relatively tight monetary policies, especially in the United States, causing the government and Bank Indonesia carry out anticipatory policies. On the other hand, the internal factors included the high-interest rate of banking and limited infrastructure availability. Those problems affected Indonesian economic growth. In 2006, economic growth was expected to reach 6.3%. Nevertheless, it only reached 5.8%.

This situation occurred due to the decline of customers' purchasing power because of the increase in fuel price and high-interest rate. The high-interest rate affected the real sector which delayed new investment and preferred utilizing the existing capacity (APBN, 2006). However, the national economy was still powerful to

deal with the global crisis impact which is proven with Indonesia's high economic development in 2011. In contrasts, some states in the world suffered from declined or even negative growth within the crisis period.

Indonesia's economy in 2006-2011 illustrated a satisfactory performance with its economic growth achievement improving annually and its significant positive improvements and changes. The 2017 growth achievement was the most noteworthy as it reached 6.3% higher than the previous year. Unfortunately, in 2008, the economic growth declined due to the global crisis, and it only reached 6%. This decline lasted until 2009, causing the economic growth attained only up to 4.6%. The economic growth got its rebound in 2010 and reached 6.2%. The trend continued in the following year with a 6.5% increase. Going through obstacles and external factors slowing down the economic growth, Indonesia was capable of managing and maintaining a sustainable national economy (APBN, 2006).

In 2007, the rate of investment growth increased along with controlled inflation, a decline of domestic interest rate, disbursement of government capital expenditures, the acceleration of infrastructure project development, and an increase in global investor confidence due to sustained economic stability. The country's economic growth was significantly influenced by a variety of improvement efforts in the real sector and progress in infrastructure development. To encourage private investment contribution in infrastructure, the government has issued a guarantee program for risks that may arise in infrastructure

development carried out by the private sector and the realization of infrastructure summit through the infrastructure development for toll roads, ports, clean water procurement, and electricity (APBN, 2006)

The infrastructure development and establishment require high investment cost. Besides emphasizing the guarantee program and infrastructure summit to run this development, the government has also initiated a collaboration with the private sector. There have been corporations between the government and the private sector in funding infrastructure development in many countries. The government and the private sector are an institutionalized collaboration that works together to attain specific targets when two parties accept investment risks based on profit-sharing and cost-sharing borne (BULT-SPIERING, 2006). The government and private sector are classified into three elements, namely: the Country (government), private, and community. The government and private sector cooperation emphasizes on transportation sector program as their priority.

Theoretically, TODARO (2000) argued that infrastructure development is a public service obligation which is supposed to be the government's duty since the infrastructure is the primary public facility to support a state economic activity. The country’s economic growth is affected by, among which, the capital accumulation such as investment on land, equipment, facility, and infrastructure, as well as human resources. If the infrastructure investment variable significantly affects national economic growth, it can be concluded that some of the government budgets are spent on infrastructure.

The regression result on transportation sector in this study demonstrated that land transportation variable (road length) and sea transportation variable (the number of loading and unloading of goods in ports) brought a positive and useful effect on the economic growth variable. It can be proven from the shock variable of loading and unloading of goods at the ports toward the economic growth variable on the variance decomposition. The contribution result of road length variable on variance decomposition increased in each period. This fact illustrates that the government has attempted the development and construction of new road infrastructure.

In terms of infrastructure investment, especially in the transportation sector, the Final Evaluation Report on the Development in Indonesia's Transportation outlines that the reliability and efficiency of transportation sector facilities and infrastructure should be improved to strengthen competitiveness. Physical networks, national infrastructure, and facilities are parts of a global network. The development of transportation networks, communications, and various other economic facilities as well as infrastructure sector must pay attention to the compatibility between national and global networks in order to achieve efficient economic movements. Goods and services produced by the infrastructure sector must have high compatibility and complementary to adjust the global market demand. Otherwise, foreign investors will face a problem to enter Indonesia due to the poor condition of facilities and infrastructures.

In accomplishing adequate facilities and infrastructures, especially in the land transportation sector, the government established a stimulus program in 2009. One of the programs was utilized to rehabilitate national roads and bridges, maintain provincial roads and bridges, maintain regional roads and bridges, improve or construct district roads and bridges, foster the implementation of road and bridge constructions in the Eastern area, construct new roads and improve strategic roads, and construct toll roads (GRIGG, 2000)

The road infrastructure condition can determine the proper economic activities since good and adequate road infrastructures will reduce the costs of transactions and distributions, the period length of shipping, and the fuel used. If this condition is achived, transaction and distribution activities will become more efficient. Inadequate transportation infrastructure conditions will have major impacts on trade costs and volumes (LIMAO, 2001)

In addition to land transportation, sea transportation with loading and unloading activities at the ports also affects economic growth since they are related to the export-import activities and inter-island distribution of goods. The Final Evaluation Report on the Development in Indonesia's Transportation in 2005-2008 described government's programs achieved in seeking better sea transportation facilities and infrastructure (ENDERS, 2004; ESFAHANI, 2003), The aforementioned programs included (1) the construction of eleven container (full container terminal) ports, namely Tanjung Priok Port, Tanjung Perak Port, Belawan Port, Tanjung Emas Port, Panjang Port,

Makassar Port, Banjarmasin Port, Pontianak Port, Bitung Port, Samarinda Port and Palembang Port; (2) the construction of four semi-container (multi-purpose) ports and seven conventional ports; (3) twenty-two ports that have break-bulk loading and unloading facilities and nine ports that have dry liquid bulk loading and unloading facilities; and last (4) ports that have passenger terminals and 142 for pioneer/public ports. By the development achievement of better transportation facilities and infrastructure, it is expected that economic activities can be more efficient (FEDDERKE, 2008; GRAMLICH, 1994).

4. CONCLUSION

There was only one significant variable at α of 1%, i.e. infrastructure investment (PMTB) which significantly contributed the most considerable shock in comparison to the variables of land transportation (road length) and sea transportation (the number of goods loading and unloading at the ports). PMTB reached 23.54934 in the first period, yet it increased in the next period. In addition, PMTB had a more significant influence on the economic growth in Indonesia. Meanwhile, the two insignificant variables were the land transportation (road length) and sea the transportation (the number of loading and unloading of goods in the ports).

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