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IMPACT OF INFRASTRUCTURE SPENDING ON SECTORAL EMPLOYMENT ABSORPTION: COMPUTABLE GENERAL EQUILIBRIUM (CGE) MODEL

R. Handayani [1]*, C. Sugianto [2], J. Saputra [3]
[1]Universitas Muhammadiyah Sumatera Utara
Jl. Kapten Mukhtar Basri No. 3 Medan
[2]Universitas Gadjah Mada
[3]University of Malaysia Terengganu
***Email:** catur@ugm.ac.id

ABSTRACT
The Computable General Equilibrium model is utilized to establish a comprehensive equilibrium in the Indonesian economic framework, assessing the impact of government expenditure on infrastructure development on sectoral employment absorption during the 2019-2021 pandemic period. The PEP-1-1 model, in its static version 2.0 within GAMS 23.5 software, incorporates expenditure variables for infrastructure development as shocks, simulated to elucidate their effects on Indonesia's macroeconomic landscape and economic recovery post-Covid-19 pandemic and crisis resolution. The study reveals that infrastructure development notably boosts sectoral employment absorption, with the Real Estate and Corporate Services sector leading at a 5.3% increase, followed by Transport Support Services and Warehousing at 4.47%, the Food Crops Agriculture Sector at 3.15%, land transportation at 2.9%, and the restaurant sector at 2.88%. Additionally, the fisheries sector, spinning, textile, clothing, and leather industry sectors, as well as government and defense, education, health, film, and other social services sectors, experienced a 1% rise. The equitable distribution of infrastructure development across Indonesia, beyond urban centers, is crucial to uphold the principles of equality and justice in development endeavors.

INTRODUCTION

Background

Infrastructure development is very necessary in the process of economic growth because it can encourage economic growth, thereby creating new jobs, reducing poverty levels and increasing per capita income (1). The main factor in accelerating economic growth in the 20th century compared to previous centuries was infrastructure development according to the World Bank, 1994(2). Todaro (2009) said that economic growth in a country is influenced by capital accumulation, namely investment in land, equipment and machinery, facilities, natural resources, human resources both in number and level of quality of the population, technological progress in access to information, innovation and self-development capabilities. as well as work culture (3). The World Bank (1994) also classifies infrastructure into 3 groups, 1. Economic infrastructure, is physical development that supports economic activities, including public utilities (telecommunications, clean water,

sanitation, gas), public works (roads, dams, irrigation, drainage) and the transportation sector (roads, railways, ports, airports). 2. Social infrastructure, is infrastructure that leads to human development and the environment, such as education, health, housing and recreation. 3 Administrative Infrastructure, is infrastructure in the form of law enforcement, administrative control and coordination (2). In 2019 the world was shocked by the outbreak of the Covid pandemic which has infected the whole world. This condition in Indonesia has resulted in the termination of employment relations (PHK) of 2.9 million employees (as of May 2020), according to the Ministry of Manpower, while KADIN (Indonesian Chamber of Commerce and Industry) is actually higher, reporting that 6.4 million employees have been laid off. The extraordinary conditions that have been established do not necessarily weaken economic movements. The expansionary fiscal policy that has been implemented for almost the last 10 years for infrastructure development has been hampered by its continuation. Infrastructure development expenditure experienced a decline in 2022 during the Covid pandemic during its heaviest period, amounting to 365.8 T from previously 417.4 T in 2021 and 307.3 T in 2020. Increasing infrastructure development is expected to be able to move the economy by creating jobs and encouraging increased investment which will accelerate the process of sustainable economic growth. In the midst of Indonesia's still difficult economic conditions due to the Covid-19 pandemic, the Government continues to strive to increase expansionary fiscal spending, one of which is infrastructure development. Based on the problems described above, the problem formulation in this research is "How do policies on infrastructure development have an impact on sectoral employment in Indonesia?"

METHOD

Analysis Tools

Computable General Equilibrium models are used to build general balance in the Indonesian economic model. The PEP -1-1 model is used with static version 2.0 in GAMS 23.5 software with the Infrastructure expenditure variable simulated as a shock for the model that has been built. The Computable General Equilibrium Model (CGE model) has been widely used in various countries, including Indonesia. The CGE model can see and analyze the impact of a policy implemented by the government using the analytical approach of general balance theory. Walras, known as Walras' law, proves the existence of a general balance point using formal mathematics, where total access demand and total access supply occur for all types of goods or commodities produced. General equilibrium theory explains that the market as a system consists of several types of markets that are interrelated. General equilibrium occurs when demand and supply in each market in the system are in equilibrium simultaneously. The equilibrium price level that is realized is the solution of a system of simultaneous equations that describe the behavior of each economic actor and the balance in each market (7). Partial equilibrium analysis describes results for one market at a time. Nicholson (1995) says, setting prices in one market usually has effects in other markets, and these effects, in turn, create ripples throughout the economy, perhaps even to the extent of affecting the price-quantity balance in the initial market. To describe complex economic relationships, it is necessary to bypass partial equilibrium analysis and build a model that allows looking at many markets simultaneously(7).

Data Types and Sources

The primary data utilized to develop the foundational data for the CGE model in the study comprises national-scale secondary data. It involves data from the 2008 Indonesian Socio-Economic Accounts System (SNSE) and the 2008 National Socio-Economic Survey (SUSENAS) released by BPS (no further updates until 2023). Additional key supporting data consist of the Indonesian Input-Output (I-O) Table for 175 sectors in 2005 and the Indonesian Input-Output (I-O) Table for 66 sectors in 2008, also published by BPS.

RESULTS

Validity of Computational Model Results

Validation of the computational model results is a prerequisite that must be satisfied before conducting simulations on the CGE model. The validation of results in the CGE model must address four computational aspects: (1) establishing initial SAM values through equations in the CGE model known as SAM calibration results, (2) ensuring that the number of iterations to generate a calibration SAM is zero, (3) confirming the existence of a solution (indicated by "EXIT-Solution Found" during program execution) for utilizing the initial SAM value in all CGE model equations, and (4) verifying that the values derived from the solution constitute the SAM resulting from the equation (post-optimal SAM) and are identical to the original SAM, meeting the equilibrium criteria. Evaluation of the CGE model program's performance indicates that the aforementioned criteria have been satisfied, leading to the conclusion that the development of the CGE model in this study has successfully validated the computational model results, as evidenced by the emergence of SOLVAR or Solution Variable.

Designing Simulation Policies for Shocks in the CGE Model

Fiscal policy regarding infrastructure development spending disrupts the established model. This study is based on data up to the conclusion of 2023. Infrastructure development totals 455 T, marking a surge of approximately 93 percent compared to the previous year.

Policy to boost government spending on infrastructure development (G) by 93%.

The table below presents the outcomes of the 93 percent increase in government spending on infrastructure development (G) and its effects on economic conditions.

Table 1. Sectoral Employment Absorption

No	Economic Metrics		Prior to Simulation	Delta Transformation
1	Labor Absorption by Sector	Economy	Prior to Simulation	Post-simulation
	1	**Agricultural Crop Production**	**3.56E+05**	**Increase by 3.15%.**

2	Livestock Farming and Its Yield	1.06E+05	Decreased by 1.22%
3	**Fishery**	91494.808	**Increase by 1.38%.**
4	Food, Beverage, and Tobacco Sector	15275.031	Decreased by 1.63%
5	Crop Farming	49457.058	Decreased by 9.13%
6	Forestry and Hunting	60074.86	Decreased by 3.74%.
7	Coal Mining, Metal Ores, and Petroleum Extraction	46746.213	Decreased by 5.31%
8	**Mining and Excavation Activities**	1.20E+05	**Increase by 2.25%.**
9	**Textile, Apparel, and Leather Sectors**	45828.696	**Increase by 1%**
10	Timber and Timber Products Sector	35860.028	Decreased by 1.22%
11	Paper, printing, transportation equipment, metal goods industry, and other sectors.	1.79E+05	Decreased by 1.22%
12	Chemical Industry, Clay Products, Cement	1.67E+05	Decreased by 1.22%

13	Electricity, Gas, and Potable Water	16370.867	Decreased by 1.22%
14	Construction	2.01E+05	Decreased by 1.22%
15	trade	4.41E+05	Decreased by 1.22%
16	**Restaurant**	**1.04E+05**	**Increase by 2.88%.**
17	**Hospitality**	9278.8	Decreased by 1.22%
18	**Ground Transportation**	**87257.51**	**Increase by 2.9%.**
19	Air, Water, and Communication Transportation	68099.975	Decreased by 1.22%
20	**Transportation and Warehousing Assistance Services**	**20444.664**	**Increase of 4.47%**
21	Personal Care, Domestic, and Miscellaneous Services	53145.725	Decreased by 1.22%
22	Banking and Insurance	45543.003	Decreased by 1.22%
23	**Real Estate and Corporate Services**	**2.86E+05**	**Increase by 5.3%.**
24	**Government and Defense, Education, Health, Film, and Other Social Services**	**86104.233**	**Increase by 1%**

CGE Model, processed data, Rita 2022

DISCUSSION

Dari From the results of the simulation (shock) carried out on the model, the increase in government spending had an effect on the increase in sectoral employment absorption in 24 economic sectors in Indonesia, the highest in the Real Estate and Corporate Services sectors, which increased by 5.3 percent, Transport Support Services and Warehousing increased by 4.47 percent, the Food Crops Agriculture Sector rose by 3.15 percent, Land Transportation by 2.9 percent, the Restaurant sector rose by 2.88 percent. Meanwhile, the fisheries sector, the spinning, textile, clothing and leather industry sectors and the government and defense, education, health, film and other social services sectors rose 1 percent. The increase in infrastructure development expenditure contributes or influences all macroeconomic conditions selected in the model. This condition can be interpreted as infrastructure development having an impact on changes in macroeconomic indicators which change or have a significant impact. This condition is in accordance with Amaliah Dyah's research (2019), infrastructure development has a significant and positive influence on economic growth. The model uses a panel data regression model with the Fixed Effect analysis method. The results of this research show that the variables electricity, clean water, education and health infrastructure have a positive and significant effect on the growth of GRDP per capita in Indonesia (2). Infrastructure development has a significant and positive influence on economic growth which is also in accordance with the results of Sri Kurniawati (2018) examining the negative and significant influence of infrastructure development on road length on economic growth and the negative and insignificant influence of electricity infrastructure development on economic growth. Meanwhile, the influence of clean water infrastructure development is positive and significant and the influence of community health center infrastructure development is positive and insignificant on economic growth (3). Arga k (2022), also found that the increase in infrastructure development will also increase economic growth and economic growth will be accompanied by increased equality in the Indonesian economy (8). Furthermore, according to research by Handayani (2022), the expansionary fiscal policy implemented by the government has had an impact on economic growth, increased sectoral employment and increased income of household groups (9). And also in accordance with research by Safina L (2011) examining the influence of domestic investment and foreign investment on industrial development in Medan. Based on research results, domestic investment has a positive influence on the industrial development of the city of Medan. Likewise, foreign investment has a positive influence on industrial development in Medan (10).

Findings

Mechanism of the impact of government spending on infrastructure development on the economy. The findings in this research are that policies on infrastructure development have

had an impact on increasing macroeconomic variables, namely economic growth, sectoral employment and household group income. However, there is something that must be remembered that spending on infrastructure development at the same time also has the impact of creating a deficit in the APBN (state revenue and expenditure budget) which will ultimately increase the debt variable. The deficit condition is a heavy burden for the APBN and this will be covered by the Government using debt assistance instruments, both domestic debt and foreign debt, recorded government debt reaching 7,755 T at the end of 2023.

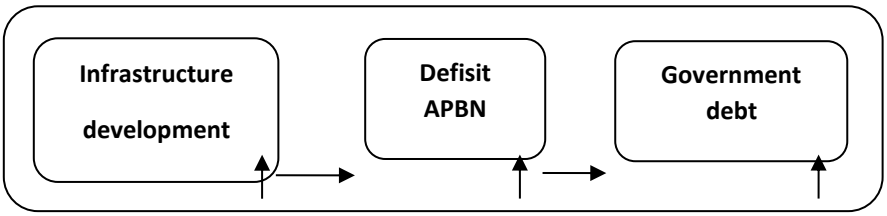

Figure 1. Infrastructure development mechanism has an impact on government debt

Infrastructure development aims to expedite economic growth for both immediate and long-term benefits. Adequate infrastructure availability is crucial for sustainable development. Government initiatives to enhance infrastructure seek to promote economic equity among all Indonesians. The substantial government debt incurred is a trade-off for hastening development to achieve market efficiency in anticipation of global economic competition. Inadequate infrastructure poses a significant challenge to the economy, leading to inefficiencies in economic activities. Many nations are actively striving to enhance efficiency to remain competitive in the age of globalization. The anticipated advancement in infrastructure is expected to foster more efficient growth in the Indonesian economy, positioning it as a key player in global market competition. Infrastructure development is the government's endeavor to excel in the global market competition, where Indonesia faces various challenges, including achieving efficiency, avoiding the middle-income trap, devising strategies for global market competition, adapting to the industrial revolution 4.0 and society 5.0, and progressing towards a prosperous Indonesia by 2045.

CONCLUSION

The research concludes that infrastructure development significantly affects sectoral employment absorption. The top 9 sectors experiencing growth are Real Estate and Corporate Services by 5.3%, Transport Support Services and Warehousing by 4.47%, Food Crops Agriculture by 3.15%, land transportation by 2.9%, and the restaurant sector by 2.88%. Additionally, the fisheries sector, spinning, textile, clothing, and leather industry sector, as well as government and defense, education, health, film, and other social services sectors, saw a 1% increase. The recommendations in this study are: It is anticipated that infrastructure development will be evenly spread across Indonesia, rather than being focused solely in urban areas, as one of the primary objectives of development is to promote equality and justice. Infrastructure development impacts state debt, so selecting appropriate projects for construction is crucial to optimize debt-financed investments. Stringent oversight is essential in infrastructure development to mitigate the risk of leaks and corruption.

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