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Article

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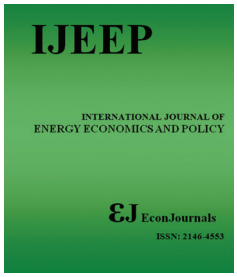

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The Impact of the Information and Communication Technology and Electricity on Inter-island Interactions in Indonesia

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ABSTRACT

The purpose of this study is to examine the economic interaction in Indonesia and the impact of the information and communication technology (ICT) and electricity on inter-island interactions in Indonesia. Data used Indonesian inter-regional input-output (IRIO) table 2016. According to the results, the largest inter-island interaction occurred between Java and Sumatra, Java-Sulawesi and Java-Kalimantan. Java was more dependent on Sumatra than Sumatra's dependence on Java. Java was more dependent on other islands than other islands' dependence on Java. The impact of ICT on the economy was higher than the impact of electricity. The ICT had more impact on the interregional economy than intraregional. Meanwhile, the electricity had more effect on the intraregional economy than interregional. The intervention to increase investment in ICT resulted in the highest increase in output of Bali and Nusa Tenggara. Both when the intervention was carried out on Bali and Nusa Tenggara islands or in other islands. The same was true for electricity investment interventions. Therefore, Bali and Nusa Tenggara islands should be given more priority in ICT and electricity investment. Investment in ICT and electricity will accelerate the economic development of eastern Indonesia so that it can become a reference for equitable development.

Keywords: ICT, Electricity, Economic Growth, IRIO
JEL Classifications: O11, O33

1. INTRODUCTION

Technology is a factor that can accelerate economic growth by increasing productivity and time efficiency. With the rapid development of technology today, technology is in the form of equipment and machines and penetrates ICT. The era of the industrial revolution 4.0 is now making ICT progress very rapidly. Most studies state that ICT can increase economic growth (Asongu and Le Roux, 2017; Asongu and Nwachukwu, 2018; Asongu, 2015; Asongu and Boateng, 2018). ICT can also interact with Foreign direct investment (FDI) in promoting inclusive economic growth (Ofori and Asongu, 2021; Pradhan et al., 2021). This relationship between ICT and gross domestic product (GDP) growth will influence each other in the long term (Sawng et al., 2021; Kallal et al., 2021; Arvin et al., 2021). ICT affects economic growth through the internet, cellular and fixed telephone penetration (Hussain et al., 2021). In developed countries, this ICT will be further developed through research and development (R&D) (Nair et al., 2020) and patents (Nguyen and Doytch, 2021). The economic benefits obtained by developing countries due to ICT development will be greater than in developed countries (Appiah-Otoo and Song, 2021).

ICT really needs electricity. The relationship between ICT and electricity is reciprocal. Increasing ICT will increase electricity consumption (Heddeghem et al., 2014 and Pothithou, Hanna, and Chalvatzis, 2017). Electricity will increase ICT in internet use (Armey and Hosman, 2016). The production of electricity increased with the improvement of computers and software (Collard et al., 2005). Therefore,

this ICT research also included electricity variables in it. ICT and electricity will be closely related to economic growth. ICT and electricity are essential in economic growth, but the contribution of ICT is 3 times greater than the contribution of electricity (Jalava and Pohjola, 2008). Electricity consumption will lead to economic growth, while the use of cellular and internet will lead to electricity consumption and economic development (Salahuddin and Alam, 2016).

Table 1 shows that the share of the Electricity sector is the second lowest in Indonesia's GDP. The ICT sector is the sixth-largest contributor to Indonesia's GDP. However, according to the Statistical Bureau of Indonesia (BPS), Indonesia's Information and Communication Technology Development Index (IP-ICT) is low, ranking 111 from 175 countries. There is a gap in IP-ICT between regions (Table 2). Therefore, this study wants to see the relationship between ICT, electricity, and economic growth from the regional side in Indonesia.

Many studies have examined ICT and economic growth in a regional context, such as Hu et al. (2020), who examined the effect of technology spillover in China; Wang et al. (2017), who researched the expansion of FDI and technological improvement in China; and Liu and Zhang's (2020), who studied the communications sector and economic growth in Europe. However, their research used time series analysis tools and did not use IRIO data. In electricity and economic development, no research examines it regionally. Meanwhile, this study looks at the relationship between the ICT sector and economic growth from the regional side between islands using the IRIO model.

Therefore, this study wants to see the relationship between ICT and electricity on the interaction of economic growth using the IRIO model. The novelty of this study lies in the use of the IRIO Model. IRIO can raise economic interactions between regions. This cannot be seen by using spatial analysis with time-series data. Within the framework of the IRIO concept, the theory used is the theory of spatial interaction, namely trade between regions. This research aimed to (i) analyze the economic interaction, and inter-island interdependence in Indonesia and (ii) analyze the impact of ICT and electricity on inter-island economic linkages in Indonesia.

2. LITERATUR REVIEW

2.1. ICT and Growth

ICT is considered to increase inclusive human development on the African continent to reduce income inequality (Asongu and Le Roux, 2017). In addition, the quality of education using mobile phones has been shown to increase inclusive human development (Asongu and Nwachukwu, 2018). There is an income redistribution effect from pro-poor mobile penetration in Africa (Asongu, 2015). There is a relationship between mobile technology and inclusive economic development in Africa (Asongu and Boateng, 2018). Nguyen and Doytch (2021) state that ICT patents are indirectly related to economic growth, especially in developed countries.

Table 1: Distribution of GDP (2010 version) at current market prices (percent)

Industrial Origin	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
A. Agriculture, Forestry and Fishing	13.93	13.51	13.37	13.36	13.34	13.49	13.48	13.16	12.81	12.71	13.70	13.28
B. Mining and Quarrying	10.46	11.81	11.61	11.01	9.83	7.65	7.18	7.58	8.08	7.26	6.44	8.98
C. Manufacturing	22.04	21.76	21.45	21.03	21.08	20.99	20.52	20.16	19.86	19.70	19.87	19.25
D. Electricity and Gas	1.06	1.17	1.11	1.03	1.09	1.13	1.15	1.19	1.19	1.17	1.16	1.12
E. Water supply, Sewerage, Waste Management and Remediation Activities	0.09	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
F. Construction	9.13	9.09	9.35	9.49	9.86	10.21	10.38	10.38	10.53	10.75	10.71	10.44
G. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	13.46	13.61	13.21	13.21	13.43	13.30	13.19	13.02	13.02	13.01	12.92	12.97
H. Transportation and Storage	3.57	3.53	3.63	3.93	4.42	5.02	5.20	5.41	5.38	5.57	4.47	4.24
I. Accommodation and Food Service Activities	2.92	2.86	2.93	3.03	3.04	2.96	2.93	2.85	2.78	2.78	2.55	2.43
J. Information and Communication	3.73	3.60	3.61	3.57	3.50	3.52	3.62	3.78	3.77	3.96	4.51	4.41
K. Financial and Insurance Activities	3.49	3.46	3.72	3.88	3.86	4.03	4.19	4.20	4.15	4.24	4.51	4.34
L. Real Estate Activities	2.89	2.79	2.76	2.77	2.79	2.84	2.83	2.81	2.74	2.78	2.94	2.76
M, N. Business Activities	1.44	1.46	1.48	1.51	1.57	1.65	1.71	1.75	1.80	1.92	1.91	1.77
O. Public Administration and Defence; Compulsory Social Security	3.78	3.89	3.95	3.90	3.83	3.90	3.84	3.67	3.65	3.61	3.77	3.44
P. Education	2.94	2.97	3.14	3.22	3.23	3.36	3.37	3.29	3.25	3.30	3.56	3.28
Q. Human health and social work activities	0.97	0.98	1.00	1.01	1.03	1.07	1.07	1.07	1.07	1.10	1.30	1.34
R, S, T, U. Other Services Activities	1.47	1.44	1.42	1.47	1.55	1.65	1.70	1.76	1.81	1.95	1.96	1.84
A. Gross Value Added at Basic Price	97.37	98.01	97.84	97.51	97.51	96.85	96.43	96.15	95.94	95.89	96.35	95.96
B. Taxes Less Subsidies on Pruducts	2.63	1.99	2.16	2.49	2.49	3.15	3.57	3.85	4.06	4.11	3.65	4.04
C. Gross Domestic Product	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Scale: High (7.26-100). Medium (5.01-7.25). Low (2.51-5.00). Very Low (0.00-2.50)

Table 2: Information and Communication Technology Development Index (IP-ICT) in Indonesia

Index	2015	2016	2017	2018	2019	2020
Access and Infrastructure	4.81	4.88	5.16	5.34	5.53	5.67
Usage	2.21	3.19	4.44	4.45	4.85	5.34
Expertise	5.38	5.54	5.75	5.76	5.84	5.92
IP-ICT	3.88	4.32	4.99	5.07	5.32	5.59

Scale: High (7.26-100). Medium (5.01-7.25). Low (2.51-5.00). Very Low (0.00-2.50)

This research was conducted on 26 developed countries and 17 developing countries using data from 1998 to 2016.

Ofori and Asongu (2021) conducted research in sub-Saharan Africa using panel data from 1980-2019 and generalized method of moments (GMM) analysis, stating that FDI and ICT induce inclusive economic growth. The data used are GDP and ICT for the years 1999 to 2016. Sawng et al. (2021) produce evidence that ICT and GDP growth influence each other in the long run, whereas only ICT affects GDP growth in South Korea in the short term.

Pradhan et al. (2021) researched India using data from 1991-2018, and Granger causality analysis stated that ICT and financial inclusion are essential to achieving sustainable economic development. The Variable are percentage change in real per capita state domestic product, total number of bank branches per square kilometer, total number of bank branches per population, total number of loan accounts per population, total number of deposit accounts per population, telephone landlines per thousand of population, total mobile phone subscribers per thousand of population, total internet users per thousand of population.

Hussain et al. (2021) conclude that ICT has a long-term positive relationship with economic growth in South Asia through internet user penetration, cellular subscriber penetration and fixed telephone subscriber penetration. This study covered India, Pakistan, Bangladesh, and Sri Lanka from 1995 to 2016 with VECM analysis. The variables used were economic growth, fixed telephone subscribers, cellular telephone subscribers, and internet users.

Appiah-Otoo and Song (2021) conducted research on 123 countries from 2002 to 2017, including 45 high-income countries and 58 middle-income countries. The variables used were GDP, mobile phone usage, Internet usage, and fixed broadband usage. The results show that ICT boosts economic growth in high-income and middle-income countries. Meanwhile, poor countries will benefit more from the ICT revolution.

Kallal et al. (2021) state that ICT was positively related to economic growth in the long term in Tunisia but negatively related in the short term. This study used data from 1997 to 2015 and the Panel Autoregressive Distributed Lag (ARDL) Panel analysis. state that ICT drives the economy in Europe using the internet, social media, e-commerce by SMEs, and e-government by the government. This analysis used the partial least square model.

Hwang and Shin (2017) state that ICT was positively related to economic growth in Korea. The Variable are Investment in ICT tangible capital/GDP; Investment in ICT intangible capital/GDP, Investment in non-ICT tangible capital/GDP with CGE model.

Jung et al. (2013) state that ICT was positively related to economic growth, TFP, and convergence in Korea indirectly. The variable are value added, employment, worked hour, Gross fixed capital formation, Depreciation rate, Real capital stock, TFP growth rate, Information network index, average years of schooling for the population aged 25 and above, real GDP, ICT with data since 1985-2007.

Nair et al. (2020) conclude that R&D and ICT contribute to economic growth in developed countries in the long term. The analysis was carried out using the VAR model and data from 1961 to 2018. Arvin et al. (2021) conducted research in G-20 countries using data from 1961-2019 using VAR analysis. The results show that ICT, FDI and trade openness influence long-term economic growth. The result state that ICT, FDI, Openness related to economic growth in the long run. Edquist and Henrekson (2017) state that R&D relate to TFP growth. ICT and TFP are related. R&D more relate to TFP more than ICT. Hardware more relate toTFP. This study use data of 50 industries in Sweden for the period 1993-2013 with OLS analysis. The variables are value added, quality adjusted hours worked, ICT capital, other capital, R&D capital, software capital, hardware capital. Edquist & Henrekson (2007) stated that ICT capital and R&D is significantly related to added value. This research using data for 47 industries for the period 1993–2012 with WLS analysis. The variables used are value added, labor input as hours worked, gross fixed capital formation, ICT capital, R&D and non-ICT capital.

Value-added in China's ICT-intensive sector will grow faster in regions with faster development of intangible capital. Intangible assets do play an important role in the growth of the ICT sector (Li and Wu, 2020). This study takes data from 29 sectors in 30 regions in China for the years 2003-2015 with variable are intangible asset, ICT, human capital, non-ICT physical capital, and financial market. Ishida (2015) states that there is a long-term stable relationship, from ICT to the production function as well as the energy demand function. But ICT investment can contribute more to a reduction in energy consumption than an increase in GDP. This study uses ARDL analysis using data for the period 1980-2010 in Japan.

2.2. ICT, Electricity and Growth

ICT needs electricity. The relationship between ICT and electricity is reciprocal; increasing ICT will increase electricity consumption. There was an increase in ICT use from communication networks, personal computers, and data centers during 2007-2012 (Heddeghemv et al., 2014). The variable used was comparing energy used by ICT equipment in 2007 and 2012. The analytical tool used was descriptive. The growth of ICT used by households has also led to increased electricity consumption in Europe (Pothithou, Hanna, and Chalvatzis, 2017). The data used was the electricity needs of each ICT device in a state of on, off, standby, and sleep. The analysis carried out was descriptive. Electricity will increase ICT in internet use in developing countries (Armey and Hosman, 2016). Analysis was conducted using GMM. Electricity production increased with the increase in computers and software usage (Collard et al., 2005). The analysis used was nonlinear least squares (NLS) and two stages NLS (TSNLS). Data are Production,

Energy consumption, Energy intensity, Electricity consumption, Electricity intensity, the share of computer and software in total capital, and Share of communication capital in total capital.

Electricity will increase ICT in developing countries with internet (Armey and Hosman, 2016). with GMM analysis and the variable are Internet users per 100 people, Night lights Gini coefficient, GDP per capita, Democracy, Urban population share, Trade share GDP, Telephone lines per 100 people, Mobile Phones per 100 people. In developing countries there is also a positive and significant relationship between electricity consumption and ICT via the internet, mobile phones or PC (Sadorsky, 2012). Use ARDL analysis with data from 19 emerging economies period 1993-2008. Variable are Electricity, Income, CPI, Internet, Mobile, and PC.

Xu et al. (2022) state that (1) the direct and indirect relationship of electricity consumption to economic growth continues to increase over time; (2) the indirect effect of electricity consumption on economic growth is stronger than the direct effect. The analysis used is a structural equation model (SEM) using data from 1978 to 2019. In addition, there is a causal relationship between electricity and economic growth (Chakraborty and Mazzanti, 2021). There is a positive long-run relationship between renewable electricity consumption and economic growth. Economic growth per capita is a factor that causes total electricity consumption and electricity consumption based on fossil fuels to increase. This study uses data from 1971-2015 with ARDL econometric analysis. Variable are per capita renewable electricity consumption, per capita gross domestic product (GDP), and electricity.

The relationship between ICT, electricity and economic growth is closely related. The contribution of ICT to economic growth is 3 times greater than the contribution of electricity (Jalava and Pohjola, 2008). Electricity consumption will lead to economic growth, while ICT through cellular and Internet usage causes electricity consumption and economic growth (Salahuddin and Alam, 2016). The variables are electric power use (per capita), GDP (per capita), mobile cellular subscription and Internet use (per 100 people).

3. METHODOLOGY

The scope of this research was Indonesia, which is divided into six Islands, is Sumatra Island, Java Island, Bali and Nusa Tenggara Islands, Kalimantan Island, Sulawesi Island, and Maluku and Papua Islands. This study wanted to see the economic interactions between the six islands. In contrast to all the literature reviews above, which used time series analysis, the analysis used in this study was a regional analysis using the interregional input-output table (IRIO) sourced from Statistical Bureau of Indonesia. The analytical tools used were as follows:

1. A multiplier effect was used to analyze the economic interaction between islands in Indonesia, is equation (2), so that how the influence of one island on another island would be obtained.

$$X_{ij=1}^{A} = \sum_{i=1}^{n} \sum_{j=1}^{n} a_{ij}^{A} X_{i}^{A} + Y_{j}^{A} \quad (1)$$

$$X_{ij}^{A} - \sum_{i=1}^{n} \sum_{j=1}^{n} a_{ij}^{AA} X_{i}^{A} = Y_{j}^{A}$$

$$X_{ij}^{A} \left(1 - a_{ij}^{AA}\right) = Y_{j}^{A}$$

$$X_{ij}^{A} = (I - a_{ij=1}^{AA})^{-1} Y_{j}^{A} \quad (2)$$

$$\text{where } a_{ij}^{AA} = \frac{x_{ij}^{AA}}{X_{i}^{AA}}$$

$$X_{ij}^{A} = A^{AA} Y_{j}^{A} \quad (3)$$

A^{AA} is a multiplier effect.

2. A intervention simulation was made in the form of investment in the ICT sector as much as 10 percent and the electricity sector by 5 percent on each island to analyze the ICT sector and the electricity sector impacts on inter-island economic linkages in Indonesia. $Y_{j}^{A^*}$, is the gross fixed capital formation (GFCF) column on the island of Sumatra, a shock of 10 percent for ICT row and 5 percent for electricity row were added. Then the impact of the changes on the other five islands was seen by using formulas (6) and (7).

$$X_{ij}^{A^*} = \sum_{i=1}^{n} \sum_{j=1}^{n} (I - a_{ij=1}^{AA})^{-1} Y_{j}^{A^*} \quad (4)$$

For the other island:

$$X_{ij}^{B^*} = \sum_{i=1}^{n} \sum_{j=1}^{n} (I - a_{ij=1}^{AB})^{-1} Y_{j}^{A^*} \quad (5)$$

The impact of the changes in Sumatera is:

$$X_{ij}^{A} = \frac{X_{ij}^{A^*} - X_{ij}^{A}}{X_{ij}^{A}} \times 100\% \quad (6)$$

The impact of the changes in other island is:

$$\Delta X_{ij}^{B} = \frac{X_{ij}^{B^*} - X_{ij}^{B}}{X_{ij}^{B}} \times 100\% \quad (7)$$

4. RESULTS AND DISCUSSION

4.1. Inter-island Economic Interaction in Indonesia

The highest economic linkage occurs between the islands of Java and Sumatra, which can be seen from the large multiplier number of these two islands (Table 3). This is in line with the research results of Resosudarmo et al. (2005), which used IRIO in 2000. Interestingly, the influence of Sumatra Island on Java Island was 0.189. This means that to produce an output of 1 rupiah, input from Sumatra is needed of 0.189 rupiahs. While the influence of Java on Sumatra Island was only 0.052, meaning that to produce 1 rupiah of output in Sumatra requires the input of 0.052 rupiahs from Java. This indicates that the dependence of Java on inputs from Sumatra is greater than the dependence of Sumatra on inputs from Java. This is in line with the research of Professor Iwan Jaya

Table 3: Multiplier effect

Island	Sumatera	Java	Bali and Nusa Tenggara	Kalimantan	Sulawesi	Maluku and Papua
Sumatera	2.089	0.189	0.004	0.013	0.006	0.004
Java	0.052	1.849	0.015	0.025	0.015	0.007
Bali and Nusa Tenggara	0.015	0.061	1.391	0.009	0.006	0.005
Kalimantan	0.026	0.084	0.007	2.201	0.013	0.005
Sulawesi	0.033	0.164	0.033	0.044	1.690	0.033
Maluku and Papua	0.026	0.056	0.005	0.014	0.032	1.616

Azis. However, this result is inversely proportional to the study conducted by Resosudarmo et al. (2005). Perhaps this is because there has been a shift in the economic structure from IRIO in 2000 to IRIO in 2016. This applies equally to all other islands. Java Island has a higher dependence on other islands than the dependence of these islands on Java Island.

Local governments other than Java have the power to reduce the supply of finished materials from Java so that net exports have a positive value. On the other hand, local governments other than Java Island also have the higher bargaining power to market the supply of raw materials to Java Island at a higher price, given the large dependence of Java on the supply of raw materials from Outside Java.

Sumatra is also closely connected to Java and Kalimantan. Apart from Sumatra, Java is also closely connected to Kalimantan. Kalimantan itself has the highest forward linkage in Java and Sumatra. This means that Sumatra, Java, and Kalimantan are very closely related. Sulawesi has the strongest forwards to Java (0.164) and Kalimantan (0.044) as well as Sumatra, and Maluku and Papua. This means that Sulawesi has economic drivers to the adjacent eastern regions, is Maluku and Papua, and the more distant western regions, is Sumatra and Java. Maluku and Papua islands were the strongest drivers for Java and Sulawesi islands (0.032). Kalimantan, Sulawesi, and Maluku and Papua are very closely related. This is different from the research results of Resosudarmo et al. (2005). Perhaps this is because there has been a shift in the economic structure from IRIO in 2000 to IRIO in 2016. So that the purpose of this study, namely the interaction and inter-island dependence, has been answered.

4.2. Impact of the ICT Sector on the Inter-island Economy in Indonesia

The impact of the ICT sector on economic growth was simulated by intervening to increase investment in ICT. An increase in the ICT sector in one island has a more significant impact on the economy of another island than an increase in output within the island itself. For example, a 10 percent increase in ICT investment on the island of Sumatra only increases the island's output by 0.008 percent. However, increasing ICT investment in Java can increase the output of Sumatra Island by 0.019 percent. This is due to the greater dependence of Java on inputs from the island of Sumatra. This is in line with Wang et al. (2017), which states that less regular investment will reduce technological improvement within the same city but positively affect technology improvement in neighboring areas.

The simulation results indicate that if there is an increase in ICT investment in Sumatra by 10 percent, it will increase economic growth in Sumatra by 0.008 percent. The increase in ICT investment has the most significant impact on the economic growth of Bali and Nusa Tenggara islands, Maluku and Papua Islands, and Sulawesi Island. Based on the simulation, if an investment is made in ICT on Sumatra Island, it will increase the economic output of the Bali and Nusa Tenggara islands by 0.019 percent, on Sulawesi Island by 0.186 percent, and in Maluku and Papua islands by 0.019 percent. Based on the simulation in Table 4, if the investment is made in Java's ICT, then Java's economic output will increase by 0.012 percent. The effect of this increase in ICT investment is less significant on the Java economy because this ICT sector has been relatively developed in Java before. This increase in ICT investment also affects the economic growth of the islands of Maluku and Papua, Sulawesi Island, and the islands of Bali and Nusa Tenggara.

If the investment is made in ICT on the islands of Bali and Nusa Tenggara, the economic output of Bali and Nusa Tenggara will increase by 0.017 percent. The increase in ICT in Bali and Nusa Tenggara islands had the most significant impact on the increase in total output in other islands in Indonesia. Based on the simulation, if the investment is made in Sulawesi Island's ICT, then Sulawesi's economic output will increase by 0.010 percent. The increase in ICT investment has the most significant impact on the economic development of Sumatra, Bali and Nusa Tenggara, and the Maluku and Papua islands.

Kalimantan Island has a different structure to the islands discussed previously. Based on the simulation, investments made in the ICT on the island of Kalimantan have little impact on increasing the total output on this island. Even the island of Kalimantan is less responsive to changes in investment in the ICT sector on the islands of Sumatra, Java, and Bali and Nusa Tenggara. Likewise, for the islands of Maluku and Papua, based on simulations, investment in the information and communication sector does not have much impact on increasing output on these islands. This is because the ICT sector has not yet developed in this easternmost island of Indonesia. Likewise, in total, the economic output of other islands is less developed despite ICT investments in Maluku and Papua.

This means that the development of investment in the ICT sector in the western islands of Indonesia, such as Sumatra and Java, will benefit the central and eastern regions of Indonesia. Inequality in the eastern region will be slightly overcome with ICT development. The highest economic returns will be obtained by investing in ICT in Bali and Nusa Tenggara islands. The government can intensify this ICT investment considering the economic benefits obtained. Only the island of Kalimantan is less developed with this ICT investment. Further research on this should be done.

Table 4: Simulation of intervention 10% on ICT Investment (%)

Island	Sumatera	Java	Bali and Nusa Tenggara	Kalimantan	Sulawesi	Maluku and Papua
Sumatera	0.00806	0.01575	0.01858	0.00003	0.01857	0.01855
Java	0.01908	0.01222	0.01850	0.00003	0.01968	0.01975
Bali and Nusa Tenggara	0.02273	0.02216	0.01651	0.00011	0.02286	0.02282
Kalimantan	0.01004	0.00968	0.01016	0.00001	0.00898	0.01020
Sulawesi	0.01699	0.01518	0.01675	0.00007	0.01001	0.01576
Maluku and Papua	0.00002	0.00002	0.00002	0.00002	0.00002	0.00001

Table 5: Simulation of intervention 5% on Electricity Investment (%)

Island	Sumatera	Java	Bali and Nusa Tenggara	Kalimantan	Sulawesi	Maluku and Papua
Sumatera	0.00003	0.00002	0.00002	0	0.00002	0.00003
Java	0	0	0	0	0	0
Bali and Nusa Tenggara	0.00005	0.00006	0.00002	0	0.00003	0.00005
Kalimantan	0.00002	0.00002	0.00001	0	0.00001	0.00002
Sulawesi	0.00002	0.00001	0.00001	0	0.00001	0.00001
Maluku and Papua	0.00003	0.00002	0.00002	0	0.00002	0.00002

4.3. Impact of the Electricity Sector on the Inter-island Economy in Indonesia

The impact of the electricity sector on economic growth was simulated by intervening to increase investment in the electricity in the IRIO Table 5 percent. Increased investment in electricity has an impact on improving the economy. This is in line with Kunstanto's research (2020) which states that regional economic growth in Indonesia is influenced by electricity infrastructure and trade openness. This study used time-series panel data from 34 provinces in Indonesia in 2010-2018 with OLS analysis.

In contrast to interventions in the ICT, which increase output more on other islands than within the island, interventions in the electricity sector will significantly impact islands. The increase in output due to the intervention of electricity investment is less impactful when compared to the impact of ICT. This indicates that the ICT sector has a higher multiplier to the economy, especially the economy of other islands. Research by Jalava and Pohjola (2008) also states the same thing, that the contribution of ICT to economic growth is 3 times greater than the contribution of electricity. The government can prioritize information technology development, which will lead to higher economic growth.

The increase in electricity investment in Bali and Nusa Tenggara islands increased the output of all islands, 0.000003 percent on Sulawesi Island and 0.00005-0.00006 percent on the islands of Sumatra, Java, and Maluku and Papua. The increase in the impact on output on the islands of Sumatra, Sulawesi, and Papua is almost the same, 0.00001-0.000003 percent, both within islands and between islands. The government can prioritize investment in electricity in Bali and Nusa Tenggara islands so that economic development in the East Island of Indonesia can develop more.

Electricity in Java is practically non-existent, so the increase in electricity investment in this island does not impact the increasing output in other islands. However, the increase in electricity investment in other islands remains as input for electricity from the island of Java. Like the impact of ICT simulation, the electricity impact simulation also indicates that the island of Kalimantan is not responding to this increase in electricity investment. Further research on this should be done.

5. CONCLUSIONS

The largest inter-island interaction occurred between Java and Sumatra, Java-Sulawesi and Java-Kalimantan. Java was more dependent on Sumatra to supply its raw materials than Sumatra's dependence on Java. Likewise, Java was more dependent on other islands than other islands' dependence on Java.

The ICT had more impact on the interregional economy than intraregional. Meanwhile, the electricity has more impact on the intraregional economy than interregional. The intervention to increase investment in the ICT resulted in the highest increase in output of Bali and Nusa Tenggara islands. Both when the intervention was carried out on Bali and Nusa Tenggara islands or in other islands. Likewise, with the electricity, investment intervention on Bali and Nusa Tenggara islands led to the highest increase in output on Sumatra islands and Maluku and Papua islands. Bali and Nusa Tenggara should be given more priority in this ICT and electricity investment.

Investment in ICT and electricity will accelerate the economic development of Eastern Indonesia so that it can be a reference for equitable development. The impact of ICT investment is more beneficial to the economy than electricity investment. Therefore, the Government of Indonesia should emphasize increasing ICT investment. This is in line with the declaration of digital transformation as the fifth national priority of the Indonesian Government in 2022. This priority must be accompanied by strengthening the telecommunications network infrastructure. In addition, the government must also encourage the readiness of the community to be technology literate by familiarizing the use of technology in all levels of society. This study did not use inferential analysis; this can be a consideration for further analysis.

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